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SOFTWARE MONITORING OF IP-CODER BASED ON RASPBERRY PI MICROCOMPUTER

Abstract: *This article involves the IP-coder monitoring system based on the Raspberry Pi microcomputer. The possibilities of forming and receiving a response to certain messages of the Telegram bot to monitor the correct operation of the IP encoder are revealed.*

Key words: *IP-coder, microcomputer, Telegram-bot, Raspberry Pi, program code, Node.js.*

Language: *Russian*

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ПРОГРАММНЫЙ МОНИТОРИНГ IP-КОДЕРА НА ОСНОВЕ МИКРОКОМПЬЮТЕРА RASPBERRY PI

Аннотация: *Данная статья рассматривается система мониторинга IP-кодера на основе микрокомпьютера Raspberry Pi. Выявляются возможности формирования и получения ответной реакции на определенные сообщения Telegram-бота для мониторинга корректной работы IP-кодера.*

Ключевые слова: *IP-кодер, микрокомпьютер, Telegram-бот, Raspberry Pi, программный код, Node.js.*

Введение

В последние годы подавляющее большинство компаний и организаций имеют систему технической поддержки в виде различных программ-ботов. Такие программы-боты имеют огромное значение в выполнении однообразной и повторяемой работы с максимально возможной скоростью.

Именно чат-боты способны к решению самых разнообразных задач – от предоставления медицинской консультации до мониторинга специализированных прикладных решений, от распознавания эмоций до решения сложных консалтинговых задач в службах поддержки клиентоориентированных информационных систем. Независимо от платформы, чат-бот – это прикладная программа, с помощью которой получая информацию от пользователя, получает корректные, логически обоснованные ответы.

Разновидностью чат-ботов являются Telegram-боты. Их суть заключается в возможности формирования и получения ответной реакции на определенные сообщения от пользователей. Эти возможности Telegram-бота, необходимые для мониторинга корректной работы IP-кодера на основе микрокомпьютера Raspberry Pi, являются предметом рассмотрения данной статьи.

Для реализации мониторинга был использован язык Node.js – программная

платформа на движке V8, который транслирует JavaScript-код в машинный. В связки вместе с Telegram API Bot.

Node.js часто используется как back-end язык программирования, выполняя роль сервера, но имеется возможность разработки оконных десктопных приложений при помощи специальных платформа, например, NW.js, AppJS или Electron. Из спецификации можно отметить возможность использовать язык Node.js для разработки приложений в сфере «интернета вещей» (Internet of Things, IoT). В последнее время мы все чаще встречаемся с смарт-браслетами, колонками и любой другой «умной» техникой, которая в теории может быть запрограммирована на Node.js. История Node.js началась с разработки нового JavaScript-движка V8 в датском отделении компании Google. Ведущий разработчик Lars Bak выделил основные проблемы, которые должны были решены в движке, это производительность и масштабируемость. Первая лабораторная версия была готова 3 июля 2008 года, а позже был представлен первый браузер Chromium в публичный релиз которого входил новый движок.

Telegram API Bot – это программный интерфейс, позволяющий программировать собственного бота.API включает в себя объекты и команды, предназначенные для установки поведения бота Telegram. Используя интерфейс, вы можете создавать собственные программные коды, которые при запуске в Telegram начинают работать как боты.

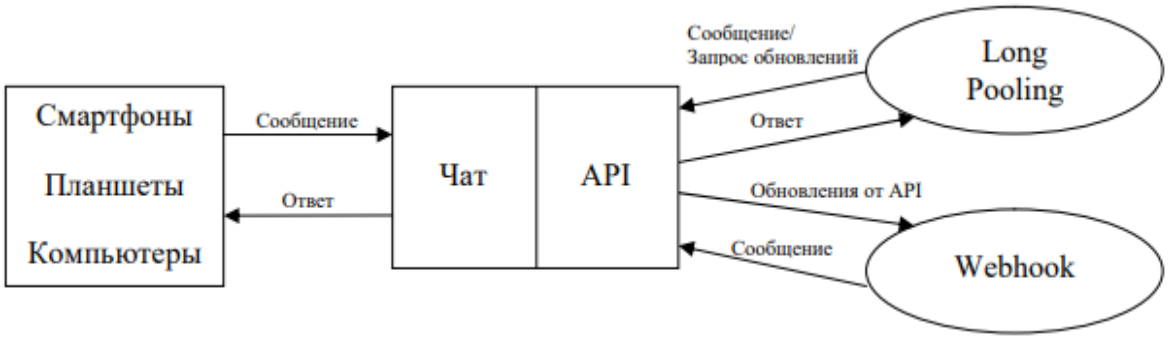

Рисунок 1 – Принцип работы чат-бота на платформе Telegram

Как видно на приведенном ниже рисунке 2, регистрация бота в Telegram происходит через пользователя BotFather, который также является ботом, позволяющим осуществлять учет и настройку пользовательских ботов. BotFather позволяет задать имя нашему боту, сделать его описание, изображение и список команд, доступных пользователям. Нами создаются и реализуются 2 команды, которые требуют ответной реакции. При наборе команды /start мы видим возможности BotFather. С помощью этих команд можно создавать, управлять своим ботом.

При создании бота выдается специальный ключ, необходимый для связи пользователей с ботом и организации их взаимодействия. Этот ключ для каждого бота уникальный.

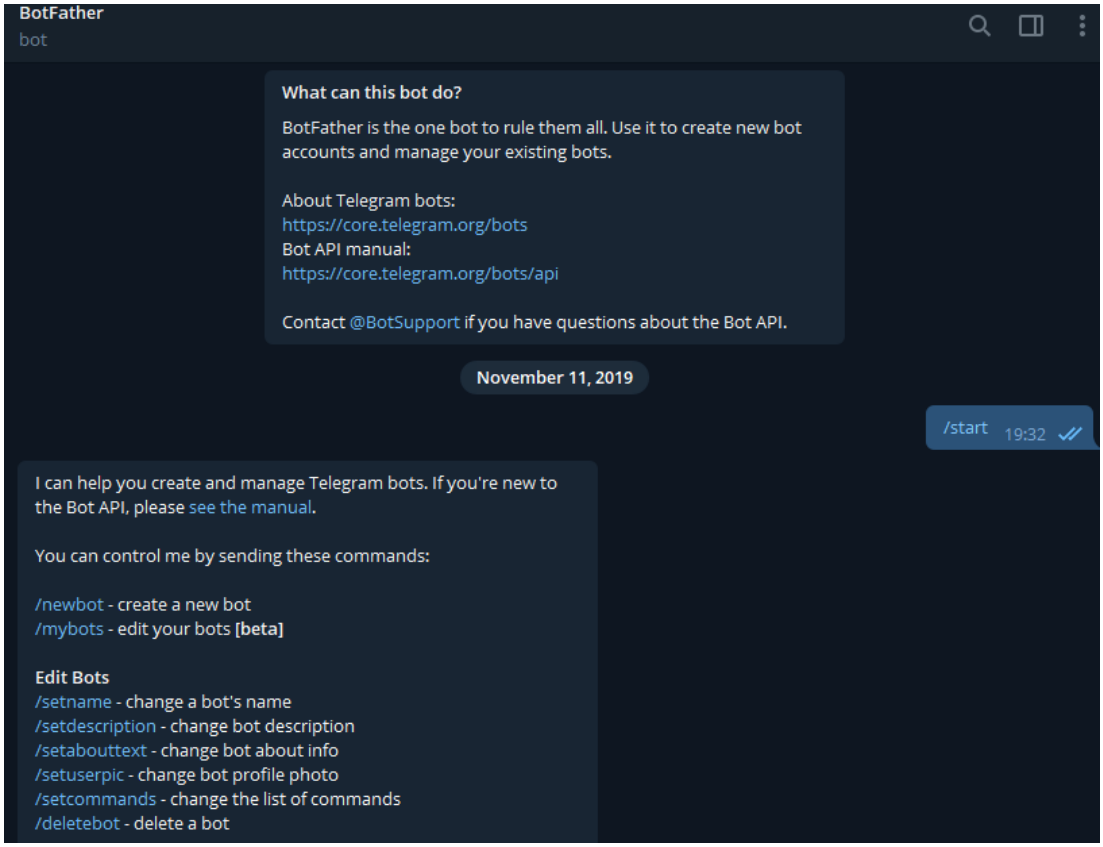

Рисунок 2 – Чат с пользователем BotFather в Telegram

На приведенном ниже рисунке. 3 можно увидеть, что, отправляя команду /newbot, нужно в ответ ввести имя бота и его никнейма, по которому он будет идентифицироваться. В дальнейшем все настройки, кроме никнейма, можно будет поменять. При необходимости также можно получить новый уникальный ключ. По аналогии создается второй такой же бот, только с другим именем.

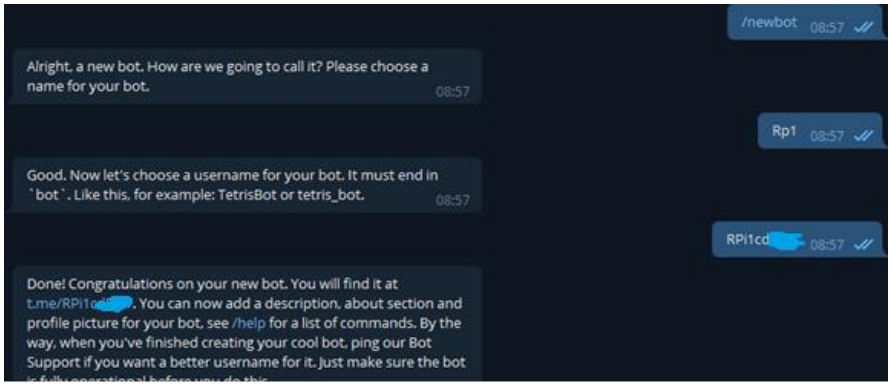

Рисунок 3. – Чат с пользователем BotFather для регистрации бота

В итоге, как видно на приведенном ниже рисунке 4, при вводе команды /mybots появляется 2 бота. При выборе каждого из них появляются дополнительные настройки в виде описания, установки аватарки и настроек приватности.

Рисунок 4 – чат в Telegram с выбором ботов

Следующим шагом, после создания telegram-бота, требуется установить библиотеки, необходимые для связи программного кода и API-функций telegram'а. Для работы устанавливается следующий ряд библиотек:

– types – это скриптовый язык, компилируемый в JavaScript;

– debug – модуль логгера для отладки и детектирования ошибок;

– esm – загрузчик модулей JavaScript'ов;

– ms – библиотека для преобразования строки (1y, 2.5hrs и т.д.) в миллисекунды;

– node-fetch – библиотека для работы с запросами и ответами HTTP;

– node-os-utils – модуль, собирающий статистику из ОС (диск, трафик, процессор);

– sandwitch-stream – библиотека для прослушивание разных протоколов, HTTP, TCP;

– spawn-sync – библиотека для чтения запущенных процессов (IceCast, liquidsoap);

– telegraf – библиотека API-функций для связи с telegram'ом;

– telegram-typings – модуль для отправки данных в telegram.

После установки библиотек необходимо перейти к написанию кода, то есть обучению нашего бота каким-то командам, или изменениям рабочей системы в зависимости от корректных условий и получения на это моментальной реакции.

С этой целью используется код программирования Node.js. В Node.js существует возможность взаимодействовать с устройствами ввода-вывода через свой API, написанный на C++, использовать сторонние библиотеки, созданные при помощи разных языков программирования, вызывая их из JavaScript-кода.

На рисунке 5 изображена функциональная блок-схема для мониторинга IP-кодера на основе микрокомпьютера Raspberry. В начале запуска скрипта требуется настроить telegram-чат для работы ботов. После настройки необходимо ввести данные каждого бота, на каждом из компьютеров RPi. Также необходимо ввести token, который выдавался при регистрации и chatId. В этот token будут отправляться данные, а также с его помощью будет производиться связь между системой и Telegram.

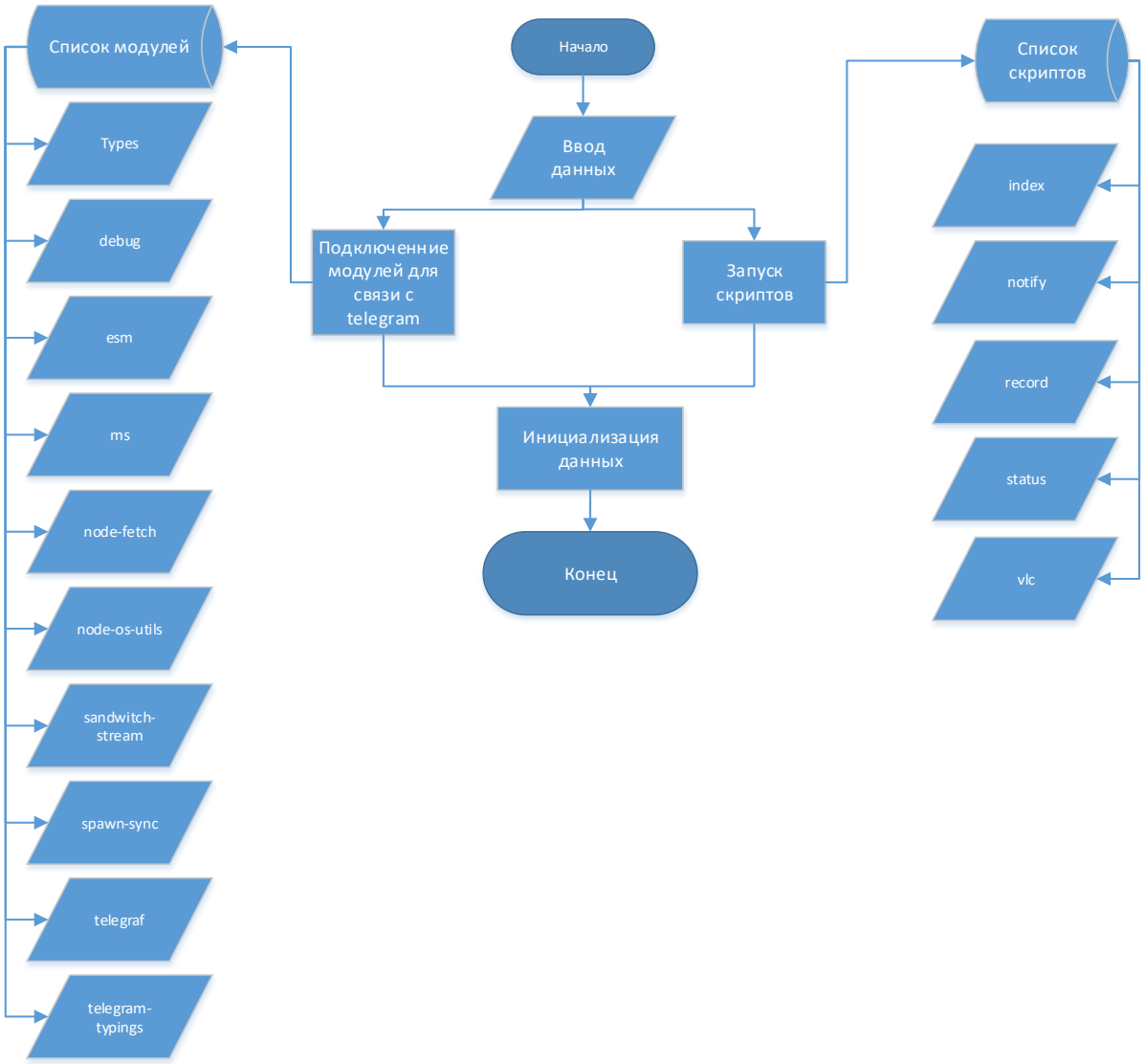

Рисунок 5 – Функциональная блок-схема устройства для мониторинга IP-кодера на основе микрокомпьютера Raspberry Pi.

Для обмена информацией необходимо подключить модули, с помощью которых можно получать уведомление о состоянии системы, захвате звука и контроле работы устройства.

После запуска модулей необходимо написать код, с помощью которого будут выполняться задачи, поставленные в нем. Программный блок будет состоять из 5 программных ячеек: index, notify, record, status, vlc.

Программный блок с названием Index собирает обобщенную информацию и является связующим звеном между блоками notify, record, status, vlc и telegram'ом.

Следующим блоком является *notify*. В данном блоке происходит контроль и отправка информации в случае отклонения от идеала. То есть, если происходит остановка программного сервиса, с помощью которого идет вещание в Icecast, vlc, liquidsoap, в Relegram придет уведомление, об обнаружении проблемы на каком-то из блоков. Такое уведомление будет присылаться до тех пор, пока не будет остановлено командой в чат /*stopalert*. Если ошибка будет исправлена, то в чат будет отправлена команда от бота - *подключение по telnet восстановлено.*

Блок *record*, используется для контроля и мониторинга отправляемого и получаемого сигнала. Принцип работы заключается в «захвате» транслируемого сигнала, передаваемого через звуковые карты. Запись сигнала происходит в течение 5 секунд и отправляется в telegram в виде голосового сообщения. С помощью данный команды можно отслеживать, на каком этапе происходит проблема с передачей звука и отслеживать его наличие.

Блок status представляет собой сбор обобщённой информации о работе RPi. При

введении команды /status в чат бот отправляет команду о текущем состоянии системы, температуре процессора, продолжительности работы хоста, отправке пакетов интернет-трафика.

Последний блок представляет собой скрипт vlc, относящийся только к RPi2. Так как вещание происходит через проигрыватель VLC, требуется его контроль на наличие проигрывания контента. Для этого создается код, который отслеживает по telnet протоколу ошибки и отправляет в Telegram через блок notify. В случае обнаружения проблем в блоках, в чате Telegram появится соответствующее уведомление.

Если все блоки функционируют корректно, то функциональная блок-схема программного обеспечения для мониторинга IP-кодера на основе микрокомпьютера Raspberry Pi может считаться законченным вариантом работы скрипта.

На основании вышеизложенного можно сделать следующие выводы:

– мониторинг корректной работы IP-кодера на основе микрокомпьютера Raspberry Pi осуществляется с помощью Telegram-бота через введение пользователя BotFather; команды /mybots, выбора дополнительных настроек описания, установки аватарки и настроек приватности, установки библиотек, необходимых для связи программного кода и API-функций telegram'a;

– для запуска скрипта требуется настроить telegram-чат, ввести на каждом из компьютеров RPi данные бота, token и chatId; затем создать блок скриптов, состоящий из программных ячеек, обеспечивающих сбор, контроль, отправку и мониторинг отправляемого и получаемого сигнала, текущего состояния системы, температуры процессора, продолжительности работы хоста, пакетов интернет-трафика, отслеживание ошибок и уведомление о них; корректное функционирование всех блоков свидетельствует о завершении работы скрипта.

Научное исследование проведено под руководством Гачко Геннадия Алексеевича, проректора по учебной работе, Гродненского Государственного университета имени Янки Купалы.

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ON THE NOMINATIVE NATURE OF THE SENTENCE

Abstract: *The article focuses on the question of the nominative nature of the sentence, which is very relevant in modern linguistics. In the analysis of actual language material, the nominative value is compared with the predicative value.*

Key words: *communicative, predicative, nominative, phraseology, linguistics.*
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Introduction

The concept of a nominative unit requires one of the topical issues on the research agenda in the field of modern development of linguistics. Indeed, the nominative meaning of language units is extremely important in the formation of the communicative process. We observe this primarily in the nominative meaning of the word, because this unit of language is distinguished not only by its meaning, but also by the fact that it itself provides the nominative expression of large units.

Indeed, the nominative meaning of persistence quotes and phraseological expressions that are considered units of language and even the unit of speech - the nominative sign of a sentence - is also expressed through words. In other words, the semantic value of a sentence arises from the synthesis of words that make up its component (building material). Of course, phraseological expressions in the form of speech are an exception.

It should also be noted that speech is always predictive in nature, since it expresses an attitude towards reality. Even sentences consisting of a single word are no exception. But predicative and nominative meanings cannot coexist. As if the predicative case focuses on the reaction to reality, the nominative meaning has nothing to do with it. In this regard, the phenomenon of predicative and nominative can be called the opposite. These phenomena can only be connected through the concept of proposition, which requires a semantic invariant. As a matter of fact, a proposition has the same meaning both for the general syntactic structure of a sentence and for transforms formed within the framework of the phenomenon of nominalization. Since we interpret the proposition in the style of the semantic structure of the sentence, it is undoubted that both the phenomenon of predicativity and the phenomenon of nominative can be reproduced under its influence. According to N.Yu.Shvedova, in the grammatical aspect of the formation of the sentence, its semantic structure is also important. This, in turn, indicates that the phenomena of predicativity and nominative have a certain relationship. But we should not understand this, that it has an absolute character. Since, if we consider a deeper approach to describing the issue, we will see that the phenomenon of nominativity is far from a reaction to reality. Therefore, phrases are usually called nominative meanings. We usually study a word as a nominative unit, since it (except for non-independent words) serves to denote objects and events in reality. But in this process, the nominative meaning expressed through the word may not always have the same status following its internal capabilities. We see that in some words the nominative sign gives its objective expression, and in some words, there are nominative signs associated with the meanings of an event or

situation. In some words, such as auxiliary and conjunctions, the nominative sign is not noticeable. However, this does not mean that a similar situation is observed in all auxiliary words. Evidence of our opinion can be seen in auxiliary verbs: started speaking, finished reading, kept speaking, etc. In this case, the verbs speaking, reading, which have an auxiliary position, do not require explanation, since they have a nominative sign following their internal characteristics.

In general, the word stands in the main (central) place among nominative units. This feature of the word has a non-changing character, both when appearing in the vocabulary of the language, and when performing the function of phrases and components of speech. In particular, simple words differ in that they express an integral (global) nominative meaning. However, the nominative meaning expressed by word combinations resulting from the interaction of words, in contrast to simple words, becomes complex due to the confusion of more than one nominative meaning. The nominative meaning formed in this situation will have additional features. For example: *большой стол (a big table), a clean room, қизиқарли китоб (an interesting book).*

Despite the fact that these examples are taken from different languages, we see that phrases are complex nominative units. In this case, we observe the complexity of nominative meaning, when the sign of the table is big, sign of the room is clean and a sign of the book is interesting. But it is worth noting that in phraseological units that denote word combinations, the expression of the nominative meaning is indivisible, that is, it has a global character. The main reason for this is that the semantic components of phraseological units do not consist of a synthesis of their meanings: A plain dealer, sinister motives, etc. The expression of the nominative meaning of phraseological units in the form of such a phrase has a permanent character because they exist in the language in a ready-made form. But this opinion cannot be drawn about the fact that free phrases mean the expression of a nominative meaning. The main reason is that they are formed in speech and each time they receive the status of a nominative unit only in this process.

The concept of “process”, which is mentioned above as a free phrase, plays an important role in realizing the nominative meaning of a unit of speech. In other words, a sentence is also formed in speech and in this process, a nominative meaning arises. But there are other aspects of the sentence, in contrast to phrases, which we primarily see in the signs of communicativeness and predicativity. The communicative function of a sentence is related to its actual use in speech because any sentence must have a certain communicative function for its practical application. The phenomenon of predicativity means the relation to the reality of the message that is transmitted through the sentence. In this respect, the phenomena of communication and predicativity are inextricably linked.

The phenomenon of nominativity also has a connection with these two aspects of the sentence. However, this relationship is not the same for both communicative and predicative phenomena. The connection of nominativity with the phenomenon of communicativeness is much less, because in the process of the communicative function of the sentence and its execution, the phenomenon of nominativity becomes secondary. In fact, during the communication period, we do not use the nominative meaning of the sentence, but its overall semantic value. However the direction of the predicative phenomenon is different. This phenomenon is much closer to a nominative phenomenon than to a communicative phenomenon. The main reason for this is that the denotation of nominativity, expressed through speech, is not a subject, but a whole situation. This, in turn, indicates that there is a certain relationship between nominativity and predicativity. In addition, predicativity is inextricably linked to the concept of proposition (the meaning of a message expressed in a sentence). Since there is a concept of a proposition, it is natural that there is a predicative phenomenon in it. However, it cannot be concluded that predicativity is a factor that creates the phenomenon of a proposition. Since the phenomenon of a proposition can be the basis for the formation of predicativity, but not vice versa.

It should also be noted that the opinions expressed by linguists regarding the phenomenon of proposition still do not coincide. While N.D.Arutyunova interprets the proposition as semantically invariant, some linguists (G.N.Manaenko) argue that this status is more of a nominative phenomenon than a proposition. In our opinion, it is appropriate to consider nominativity as an invariant character rather than a proposition. Because the concept of nominativity can serve as the basis for the formation of the semantic meaning of a particular sentence, and the concept of a proposition - a real one in the process in which we can perceive the semantic perception of the sentence structure after the complete formation of the syntactic form of the sentence.

In general, in our modern linguistics, the question of the relationship between the concepts of communicative, predicative and nominative remains ambiguous. Of course, each of these concepts has served as the basis for several monographic studies. But in the research chapter on the level of connections between them, riddle situations are still visible.

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QR – Issue QR – Article

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THE ROLE OF COUNTRY STUDIES IN TEACHING ENGLISH

Abstract: *In our country, various information about a particular country that is taught in the course of language learning is called country studies. Education by means of a foreign language involves knowledge of the culture, history, religions and traditions of the country of the language being studied.*

Key words: *linguistics, country studies, approach to learning, discipline, language unit, foreign language, vocabulary.*

Language: *English*

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Introduction

The progressive development of international contacts and relations in politics, economy, culture and alternative areas determines the consistent orientation of contemporary ways of teaching foreign languages to the real conditions of communication. the desire for communicative ability, because the consequence of learning, involves not solely the possession of acceptable foreign-language technology (i.e., the flexibility to speak in an exceedingly foreign language, ability of students), however additionally the assimilation of huge non-linguistic data necessary for adequate learning and understanding, as a result of the latter is unachievable while not the relative equality of the fundamental data of students concerning the encircling reality. The noticeable distinction within the stock of this data among speakers of various languages is principally determined by the various material and religious conditions of the various peoples and countries, the peculiarities of their history, culture, socio-political system etc. Thus, the conclusion concerning the requirement to understand thorough the specifics of the country (countries) of the studied language and so the requirement for a country-specific approach united of the most principles of teaching foreign languages has become typically recognized.

Acquaintance with the culture of the country of the language being studied has been one of the main tasks since antiquity. Teaching classical languages as an interpretation of religious texts cannot be conceived without cultural commentary. In the teaching of living languages since the end of the XIV century, the first place along with oral speech is put forward to familiarize with the realities of the country of the language being studied. This was especially characteristic of the German linguistic-didactic school. In our country, various information about a particular country, taught in the process of language learning (or in connection with language learning), is called country studies, in Germany – kulturkunde, in American educational institutions there are courses of language and territories (language and area), in the French methodological school there is the concept of "language and civilization" (langue et civilisation). English colleagues use the theory of "linguocultural studies".

The temporary state educational standard among the goals of teaching foreign languages at the basic level includes the education of "students with a positive attitude to the foreign language and culture of the people who speak this language. Education by means of a foreign language involves knowledge of the culture, history, realities and traditions of the country of the language being studied (linguistics, country studies). It includes students in the dialectic of cultures, in the development of universal culture, in

the awareness of the role of spoken language and culture in the mirror of the culture of another people."

Addressing the problem of learning language and culture at the same time is not accidental, as it allows to successfully combine elements of country studies with language phenomena that act not only as a means of communication, but also as a way to familiarize students with a new reality for them. According to N.A.Salonovich, this approach to teaching a foreign language at higher educational establishments in many ways provides not only a more effective solution to practical, general, developmental and educational tasks, but also contains huge opportunities to challenge and further maintain the motivation of teaching.

There are two approaches to teaching culture in the process of learning foreign languages: social science and philosophy. The first approach is based on the discipline traditionally associated with the study of any foreign language. Country studies is understood as a comprehensive academic discipline that includes a variety of information about the country of the language being studied. In contrast to the basic sciences on which it is based, country studies includes a variety of information of a fragmentary nature and is defined as a discipline in the system of geographical sciences that deals with the complex study of materials, countries, and large areas.

The theories of "linguo-country studies" emphasize that this direction combines, on the one hand, language learning, and on the other – gives certain information about the country of the language being studied. Since the main object is not the country, but the background knowledge of native speakers, in a generalized form, their culture, it would be correct to talk about "cultural studies". However, the term "linguo-country studies" is already firmly established in the practice of teaching foreign languages and, perhaps, it should be abandoned. However, we must clearly understand the difference between traditional country studies and linguo-country studies. If country studies is a social discipline, in whatever language it would not be taught, then linguo-country studies is a philological discipline, largely taught not separately as a subject, but in classes on the practice of language in the process of working on the semantics of a language unit, with the philological approach it is possible to set two different tasks:

1. Extracting cultural information from a language unit. In this case, culture comes to the fore as the main task of learning. This method has been the dominant method of teaching English as a foreign language for some time.

2. Learning to perceive or teach a language unit against the background of an image similar to what is present in the mind of a native speaker of a language and culture.

The image on which the semantics of a word or phraseology is based is created in the student of a foreign language sequentially in the process of working on the meaning of a language or speech unit and occurs in its entirety when the student encounters this unit. With this approach to work on semantics, on the national cultural component of meaning, the language is put in the foreground of the study, and the linguo-country studies competence is designed to provide a communicative competence, which involves operating with similar images in the minds of the speaker and listener, since this occurs when speakers of the same language and culture communicate with each other.

Thus, the main goal of linguo-country studies is to provide communicative competence in acts of international communication, primarily through an adequate perception of the interlocutor's speech and original texts intended for native speakers. Linguo-cultural studies provides a solution to a number of problems, in particular, the main philological problem of adequate understanding of the text, so it acts as a linguistic basis not only for linguodidactics, but also for translation. After all, to translate, it is first necessary to fully understand foreign language text with all the nuances of values, including the subtext, allusions, hints, and then subject the recipient to select appropriate equivalents in the target language, and their ignorance leads to difficulty in communicating in a foreign language and, ultimately, to the decline of learners ' communicative competence.

One of the tasks of linguistics is to study the means of language and speech, systematize them and present them in a form that is optimal for teaching a foreign language. Therefore, it is possible to speak freely about the linguistic foundations of the country-specific aspect in teaching a foreign language, which should be understood as part of the general linguistic foundations of its teaching acting in a row with other sciences: psychology, pedagogy, etc., as a theoretical foundation for teaching a foreign language in general. The greatest contribution to the development of the linguistic bases of cross-cultural aspect in teaching foreign languages have made scientists, mainly in the framework of the theory of linguo-cultural studies arising from the research E.M.Vereshagina, V.G.Kostomarov and their followers. The theoretical and practical value of works on linguo-cultural studies has found international recognition.

The linguistic justification of the country-specific facet in teaching a foreign language is on the far side the scope of method analysis and is that the task of country-oriented linguistics. However, it's not concerning the proclamation of a brand new linguistic discipline, however solely regarding the sensible wants of light the applied facet of linguistic analysis, taking into consideration the requirements of international communication. The theoretical basis of this side is created by sections of linguistic theory that affect the additive operate of language, that is, the reflection and consolidation of the results of social

practice in language and speech. As for the analysis of the system, it's primarily linguistics and phraseology, that study each basic units of the language that may carry country-specific information-the word (lexeme) and also the stable word complex (SWC).

At the same time, the semantic analysis of inter-language differences that reflect differences in reality is brought to the fore. This analysis is carried out by means and methods of comparative (contrastive) linguistics. Thus, the general and especially comparative lexicology and phraseology of the studied and native languages form the linguistic basis of the country studies aspect in teaching a foreign language. The general approach of country-oriented linguistics to language material has a sociolinguistic character, with attention being paid to socially determined interlanguage differentiation, rather than to language forms.

Thus, the tasks of country-oriented linguistics include the identification, systematization and interpretation of foreign language reflection of phenomena specific to the country or countries of the language being studied from the perspective of contrastive linguistics. However some more specific tasks of linguo-cultural linguistics can also be mentioned:

1. semantic analysis of significant national-specific elements of the content plan of individual lexemes and SWC in the communicative and educational aspect;
2. reduction of country-specific significant lexicon units into lexical and phraseological fields of corresponding keywords;
3. the study of specific formal means of a foreign language for the designation of significant phenomena in the country;
4. analysis of national-specific interaction of language and nonverbal means of communication in certain conversational situations;

Linguo-cultural studies aims to study the language units that most clearly reflect the national characteristics of the culture of the native speaker and the environment of its existence.

The need for social selection and study of language units, which most clearly show the uniqueness of national culture and which cannot be understood as native speakers understand them, is felt in all cases of communication with foreigners, when reading fiction, journalism, the press, when watching movies and videos, when listening to songs, etc.

The number of lexical units that have a pronounced national cultural semantics includes names:

1. realia-the designation of objects or phenomena that are characteristic of one culture and absent in another;
2. connotative vocabulary, i.e. words that match the main meaning, but differ in cultural and historical associations;
3. background vocabulary that denotes objects and phenomena that have analogs in the culture being compared, but differ in some national peculiarities of functioning, form, purpose of objects, etc.

For linguo – cultural studies, phraseological units that reflect the national identity of the history, culture, and traditional way of life of a native speaker are also of great interest.

To conclude, the selection of units with a pronounced national-cultural semantics is the task of those sections of lexicology and phraseology that act as the linguistic basis of linguo – cultural studies and can be called country-oriented linguistics.

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RESEARCH OF TEXT PRE-PROCESSING METHODS FOR PREPARING DATA IN RUSSIAN FOR MACHINE LEARNING

Abstract: *The article includes information about pre-processing methods for preparing text data in Russian language for machine learning. The article covers such techniques as tokenization, normalization, named entity recognition, stemming, lemmatization and removing of stop words. Also, this article shows some approaches using morphological analyzers and libraries for NLP tasks.*

Key words: *pymorphy2, gensim, mystem, spacy, stemming, lemmatization, ner, deeppavlov*

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Introduction

There is still a huge problem that we can see in the practice of creating and transforming data collections that are large enough, which forces us to pay attention to efficiency in developing data applications.

Pre-processing is the most important step in the data analysis, and if it is not performed, then further analysis in most cases is impossible due to the fact that analytical algorithms simply cannot work, or the results of their work will be incorrect or ineffective. In other words, the GIGO principle is implemented - garbage in, garbage out.

This paper is devoted to an overview of the methods that will be used to pre-process text data in Russian language in order to prepare them for using of machine learning algorithms. And we will also describe the methods that are used in our application “chat bot assistant for organizing employee support”.

About a corpus

At present moment natural language is one of the forms of data available today and which are little used in machine learning algorithm in its initial form. Its analysis allows us to increase the usefulness of data and make it more accessible for our lives.

The main task of any machine learning application is to determine what is considered useful from a large flow of information and how to distinguish this useful information from information noise.

The analysis of text data is the splitting of large text into separate fragments - the selection of sentences, unique words, common phrases - with the subsequent application of other processing methods to these fragments. Data analysis is represented by a large number of different methods and practices and can be applied at various levels, and usually all of them are tied to one key element - a corpus.

A corpus is a collection of documents or texts, possibly related to one subject, in a natural language. Size of corpus can be large or small. The corpus can be annotated, that is, the data in them can be pre-marked with certain labels, such cases are used for training with a teacher, or unannotated - such documents are used in

clustering algorithms and various modeling tasks, for example, to predict dollar exchange rates.

As mentioned above, the corpus can consist of documents and it can be divided into categories of documents or into individual documents. Documents can be divided into paragraphs, each of which usually expresses one idea - semantic units of speech. Paragraphs are divided into sentences - syntactic units. A completed sentence is one specific expression. Sentences, in turn, consist of words and punctuation marks - lexical units. These units determine the general meaning of the proposal and can be used not only individually, but also in combination, so they can be of greater importance for analysis.

The corpus with which we will work is consisted of data that were taken from ticket systems operating in the company and represent a collection of text messages. First of all, each message is needed to be marked. For our task - the classification of the input message as belonging to a particular class, two classes are selected “question” and “application”. A “question” class message is any message that you can try to answer without human’s help.

An «application» class message is a message for which additional forces are required. For example, if an employee wrote “I want to buy a teapot,” then the bot itself cannot in any way influence the decision of this application, it can only create a ticket in the ticket system and in the future find out the status of this ticket, inform the employee about various changes, and when ticket is solved send employee an answer.

Processing and transformation of a corpus

Any corpus in its initial form is absolutely unsuitable for analysis - it is necessary to pre-process it first.

To begin with, briefly note the components of the corpus. The corpus consists of documents, each document consists of paragraphs, paragraphs of sentences, sentences of words. We will consider paragraphs as structural units of the document. And sentences as semantic units containing a complete thought formulated and expressed by the author of this proposal. At this stage, we need to implement segmentation, i.e., the division of the text into sentences. Then these proposals will be further subjected to various processing methods, which we will discuss later. The paragraphs are segmented into sentences based on punctuation marks: a period (.), a question mark (?), an exclamation point (!). It is also necessary to consider compound punctuation marks, for example “!?”. After segmentation, you can directly start to process sentences.

Tokenization

The first thing to do is to remove the punctuation marks and service characters. This can be done “manually”, that is, write code yourself that checks the characters and removes those that we don’t need, or use the tools from NLTK (Natural Language Toolkit). Also, this process can be combined with the tokenization of the sentence to words - the allocation of individual tokens of each sentence. This is what we are doing for working directly with words. Tokenization of sentences must be carried out with the peculiarities of the language with which you work. For example, if we use the NLTK tools, we can get unexpected results for the Russian language. Suppose we have the word «Санкт-Петербург". With tokenization for all punctuation marks that are possible, we get two separate words “Санкт” and “Петербург”, which in some cases after processing simply will not make any sense. So, at this stage, you must be very careful.

Named entity recognition

When a large number of various tickets created in ticket systems were viewed, it was noticed that very often there are human names and surnames, names of organizations, locations, etc., for example, “Organize a workplace for Ivan Ivanov.” For training, these data do not carry any useful information and therefore it was necessary to get rid of them. To do this, it was decided to use one of the most popular tasks in NLP - the recognition of named entities (NER - Named-entity recognition). In most cases, the NER task can be formulated as follows: for a given sequence of tokens (words and possibly punctuation marks), it is necessary to provide a tag from a predefined set of tags for each token in the sequence.

For the task of recognizing named entities, there are several general types of objects used as tags:

- people;
- locations;
- organization;
- expressions related to time;
- quantitative data;
- monetary values.

In addition, many applications use the BIO tagging scheme to distinguish adjacent objects with the same tag. Here, “B” indicates the beginning of the object, “I” means “inside” and is used for all words that make up the object except the first, and “O” means the absence of the object.

In order to perform entity recognition, it was decided to take advantage of the open-source conversational AI of the deeppavlov framework [1]. In figure 1 you can see how entity recognition occurs.

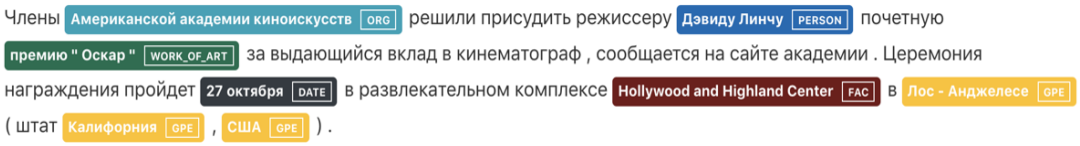

Figure 1. Demo of named entity recognition using deeppavlov

At present moment they have two main types of models available: standard based on RNN and BERT. RNN (recurrent neural network) is a class of neural networks in which the output from the previous step is supplied as input for the current step. In traditional neural networks, all inputs and outputs are independent of each other, but in cases where, for example, it is necessary to predict the next word of a sentence, previous words are required and, therefore, it is necessary to remember them. Thus, a recurrent neural network appeared, which solved this problem with the help of a hidden layer. The main and most important feature of RNN is the latent state, which stores some sequence information.

BERT (Bidirectional Encoder Representations from Transformers) is a natural language processing method based on the use of neural networks of a new architecture for working with sequences, better known as “transformers”. This technology helps Google better define the context of words in search queries [2].

Deeppavlov has various BERT and RNN models, trained in various languages and able to recognize up to 19 entities. Models for the Russian language are trained on the Collection 3 dataset [8] and are able to recognize three entities, such as ORG - organizations, agencies, institutes, PER - people, including fictional personalities and LOC - locations, mountain ranges, rivers, etc. Models for the English language and multilingual models (104 languages are available in them) can recognize more entities: events, products, numerical values, time, language names, percentages, numerical values, cities, countries and states, etc.

In figure 2 you can see pre-trained models available at deeppavlov.

Model	Dataset	Language	Embeddings Size	Model Size	F1 score
ner_rus_bert	Collection3 [1]	Ru	700 MB	1.4 GB	**98.1**
ner_rus			1.0 GB	5.6 MB	95.1
ner_ontonotes_bert_mult	Ontonotes	Multi	700 MB	1.4 GB	**88.8**
ner_ontonotes_bert		En	400 MB	800 MB	88.6
ner_ontonotes			331 MB	7.8 MB	86.7
ner_conll2003_bert	CoNLL-2003		400 MB	850 MB	**91.7**
ner_conll2003			331 MB	3.1 MB	89.9
ner_dstc2	DSTC2		–	626 KB	97.1

Figure 2. Pre-trained NER deeppavlov models

Stop words

One of the main forms of preprocessing is filtering out unnecessary data. In natural language processing, useless words (data) are called stop words.

A stop word is a commonly used word (such as “и”, “на”, “или”), which the search engine should ignore both when indexing records to search, and when retrieving them as the result of a search query, for the exception of strict search for a specific phrase. In order to analyze text data and build NLP models, these words do not add special importance to the document.

When to delete such words and when not? In situations where it is necessary to classify the text, for example, filtering spam or generating titles (scripts) to the image or tags, it is possible to use techniques to remove stop words. On the contrary, in such tasks as machine translation, language modeling, a short summary of the text, it is recommended to leave stop words, because they have great importance.

In our work of development chat bot for organizing employee support, we are more interested in the classification of the input message — the definition of which class it belongs to — an application or a question, and therefore we can use the method of removing stop words because we would not like these words to occupy a place in our database or occupy extra

time for processing and interfered with the classification.

There are several different methods.

The first is the removal of stop words using NLTK (Natural Language Toolkit, a natural language toolkit) [3] - a large package of libraries and programs for processing natural language written in the programming language Python. As for stop words, NLTK has lists for 16 different languages. You can see the list of words for the Russian language as follows (listing 1):

```
import nltk
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize

nltk.download("stopwords")
stop_words = stopwords.words('russian')
```

Listing 1. Collection of stop words using NLTK

Consider a usage example, you can see the messages after tokenization:

```
Добрый день , коллеги . Кофемашину на 7-й этаж вернули . Причиной этой поломки
была залитая в кофемолку вода . Будьте бдительны и осторожны . Перед тем как
налить воду в резервуар , снимайте его ! В следующий раз будет большой счет за
ремонт .
```

Listing 2. Input text after tokenization

After applying the algorithm to delete words from the stop words list, we will receive the following message. It may be noted that some words still remained, for example, “будьте,” which is the form of the word “быть” while the word “была” was deleted (listing 3). The list of stop words in the NLTK package is not complete and can be expanded depending on your needs.

```
Добрый день , коллеги . Кофемашину 7-й этаж вернули . Причиной поломки залитая
кофемолку вода . Будьте бдительны осторожны . Перед налить воду резервуар ,
снимайте ! следующий большой счет ремонт .
```

Listing 3. Input text after removing stop words

The second method is to remove stop words using spaCy. SpaCy is one of the most versatile and widely used libraries in NLP [4]. In the following way, you can get a list of stop words for one of 48 languages (listing 4). We would also like to note that spaCy has almost two times more words in the list of stop words for the Russian language than in NLTK.

```
from spacy.lang.ru.stop_words import STOP_WORDS
```

Listing 4. Collection of stop words using spaCy

And the third, but not the last - the use of Gensim. Gensim is a pretty handy library for working on NLP tasks [5]. During preprocessing, gensim also provides methods for removing stop words. Using the method from this library is noteworthy in that it can be used immediately throughout the text.

And also there is no need to apply tokenization before that (listing 5).

```
from gensim.parsing.preprocessing import remove_stopwords

text = <...>
remove_stopwords(text)
```

Listing 5. Removing stop words using gensim

In addition to such well-known packages and libraries, there are a large number of open-source projects in which stop-word lists can have different types, and also, as was noted earlier, you can expand any of these lists to your own needs.

Words normalization

In any natural language, words can be written in more than one form, depending on the situation. For example:

- “Я был в Америке трижды”.
- “Я буду в Америке 25 мая”.
- “Мы бываем в Америке каждое первое число апреля”.

In all these sentences, we see that the word “быть” is used in several different forms. For us people, it’s really easy to understand that “быть” is some activity. And it does not matter in what form we see this word - “был”, “бываем”, etc. We know for sure that they mean the same thing.

But this is not the same as with machines. They believe that all these words are different. Therefore, we need to normalize them to the root word, in our example it is "быть" Therefore, normalization is the process of converting a word into a single canonical form. This can be done in two ways, which are called stemming and lemmatization.

Stemming is a method of normalizing a word, which truncates its end or beginning, according to the list of common prefixes or suffixes that can be found in this word. Lemmatization, on the other hand, is an organized and step-by-step procedure for obtaining the root form of a word. It uses vocabulary (vocabulary meaning of words) and morphological analysis (word structure and grammatical relationships).

Why do stemming or lemmatization? Consider the following sentences:

1) “Я буду в этом ресторане в 12 часов”.
2) “Я побываю в этом ресторане в 12 часов”.

We easily understand that both of these sentences mean the same action, that someone will be at the restaurant at 12 noon in the future. But the machine will handle these sentences in different ways. Thus, in order to make the text understandable for the machine, we need to perform stemming or lemmatization. Another advantage of text normalization is that it reduces the number of unique words in text data. This helps reduce time for execution of machine learning algorithm.

To sum up, the stemming algorithm works by cutting out a suffix or prefix from a word. Lemmatization is a more powerful operation, since it takes into account the morphological analysis of the word. Lemmatization returns a lemma, which is the root word of all its various variations.

We can say that stemming is a quick and “dirty” method of trimming words to their root form, while, on the other hand, lemmatization is an intellectual operation that uses dictionaries created by deep linguistic knowledge. Therefore, lemmatization helps in the formation of the best features.

What are the options for applying the algorithms of stemming and lemmatization.

First, let’s consider the features of NLTK. In stock, NLTK has a number of great methods for performing this step - normalization. To stamp English words, you can choose between Porter and Lancaster. The Porter Algorithm is the oldest stemming algorithm supported by NLTK and was published in 1979. The Lancaster algorithm is newer and was published in 1990 and may be slightly more aggressive than the Porter Stemmer. The WordNet Lemmatizer uses the WordNet database to search for lemmas.

For non-English words, you can use the Snowball stemmer. Actually, Snowball is a language for creating stemmers and was added to NLTK version 2.0b9 as a separate SnowballStemmer class. This stemmer supports the following languages: Danish, English, Finnish, German, Spanish, Swedish, most importantly for us Russian and some other languages.

Since NLTK has few features for the Russian language, we’ll only consider stemming with SnowballStemmer. Consider the source text and the text obtained after stemming. As we see, after performing word processing using stemming, most of the words were trimmed (listing 6).

```
Добрый день, коллеги.
Кофемашину на 7-й этаж вернули.

Причиной этой поломки была залитая в кофемолку вода.
Будьте бдительны и осторожны.
Перед тем как налить воду в резервуар, снимайте его!
В следующий раз будет большой счет за ремонт.
```

```
добр ден , коллег . кофемашин 7-й этаж вернул . причин поломк залит кофемолк
вод . будьт бдительн осторожн . перед нал вод резервуар , снима ! след больш
счет ремонт .
```

Listing 6. Stemming using SnowballStemmer from NLTK

When two options are available, lemmatization will always be a better option than stemming. Stamming algorithms are an optimized way to identify related words using a relatively short algorithm and without the need for vocabulary data for each language. The disadvantage is that it is not always accurate: sometimes it connects by kinship relations words that do not come from the same word, but on the other hand, does not identify the related forms of a particular word.

In turn, lemmatization will always give a better result, because lemmatizers rely on the correct language data (dictionaries) to identify the word with its lemma. In addition, the result will always be another element of the dictionary (infinitives, singular forms, etc.), and not a "basis", which can sometimes be difficult to determine (especially when working with typologically different languages).

For our tasks, we also decided to choose lemmatization, because we believe that this will help to give a better result in the classification. And besides, we need to highlight keywords that will help us search for answers for questions in the future. And this would not be possible if we normalized using stemming algorithms, because the knowledge base will be filled in by a person (in the future, an algorithm) who will also select keywords for articles, and it will be difficult for them to select them with stemming.

Consider lemmatization using the pymorphy2 morphological analyzer (listing 7) [6].

```
добрый день , коллега . кофемашин 7-й этаж вернуть . причина поломка залить
кофемолка вод . быть бдительный осторожный . перед налить вода резервуар ,
снимать ! следующий большой счёт ремонт .
```

Listing 7. Lemmatization using PyMorphy2

The normal form of the word can be obtained through the attributes Parse.normal_form and Parse.normalized. To get the Parse object, you must first parse the word and select the correct parsing option from the ones proposed. pymorphy2 now uses the algorithm for finding the normal form, which works most quickly (the first form in the token is taken) - therefore, for example, all participles are now normalized to infinitives. This can be considered an implementation detail. At the same time, pymorphy2 returns all valid parsing options, but in practice you usually only need one option, and therefore if you want to normalize words differently, you can use the Parse.inflect() method, into which you can pass parameters for selection, such as part of speech, case, number, genus.

But in some cases, this analyzer may not work correctly. If we consider the text taken as an example, then there were two words "воду" and "вода". In the first case, pymorphy2 recognizes everything correctly and produces a normal "вода" form.

But in the second case, the word "воду" was recognized with the following set of tags: noun, masculine, genitive. And, accordingly, the normal form of such a word is "вод". Although we understand that the word "вода" is already in itself a normal form.

As a result, which we obtained when executing the parse method, we can see that there are two options for

word “вода”, and the second variant in the parsed result (listing 8) is more suitable for us. But to understand this will be quite difficult.

```
[Parse(word='вода', tag=OpencorporaTag('NOUN,inan,masc sing,gent'),
normal_form='вод', score=0.5, methods_stack=((<DictionaryAnalyzer>, 'вода', 33,
1),)),

Parse(word='вода', tag=OpencorporaTag('NOUN,inan,femn sing,nomn'),
normal_form='вода', score=0.5, methods_stack=((<DictionaryAnalyzer>, 'вода',
55, 0),))]
```

Listing 8. The result of parsing word "вода" using PyMorpy2

Let’s consider another popular morphological analyzer along with PyMorphy2 MyStem - a morphological analyzer of the Russian language with support for the removal of morphological ambiguity, developed by Ilya Segalovich at Yandex [7]. The program works on the basis of a dictionary and is able to form morphological hypotheses about unfamiliar words.

The first version was developed in the 90s [11], but it was not very popular and could not be found in the public domain. Now there is already a version of MyStem 3.1, which fully provides all the functions of morphological analysis. The MyStem morphoanalyzer is based on the NKRL (National Corpus of the Russian Language) dictionary [9], which contains more than 200 thousand lemmas. MyStem source codes are not accessible to ordinary users, so the characteristics of the data structure used are not known.

Like PyMorphy2, MyStem can parse non-dictionary forms and also provides the ability to resolve morphological homonymy. To solve this problem, depending on the input data, MySte allows homonymy in one of the following ways: without considering the context and vice versa.

Removing homonymy without regard to the context is possible due to the training of the naive Bayesian classifier on the marked-out case with the removed homonymy [10]. The probability of an unknown word stem having a stem basis and the ending flex to belong to the para (paradigm) is calculated by the formula 1 [10]:

$$P(para|word) = \frac{P(para|word) \cdot P(para)}{P(word)} = \frac{P(stem|para) \cdot P(flex|para) \cdot P(para)}{P(word)}, \quad (1)$$

where para – paradigm,
stem – base of word,
flex – end of word,
word – our word.

It is assumed that stem and flex are independent and random variables.

In turn, removing context-specific homonymy is pluggable and uses MatrixNet technology. The main idea is to rank parses based on the words (contexts) closest to the parsed.

Consider the same example with the source code used above. To connect to your MyStem project, you can use the wrapper written in the Python programming language - pymystem3 [12]. This tool is publicly available and licensed under the MIT license.

```
добрый день , коллега . кофемашина 7-й этаж вернуть . причина поломка
заливать кофемолка вода . быть бдительный осторожный . перед наливать вода
резервуар , снимать ! следующий большой счет ремонт .
```

Listing 9. Lemmatization using MyStem

As can be seen MyStem did a better job of finding a lemma for the word "вода when pymorphy2 considered the word "вода" to be a masculine word in the genitive and made a conversion to the word "вод" which turned out to be completely wrong.

Conlusion

We examined what basic pre-processing methods are applied to data for their further use with machine learning methods: tokenization, removal of stop words, reduction to the basic form (normalization). We showed different approaches with using NLKT, pymporphy2, spaCy, gensim and MyStem. We also considered an additional method - recognition of named entities with using capabilities of the deeppavlov framework.

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MATHEMATICAL MODELING OF VIBRATION PROCESSES IN WAVE-LASTED ELASTIC CYLINDRICAL BODIES

Abstract: *Environments of the set of problems put forward by practice are some of the urgent problems in which the propagation of wave processes in three-dimensional limited bodies is considered. Such processes are important in aircraft manufacturing, rocket engineering, mechanical engineering and construction. They occur during explosions, impacts, some technological operations and in a number of other cases. The main elements of most designs are composite shells and plates. Therefore, the study of dynamic processes in such objects is of the greatest interest.*

Key words: *short-term impulse, stress waves, construction, two-layer cylinder, rigid fastening, three-dimensional equations.*

Language: *Russian*

Citation: Safarov, I. I., Kulmuratov, N. R., Nuriddinov, B. Z., & Esanov, N. (2020). Mathematical modeling of vibration processes in wave-lasted elastic cylindrical bodies. *ISJ Theoretical & Applied Science, 04 (84)*, 321-327.

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МАТЕМАТИЧЕСКОЕ МОДЕЛИРОВАНИЕ КОЛЕБАТЕЛЬНЫХ ПРОЦЕССОВ В ТРЕСЛОЙННЫХ УПРУГИХ ЦИЛИНДРИЧЕСКИХ ТЕЛАХ

Аннотация: *Среди множества выдвигаемых практикой задач одними из актуальных являются задачи, в которых рассматривается распространение волновых процессов в трехмерних ограниченных телах. Важные значение такие процессы имеют в авиастроении, ракетостроении, машиностроении и строительства. Они возникает при взрывах, ударах, некоторых технологических операциях и в ряде других*

случаев. Основными элементами большинства конструкций являются составные оболочки и пластинки. Поэтому изучение динамических процессов в таких объектах представляет наибольший интерес.

Ключевые слова: *кратковременный импульс, волны напряжения, конструкция, двухслойный цилиндр, жесткое скрепление, трехмерные уравнения.*

Введение

Конструкции, состоящие из элементов, обладающих различной геометрией и жесткостью, широко используются в машиностроении, энергетике, нефтяной и химической промышленности, строительстве и т.д. Среди них наиболее распространение получили конструкции многослойной цилиндрической формы.

Примером использования состыкованных цилиндрических оболочек являются трубопроводы, где начали применяться и многослойные оболочки. Экспериментально доказано высокая несущая способность таких конструкций, которые нашли применение в химической, атомной промышленности и ракетостроении [1,2] и Многослойными конструкциями являются ракеты на твердом топливе [3],сосуды давления [4], и т.д. Во многих случаях сложные конструкции работает под действием кратковременных нагрузок [5]. Исследование напряженно- деформированного состояния, возникающего в таких конструкциях при динамическом нагруженное, связано со значительными трудностями. При падении на конструкцию кратковременных импульсов, инициируемых, например, взрывчатым веществом, ударом твердого тела и т.п., распределение давления может быт локализовано в виде пятна ограниченных размеров [6,7].

Экспериментальные исследования ограничиваются в основном регистрацией конечных поверхностных параметров процесса и не позволяют проследить, как развиваются и взаимодействуют волны напряжений в материале элементов конструкции [8,9]. В большинстве теоретических работ исследуется поведение конструкций, как правило, с применением уравнений теории пластин и оболочек [10,11]. Рассматривается действие на оболочки подвижных осесимметричных не осесимметричных нагрузок [12]. Однако подход с позиций теории оболочек не позволяет исследовать распространение волн напряжений в материале тела. Это возможно только на основе трехмерных уравнений.

В работах [13, 14] проведены исследования трехмерных процессов в толстостенных цилиндрах, подверженных процессов импульсные нагруженные, с использованием уравнений теории упругости. Вмести с тем вопросы исследования динамического поведения составных конструкций, содержащих зоны быстрого изменения механических свойств материала, изучены недостаточно. Важной задачей является развитие методов расчета таких многослойных толстостенных конструкций.

Постановка задачи.

В настоящей работе исследуется реакция конечного трехслойного цилиндра на действие импульса давления, имеющего ограниченные размеры в пространстве и времени. Физико - механически и геометрические (поперечные сечения) параметры слоев разные. Первый и третий оболочек изготовлено из твердых материалов. Средний слой заполнителя изготовлены из мягких материалов. Предполагается, что между слоями обеспечивается жесткое скрепление без натяга по всей поверхности контакта. Задача решается, в цилиндрических координатах r, φ, z. Расчетная схема приведена на рисунке 1. Слои нумеруются, начиная с внутреннего.

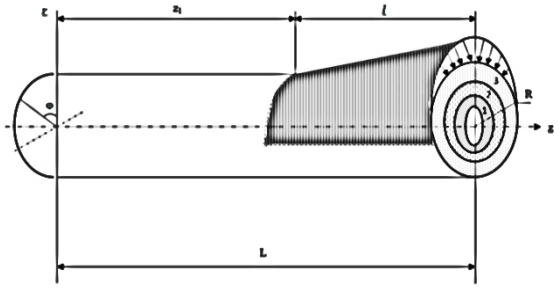

Рисунок 1. Расчетная схема. Схема трехслойного толстенного цилиндра, нагруженного локальным импульсом давления

Система дифференциальных уравнений в цилиндрической системе координат, описывающая деформирование элементарного объема в k - ем слое, следующая [13]

$$\frac{\partial \sigma_{ij}^{(k)}}{\partial x_j} + \rho_k F_{ki} = \rho_k \frac{\partial^2 u_{ki}}{\partial t^2}, \quad (i, j = 1,2,3; \kappa = 1,2,3) \qquad (1)$$

формулы Коши

$$\varepsilon_{ij}^{(k)} = \frac{1}{2}\left(\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial x_i}\right) \quad (2)$$

и начальные условия при t=0:

$$u_{ki}(u_k, \vartheta_\kappa, w_k) = 0, \frac{\partial u_{ki}}{\partial t} = 0, \quad (3)$$

где $\sigma_{ij}^{(k)}$ - тензор напряжений кого слоя; u_{ki} - вектор перемещений кого слоя; F_{ki} - вектор плотности массовых сил *к*-го слоя; ρ_k - плотности кого цилиндрического слоя, *t*-время. Система (1) - (3) замыкается граничными условиями $r = r_k$ [14]:

$$\begin{aligned} \sigma_r^k &= \sigma_r^{k+1};\ u_k = u_{k+1}; \\ \tau_r^k &= \tau_r^{k+1};\ \ \vartheta_k = \vartheta_{k+1}; \\ \tau_{r\varphi}^k &= \tau_{r\varphi}^{k+1};\ w_k = w_{k+1}. \end{aligned} \quad (5)$$

При $r = r_0$ ставится условия свободно от напряжения:

$$\sigma_{rr}^{(1)} = 0;\tau_{r\varphi}^{(1)} = 0;\tau_{rz}^{(1)} = 0. \quad (6)$$

На внешней поверхности тертого цилиндра ставится следующие условия

$$\sigma_{rr}^{(3)} = P(r,\varphi,z);\tau_{r\varphi}^{(3)} = 0;\tau_{rz}^{(3)} = 0. \quad (7)$$

Граничные условия формулируются для каждой поверхности, ограничивающей область тела с неизменяющимися характеристиками материала (рисунке 1). На закрепленном торце цилиндр (*z=0*):

$$u_k = \vartheta_k = w_k = 0. \quad (8)$$

Давления $P(7)$ в случае локального награждения представлено зависимостью от координат и времени в виде

$$P(r,\varphi,z) = \begin{cases} P_a\left(\frac{t}{T_0}\right)\xi_p \cos n\varphi;\ 0 \le t \le T_0, \\ 0 \le z \le l,\ -\frac{\pi}{2} \le \varphi \le \frac{\pi}{2} \\ 0;\ \ l > z; \\ P_a\left(1 - \frac{t}{T_1}\right)\xi_p \cos n\varphi;\ T_0 \le t \le T_1, \\ 0 \le z \le l,\ -\frac{\pi}{2} \le \varphi \le \frac{\pi}{2} \\ 0;\ \ t > T_1; \end{cases} \quad (10)$$

где P_a - амплитудное значение нагрузки, T_0-период воздействия внешних нагрузок; *l*- длина цилиндра который воздействуют импульсная нагрузка и ξ_p - постоянная величина. Искомые функции в уравнениях системы (1)-(10) зависят от трех пространственных переменных и времени.

Методы решения.

В связи с линейностью постановки задачи решение ищем в виде:

$$\begin{aligned} u_{kn} &= \sum_{n=0}^{\infty} U_{kn}(r,z,t)\cos n\varphi, \\ \vartheta_{kn} &= \sum_{n=0}^{\infty} V_{kn}(r,z,t)\sin n\varphi, \\ w_{kn} &= \sum_{n=0}^{\infty} W_{kn}(r,z,t)\cos n\varphi, \end{aligned} \quad (11)$$

где U_{kn}, V_{kn}, W_{kn} - амплитуды перемещений, *n*-целые число.

Подставляя (11) в (1) - (9), тогда получим следующие системы дифференциальных уравнений в частных производных в перемещениях

$$\begin{aligned} &\frac{\lambda_k + 2\mu_k}{\mu_k}\left(\frac{\partial^2 W_n}{\partial r^2} + \frac{1}{r}\frac{\partial W_n}{\partial r} - \frac{W_n}{r^2}\right) + \\ &+ \frac{\lambda_k + \mu_k}{\mu_k}\left(\frac{\partial^2 U_n}{\partial r \partial z} + \frac{n}{r}\frac{\partial V_n}{\partial r}\right) - \\ &- E_k\frac{n^2}{r^2}W_n + E_k\frac{\partial^2 W_n}{\partial z^2} - \frac{(\lambda_k + 3\mu_k)n}{\mu_k r^2}V_n = \frac{\rho_k c_0^2}{\mu_k}\frac{\partial^2 W_n}{\partial t^2}, \\ &E_k\frac{\partial^2 V_n}{\partial r^2} + E_k\frac{1}{r}\frac{\partial V_n}{\partial r} - \frac{(\lambda_k + \mu_k)n}{\mu_k r} \times \\ &\times\left(\frac{\partial W_n}{\partial r} + \frac{\partial U_n}{\partial z}\right) - \\ &- E_k\frac{V_n}{r^2} - -\frac{\lambda_k + 2\mu_k}{\mu_k r^2}n^2 V_n + E_k\frac{\partial^2 V_n}{\partial z^2} - \\ &- \frac{(\lambda_k + 3\mu_k)n}{\mu_k r^2}W_n = \frac{\rho_k c_0^2}{\mu_k}\frac{\partial^2 V_n}{\partial t^2}, \\ &E_k\frac{\partial^2 U_n}{\partial r^2} + E_k\frac{1}{r}\frac{\partial U_n}{\partial r} + \frac{\lambda_k + \mu_k}{\mu_k r}\left(\frac{\partial W_n}{\partial z} + n\frac{\partial V_n}{\partial z} + r\frac{\partial^2 W_n}{\partial r \partial z}\right) - \\ &- E_k\frac{n^2}{r}U_n + \frac{\lambda_k + 2\mu_k}{\mu_k}\frac{\partial^2 U_n}{\partial z^2} = \frac{\rho_k c_0^2}{\mu_k}\frac{\partial^2 U_n}{\partial t^2}, \end{aligned} \quad (12)$$

где $\lambda_\kappa, \mu_\kappa$ - коэффициенты Ляме (9), $E_k = 1$. Задача решается в безразмерных величинах. В качестве масштаба длины используется внешний радиус цилиндра R, а масштаба времени - R/c_0. Компоненты вектора смещений отнесены к $p_0 R/\mu_k$.

Решение (12) с учтем граничных и начальных условий (3) –(8) осуществляется методом конечных разностей. Область $0 \le r \le R$ разбиваем на N отрезков h_r ($h_r = R/N$), а время воздействия - на J малых шагов τ.

При рассмотрении различных вариантов задачи принималось *N*=40, *J* зависело от интервала времени, в котором производилось численное интегрирование. В каждой внутренней точке пластины i ($i = 3,4,.....N+1$)в моменты времени $t = (m-2)\tau$ ($m = 2,3,....J$) уравнение (1) записывалось в конечных разностях.

Для расчета многослойного изотопного цилиндра конечной длины применяется разностную схему [15]. В узлах лежащих внутри упругой области, с помощью центральных разностей вида

$$\frac{\partial W(r_i,t)}{\partial r} = \frac{1}{2h_r}(W_{i+1}^m - W_{i-1}^m) + 0(h_r^2);$$

$$\frac{\partial^2 W(r_i,t)}{\partial r^2} = \frac{1}{h_r^2}(W_{i+1}^m - 2W_i^m - W_{i-1}^m) + 0(h_r^2);$$

$$\frac{\partial W(r_i,t_m)}{\partial t}=\frac{1}{2\tau}(W_i^{m+1}-W_i^{m-1})+0(\tau^2);$$
$$\frac{\partial^2 W(r_i,t_m)}{\partial t^2}=\frac{1}{\tau^2}(W_i^{m+1}-2W_i^{m}+W_i^{m-1})+0(\tau^2); \quad (13)$$
$$\frac{\partial^4 W(r_i,t)}{\partial r^4}=\frac{1}{h_r^4}(W_{i+2}^m-4W_{i+1}^m+6W_i^m-4W_{i-1}^m+W_{i-2}^m)+0(h_r^2);$$

Здесь $W_i^m,.....W_{i-2}^m,W_i^{m+1}$- сеточные функции; r_i- координата узла на линии r; Остальные функции $V_i^m,.....V_{i-2}^m,V_i^{m+1}$ – напишется аналогичном виде (13). Разностные аппроксимации производных по r имеют одинаковый (второй) порядок точности по отношению к h_r, точность аппроксимации производных по времени порядка τ^2.

В узлах, лежавших внутри вязкоупругой области, с помощью центральных разностей вида (13) записываем явную аппроксимацию уравнений, определяющих $w_\kappa,\vartheta_\kappa,u_k$:

$$\begin{aligned}
U_{i,j}^{m+1}&=2U_{i,j}^m+U_{i,j}^{m-1}+\\
&+c_1\left[U_{i,j+1}^m-2U_{i,j}^m+U_{i,j-1}^m+c_2(U_{i,j+1}^m-U_{i,j-1}^m)\right]-\\
&-c_3U_{i,j}^m+c_4(U_{i+1,j}^m-2U_{i,j}^m+U_{i-1,j}^m)+\\
&+c_5(V_{i+1,j}^m-V_{i-1,j}^m)+c_6(W_{i+1,j}^m-W_{i-1,j}^m)+\\
&+c_7(W_{i+1,j+1}^m-W_{i-1,j+1}^m-W_{i+1,j-1}^m+W_{i+1,j-1}^m);\\
V_{i,j}^{m+1}&=2V_{i,j}^m-V_{i,j}^{m-1}+\\
&+c_1\left[V_{i,j+1}^m-2V_{i,j}^m+V_{i,j-1}^m+c_2(V_{i,j+1}^m-V_{i,j-1}^m)\right]-\\
&-c_8V_{i,j}^m+c_9(V_{i+1,j}^m-2V_{i,j}^m+V_{i-1,j}^m)-c_{10}W_{i,j}^m-\\
&-c_{11}(W_{i,j+1}^m-W_{i,j-1}^m)-c_5(U_{i+1,j}^m-U_{i-1,j}^m);\\
W_{i,j}^{m+1}&=2W_{i,j}^m-W_{i,j}^{m-1}+\\
&+c_{12}\left[W_{i,j+1}^m-2W_{i,j}^m+W_{i,j-1}^m+c_2(W_{i,j+1}^m-W_{i,j-1}^m)\right]-\\
&-c_{13}W_{i,j}^m+c_9(W_{i+1,j}^m-2W_{i,j}^m+W_{i-1,j}^m)+c_{11}(V_{i,j+1}^m-V_{i,j-1}^m)+\\
&+c_7(U_{i+1,j+1}^m-U_{i-1,j+1}^m+U_{i+1,j-1}^m-U_{i+1,j-1}^m)-c_{10}V_{i,j}^m.
\end{aligned} \quad (14)$$

Здесь

$c=(\lambda_l+2\mu_l)/\mu_l;c_1=\mu_l\tau^2/\rho h_r^2a_0^2;\ c_2=0.5/(1/h_r-j+1);$

$c_3=4k^2c_1c_2^2;c_4=ch_r^2h_x^{-2};\ c_5=(c-1)kh_rh_x^{-1}c_1c_2;$

$c_6=c_5k^{-1};\ c_7=c_6c_2^{-1}/4;c_8=4(ck^2+1)c_1c_2^2;c_9=c_1h_r^2h_x^{-2};$

$c_{10}=4(c+1)kc_1c_2^2;c_{11}=(c-1)kc_1c_2;c_{12}=cc_1;c_8=4(c+k^2)c_1c_2^2.$

При реализации на ЭВМ использовалась явная трехслойная схема аппроксимации производных по времени с постоянным шагом h_t [16,17]. Для получения разностного аналога пространственных производных расчетная область $r_0\le r\le R$, $0\le z\le L$ покрывалась сеткой, состоящей из четырёхугольных элементов со сторонами h_r и h_z В настоящей работе реализован алгоритм вывода результатов виде полей линий равных напряжений относительно переменных r и z при $\varphi=const$ и требуемой последовательности моментов времени. При этом обработка результатов состоит в анализе развития напряжений по набору плоских картин изолиний напряжений. Основным результатом такого представления данных является значительное сокращение времени всего исследования. Полученные в работе результаты позволяют, проследит особенности формирования и распространения, локализованных в теле волн напряжений в материалы трехслойного цилиндра, слои которого выполнены из разных материалов.

В расчетах были использованы следующие параметры: $L=0.7m,\ R=0.6m,\ r_0=0.1m,\ r_1=0.2,m\ r_2=0.4m,$ $r_3=0.6m,\ l=0.5m,$, $E_1=E_3=2\cdot10^5\ MPa,\ \nu_1=\nu_3=0.26,$ $\rho_1=\rho_3=7800kg/m^3,\ E_2=6.67\cdot10^4\ MPa,\ \nu_2=0.2,$ $\rho_2=2280kg/m^3$ импульс давления $P_a=1\cdot10^3\ MPa$, $T_0=2\cdot10^{-3}c$ характеристики сетки элементов $h_r=0.011m:,\ h_z=0.015m:\ h_t=2\cdot10^{-5}c.$

При решении ограничивались пятью членами ряда Фурье, так как при заданном (13) изменении нагрузки удержание следующих членом ряда практически 10 членов изменяет амплитудное значение напряжение меньше чем на 3%. Шаг по времени определен из условия Куранта. Дальнейшее уточнение h_t осуществлялось в процессе расчетов. Для решения задачи шаг по времени выбрано $h_t=2\cdot10^{-5}c$.

Численные результаты.

Расчеты проводились для двух случаев расположения слоев. В первом случае внешний и внутренний слой выполнено из стали (2-4). На рисунке показаны напряжений волны, возникающие в сечении $\varphi=0;\ z=L$

Штриховые линии соответствуют напряжениям при равномерных нагрузках по оси z сплошные локальному нагруженную. Расчеты показали, что при одинаковых характеристиках награждения в материале внешнего слоя формируются волны напряжений. С одинаковыми параметрами (на рисунках 3-5, кривая) в первые моменты времени. При этом величина напряжений на пряженики не зависит от того, из какого материала выполнен внешний слой. По мере прохождения волн внутрь слоев в случае, когда внешний слой из ситалла (см. рис. 2-4), в материале возникают напряжения σ_r и σ_φ в два-три раза больше, чем при обратном распоположении слоев (рис. 2-4).

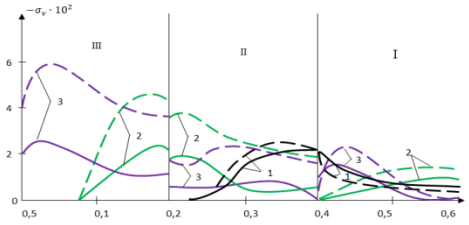

Рисунок 2. Изменение напряжений в сечении $\varphi = 0$ при локальном (сплошная кривая) и постоянном по оси z (штриховая) нагружении: $1 - t = 60h_t$; $2 - t = 120h_t$; $3 - t = 160h_t$.

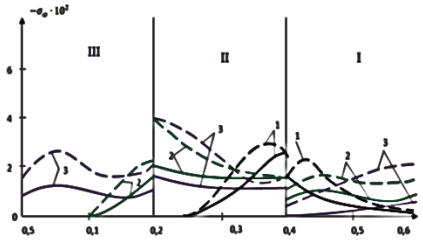

Рисунок 3. Изменение напряжений в сечении $\varphi = 0$ при локальном (сплошная кривая) и постоянном по оси z (штриховая) нагруженные: $1 - t = 60h_t$; $2 - t = 120h_t$; $3 - t = 160h_t$.

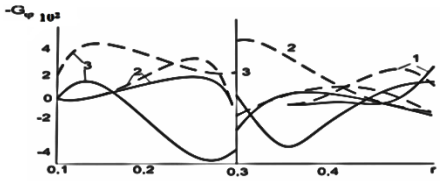

Рисунок 4. Изменение напряжений в сечении $\varphi = 0$ при локальном (сплошная кривая) и постоянном по оси z (штриховая) нагруженные: $1 - t = 60h_t$; $2 - t = 120h_t$; $3 - t = 160h_t$.

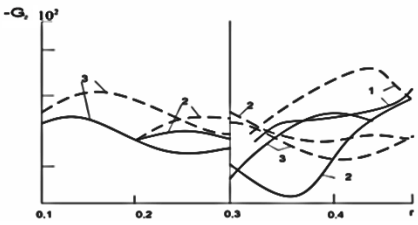

Рисунок 5. Изменение напряжений в сечении $\varphi = 0$ при локальном (сплошная кривая) и постоянном по оси z (штриховая) нагруженное: $1 - t = 60h_t$; $2 - t = 120h_t$; $3 - t = 160h_t$.

Это наблюдается как при равномерном по оси z нагружении, так и при локальном. В случае локального нагружения величина напряжений σ_r и σ_φ со временем падает, что объясняется увеличением области приложения напряжений в направлениях r, z и φ. При прохождении волн через встик материалов наблюдаются скачки напряжений σ_φ и σ_z. Характерной особенностью напряженного состояния при локальном нагруженные является возникновение соизмеримых по величине со сжимающими растягивающих напряжений σ_z уже в первые моменты нагруженное. На рис. 5 показаны обширные зоны в слое, выполненном могут быть причиной локального разрушения внутри слоя. При равномерном нагруженное по оси, z растягивающие σ_z по величине значительно меньше и возникают в слое из стали (рисунках 2- 4, кривая 3). Рассмотрим изменение напряжения

$\sigma_r = f(r,z)$ при одинаковом локальном нагруженные для обоих слоев, волны сжатия, по форме соответствующие импульсу давления, движутся в материале внешних слоев со скоростью продольных волн. В обоих случаях происходит уменьшение величины напряжений σ_r вследствие расширения области приложения напряжений. Так как скорости распространения волн в стали и ситалле близки (c_{cm}=5600м/с, c_{cum}=5040м/с), волны подходят к стыку слоев примерно в одинаковые моменты времени. Далее картины волнообразования начинают отличаться. В случае, когда внешний слой выполнен из ситалла (рис. 5), наблюдается свободное прохождение волной сжатия стыка. При отражении от внутренней поверхности происходит образование движущейся по внутренней поверхности цилиндра области перехода сжимающих напряжений в растягивающие. Далее зона растягивающих напряжений распространяется на большую часть расчетной области. При этом величина растягивающая σ_r достигает $0{,}6P_a$. В следующие моменты времени волна растягивающая σ_r движется от внутренней поверхности цилиндра к стыку и отражается волной сжатия. Во внешний слой волна практически не проходит. Иная картина наблюдается, если внешний слой выполнен из стали. Волна сжатия σ_r отражается от стыка слоев волной растяжения, которая возвращается к внешней поверхности волной растяжения. В ситалле возникает волна сжимающих напряжений $\sigma_r = -0{,}2 \cdot P_a$. При ее отражении от внутренней поверхности цилиндра наблюдаются небольшие $\sigma_r = -0{,}18 \cdot P_a$ растягивающие напряжения. В целом при таком расположении слоев уровень напряжений значительно ниже. Рассмотрим изменение напряжения $\sigma_z = f(r,z)$ для $\varphi = 0$.

Из рис.5 видно, что при локальном нагруженных в обоих случаях расположения слоев уже в первые моменты времени возникает круговая полоса растягивающих напряжений

σ_z, охватывающая места приложения нагрузки.

Если внешний слой выполнен из ситалла, при прохождении волной стыка сжимающие σ_z увеличиваются скачком (максимальный перепад напряжений составляет $0{,}24P_a$) и достигают величины $\sigma_z = -0{,}5P_a$ на внутренней поверхности цилиндра.

На стыке образуется движущаяся к заделке ($z = 0$) зона перехода сжимающих напряжений в растягивающихся. Если внешний слой из стали, тогда не происходит увеличения напряжений при прохождении волной стыка слоев и картина волнообразования более гладкая. На стыке образуется скачок напряжены, против ложный по знаку в сравнении с напряжениями при первом случае слоев. Область существования растягивающих напряжений уменьшается.

Выводы.

По результатам исследования можно сделать следующие выводы. Сжимающие радиальные напряжения σ_r в случае равномерного по оси z нагруженное превышают более чем в два раза напряжения, полученные при локальном нагруженное. Образовавшая в обоих случаях нагруженния растягивающих зона σ_r в ситалле может служить причиной разрушения материала в зоне стыка. На стыке слоев возникают скачки напряжения σ_z и σ_φ могущие привести к сдвигу слоев относительно друг и нарушению геометрической формы объекта.

Особенностью развития напряжений при локальном нагруженные является возникновение интенсивных растягивающих напряжений уже в начале нагруженные. В отличие от равномерное нагруженное, когда растягивающие σ_z напряжения распространяется практически на всю толщину стенки.

Эффект усиления напряжений при входе волны в более плотный материал при локальном нагруженные инициирует бегущую по стыку волну σ_z с большими растягивающими напряжениями.

Заключения.

Исходя из изложенного выше, можно сказать, что разработанные алгоритмы позволяют исследовать волновые процессы развития напряжений в упругих телах, могут быть использованы при анализе динамической прочности составных тел вращения.

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ON THE ACTION OF MOBILE LOADS ON AN UNINTERRUPTED CYLINDRICAL TUNNEL

Abstract: *He article gives the basics of the calculation technique for the action of mobile loads of long underground transport structures such as tunnels and pipelines taking into account the influence of the earth's surface. On elastic models, the dynamic behavior of unreinforced and reinforced structures at different depths of bedding is considered, as well as the effect of the type and parameters of the running load on the stress-strain state of the rock massif. The speed of the movement of the cargo is considered subsonic, which corresponds to the modern speeds of transport in the investigated underground objects. To describe the motion of a half-space and thick-walled shells, dynamic equations of the theory of elasticity in displacement potentials are used, and for thin-walled shells the classical equations of the theory of thin shells are used. Equations are written in a moving coordinate system associated with the load. A closed system of differential equations is constructed. The system of differential equations is solved by the method of separated variables, integral Fourier transforms, the Romberg, Muller and Gauss method. From the analysis of the obtained numerical results it follows that in these cases the reinforcement of the tunnel leads to a decrease in the dynamic effect of the moving loads on the earth's surface. The Earth's surface has an uneven effect on the stress-strain state of the rock massif under the action of moving loads. For a load with a shorter period, this effect is almost not noticeable, and becomes noticeable for very small periods.*

Key words: *thick-walled shell, stationary load, cavity, mobile coordinate system, Lame potentials, Muller and Gauss method.*

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Introduction

In many cities it is planned to build underground highways of considerable length, as well as tunnels for new high-speed transport. Extremely widespread development of the construction of underground main pipelines providing transportation of virtually the entire volume of produced natural gas, most of the oil and various cargoes. Modern transport underground structures in accordance with the requirements of reliability and durability are among the most important objects of underground construction. Along with the static calculation of such structures [3] their dynamic calculation [1, 2] is necessary. Among the dynamic loads and impacts on underground structures in the form of tunnels and pipelines, operational transport loads and the impact of seismic waves of natural or artificial origin should be singled out. Difficulties in the calculation of objects in the presence of mobility of the load multiply increase in comparison with the volume of static calculations. Especially great mathematical difficulties appear when taking into account the massiveness of the driving loads. The study of the dynamics of extended underground structures under the action of various perturbations leads to the solution of boundary value problems in the mechanics of continuous media. [4-6]

Work in this direction with a sufficiently detailed bibliography can be found in monographs [9, 11, 12, 15] and many other publications are devoted to a generalization and systematization of research results on a comprehensive study of the dynamic behavior of cylindrical shells of various designs. The stationary solution of the dynamics of an infinitely long thin cylindrical shell immersed in an acoustic medium and subjected to an axisymmetric load moving with a constant velocity in the axial direction was investigated [13], the reaction of an infinitely long cylindrical shell in an acoustic medium to the action of a moving stepped plane shock wave was considered. The solution is given in generalized coordinates without taking into account the extension of the middle surface of the shell. In [14], such problems are solved by the method of integral transformations. Later, hinged-supported shells were considered in [10], the nonlinear dynamics of shells was investigated. In [8], the ax symmetric vibrations of a priestesses shell were studied under the action of a moving force, where the Bubnov - Galerkin method was applied to geometric coordinates and the Bogolyubov - Mitropolsky coordinate in time coordinate. Starting from the equation of shell motion [5], we studied the dynamics of a priestess's cylinder under the action of two types of loads: a concentrated normal force moving along a circle at a constant velocity, and a point wise normal force moving along the axis of the cylinder.

An approximate model approach for determining vibrations on a free surface from moving loads in reinforced tunnels of a rectangular and circular profile has been applied [7]. The action of a mobile periodic load on a circular cylindrical cavity in an elastic half-space for subsonic speeds of load motion was considered in [14] where the motion of a half-space described the dynamic equations of the theory of elasticity [5] in Lame potentials. To solve problems in this paper, a model research method is used.

The tunnel is modeled as an infinitely long circular cylindrical cavity located in a homogeneous and isotropic linearly elastic half-space parallel to its horizontal boundary. The cavity can be supported by a homogeneous or layered elastic shell (in which case the tunnel can be considered as an underground pipeline). The no stationary load acts on the surface of the cavity or on the inner surface of the shell reinforcing cavity. The speed of the load is assumed to be subsonic.

2. Statement of the problem for a circular tunnel.

Using the model approach for research, we will represent the tunnel as an infinitely long circular cylindrical cavity with a radius $r = R$, located in a linear viscoelastic, homogeneous and isotropic half-space $x \leq h$ (Figure 1) parallel to its horizontal boundary (the earth's surface). We define the reaction of a half-space on a moving with a constant subsonic velocity c along the cavity surface in the direction of the Z-axis of the load P.

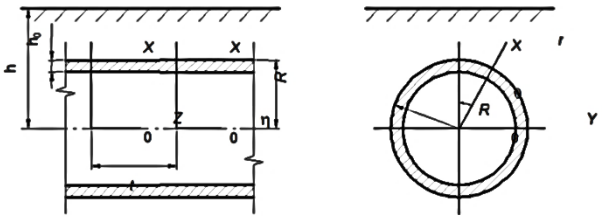

Figure 1. The calculated scheme of the reinforced tunnel and underground pipeline

For this, we use the equations of motion of an elastic medium in vector form [16, 17]

$$\tilde{\mu}_j \nabla^2 \vec{u} + (\tilde{\lambda}_j + \tilde{\mu}_j) grad.di\vartheta \vec{u} = \rho_j \frac{\partial^2 \vec{u}}{\partial t^2}, \quad (1)$$

Here $\vec{u}(u_x, u_y, u_z)$ - vector of displacement of points of the medium; ρ_j - material density; u_x, u_y, u_z - displacement components; ν_j - is the Poisson's ratio;

$$\tilde{\lambda}_j = \frac{\nu_j \tilde{E}_j}{(1+\nu_j)(1-2\nu_j)}; \quad \tilde{\mu}_j = \frac{\nu_j \tilde{E}_j}{2(1+\nu_j)},$$

where $\tilde{E}_j$ – Operational modulus of elasticity, which have the form [25, 26].

$$\tilde{E}_j \phi(t) = E_{0j}\left[\phi(t) - \int_0^t R_{Ej}(t-\tau)\phi(t)\,d\tau\right] \qquad (2)$$

$\phi(t)$ - arbitrary time function; $R_{Ej}(t-\tau)$ - relaxation core; E_{0j} - instantaneous modulus of elasticity; We assume the integral terms in (5) to be small, then the functions $\phi(t) = \psi(t)e^{-i\omega_R t}$, where $\psi(t)$ - a slowly varying function of time, ω_R - real constant. Further, applying the freezing procedure [14], we note relations (2) as approximations of the form

$$\bar{E}\phi = E\left[1 - \Gamma^C(\omega_R) - i\Gamma^S(\omega_R)\right]\phi,$$

where

$$\Gamma^C(\omega_R) = \int_0^\infty R(\tau)\cos\omega_R\tau\,d\tau,$$

$$\Gamma^S(\omega_R) = \int_0^\infty R(\tau)\sin\omega_R\tau\,d\tau$$

respectively, the cosine and sine Fourier images of the relaxation core of the material. As an example of a viscoelastic material, we take three parametric relaxation nuclei $R(t) = Ae^{-\beta t}/t^{1-\alpha}$.

On the influence function $R(t-\tau)$ the usual requirements of inerrability, continuity (except for $t = \tau$), sign of uncertainty and monotony:

$$R > 0, \quad \frac{dR(t)}{dt} \le 0, \quad 0 < \int_0^\infty R(t)dt < 1.$$

$\vec{u}$ - the vector of displacements of the environment.

Since the steady-state process is considered, the strain pattern is stationary with respect to the moving load. Therefore, it is convenient to move to a moving coordinate system $\eta = z - ct$, connected with the load P.

Then equation (1) can be rewritten in the form

$$\left(\frac{1}{M_p^2} - \frac{1}{M_s^2}\right)\text{grad div}\mathbf{u} + \frac{1}{M_s^2}\nabla^2\mathbf{u} = \frac{\partial^2\mathbf{u}}{\partial\eta^2}. \qquad (3)$$

Here $M_p = c/c_p$, $M_s = c/c_s$ - Mach numbers; $c_p = \sqrt{(\bar{\lambda}+2\bar{\mu})/\rho}$, $c_s = \sqrt{\bar{\mu}/\rho}$ – complex propagation velocities of expansion waves - compression and shear in a medium.

3. Tasks of the action of mobile loads on an Unreinforced tunnel.

In the theoretical aspect, the solution was based on the papers [23, 24] In [25], the first and second boundary-value problems of the theory of elasticity for a half-plane with a point source of stationary waves concentrated within it, the potential of which is represented in terms of cylindrical functions, are solved by the method of expanding potentials on plane waves. And in [24] using this approach, the problem of the stationary load on the contour of a circular hole in a half-space was solved. Using the idea of these papers on the superposition of solutions and the re-expansion of plane waves into series in cylindrical functions, in [25], in contrast to the exact analytical solution for the subsonic case, when the velocity of a moving load is less than the velocity of the Rayleigh waves.

Since the steady-state process is considered, the strain pattern is stationary with respect to the moving load. Therefore, it is convenient to move to the mobile coordinate system $\eta = z - ct$, connected with the load P.

Then equation (1) can be rewritten in the form

$$\left(\frac{1}{M_p^2} - \frac{1}{M_s^2}\right)\text{grad div}\mathbf{u} + \frac{1}{M_s^2}\nabla^2\mathbf{u} = \frac{\partial^2\mathbf{u}}{\partial\eta^2}. \qquad (4)$$

When the load acts on the cavity surface, we have

$$\sigma_{rj}\big|_{r=R} = P_j(\theta,\eta), \quad j = r,\theta,\eta, \qquad (5)$$

where σ_{rj} – components of the stress tensor in a medium, $P_j(\theta,\eta)$ – components of the intensity of the mobile load $P(\theta,\eta)$.

Since the boundary of the half-space is free from loads, $x = h$

$$\sigma_{xx} = \sigma_{xy} = \sigma_{x\eta} = 0. \qquad (6)$$

We transform equation (1) by expressing the displacement vector of an elastic medium through Lame potentials

$$\mathbf{u} = \text{grad}\,\varphi_1 + \text{rot}\,\boldsymbol{\Psi} \qquad (7)$$

Potential $\boldsymbol{\Psi}$ can be represented in the form [27]

$$\boldsymbol{\Psi} = \varphi_2\mathbf{e}_\eta + \text{rot}(\varphi_3\mathbf{e}_\eta), \qquad (8)$$

where $\mathbf{e}_\eta$ «ort axis η».

With this in mind, (5) takes the form

$$\mathbf{u} = \text{grad div}\,\varphi_1 + \text{rot}(\varphi_2\mathbf{e}_\eta) + \text{rot rot}(\varphi_3\mathbf{e}_\eta). \qquad (9)$$

It follows from (3) and (8) that the potentials φ_j satisfy the modified wave equations

$$\nabla^2\varphi_j = M_j^2\frac{\partial^2\varphi_j}{\partial\eta^2}, \; j = 1, 2, 3. \qquad (10)$$

Here $M_1 = M_p$, $M_2 = M_3 = M_s$.

We express the components of the stress and displacement of the material point through the potentials φ_j.

The components of the vector u (7) in cylindrical (8) and Cartesian (9) coordinate systems [24-26]:

$$u_r = \frac{\partial\varphi_1}{\partial r} + \frac{1}{r}\frac{\partial\varphi_2}{\partial\theta} + \frac{\partial^2\varphi_3}{\partial\eta\partial r},$$

$$u_\theta = \frac{1}{r}\frac{\partial\varphi_1}{\partial\theta} - \frac{\partial\varphi_2}{\partial r} + \frac{1}{r}\frac{\partial^2\varphi_3}{\partial\eta\partial\theta}, \qquad (11)$$

$$u_\eta = \frac{\partial \varphi_1}{\partial \eta} + m_s^2 \frac{\partial^2 \varphi_3}{\partial \eta^2};$$

$$u_x = \frac{\partial \varphi_1}{\partial x} + \frac{\partial \varphi_2}{\partial y} + \frac{\partial^2 \varphi_3}{\partial x \partial \eta},$$

$$u_y = \frac{\partial \varphi_1}{\partial y} - \frac{\partial \varphi_2}{\partial x} + \frac{\partial^2 \varphi_3}{\partial y \partial \eta},$$

$$u_\eta = \frac{\partial \varphi_1}{\partial \eta} + m_s^2 \frac{\partial^2 \varphi_3}{\partial \eta^2},$$

Where $m_s^2 = 1 - M_s^2$.

Volumetric strain

$$\varepsilon = \mathrm{div}\,\mathbf{u} = \nabla^2 \varphi_1. \qquad (12)$$

Using Hooke's law, taking into account (9), (11), we find expressions for the stress tensor components in cylindrical and Cartesian coordinates

$$\sigma_{\eta\eta} = (2\mu + \lambda M_p^2)\frac{\partial^2 \varphi_1}{\partial \eta^2} + 2\mu m_s^2 \frac{\partial^3 \varphi_3}{\partial \eta^3},$$

$$\sigma_{\theta\theta} = \lambda M_p^2 \frac{\partial^2 \varphi_1}{\partial \eta^2} + \frac{2\mu}{r}\left(\frac{1}{r}\frac{\partial^2 \varphi_1}{\partial \theta^2} + \frac{\partial \varphi_1}{\partial r} + \frac{1}{r}\frac{\partial \varphi_2}{\partial \theta} - \frac{\partial^2 \varphi_2}{\partial r \partial \theta} + \frac{1}{r}\frac{\partial^3 \varphi_3}{\partial \theta^2 \partial \eta} + \frac{\partial^2 \varphi_3}{\partial r \partial \eta}\right),$$

$$\sigma_{rr} = \lambda M_p^2 \frac{\partial^2 \varphi_1}{\partial \eta^2} + 2\mu\left(\frac{\partial^2 \varphi_1}{\partial r^2} + \frac{1}{r}\frac{\partial^2 \varphi_2}{\partial \theta \partial r} - \frac{1}{r^2}\frac{\partial \varphi_2}{\partial \theta} + \frac{\partial^3 \varphi_3}{\partial r^2 \partial \eta}\right),$$

$$\sigma_{r\eta} = \mu\left(2\frac{\partial^2 \varphi_1}{\partial \eta \partial r} + \frac{1}{r}\frac{\partial^2 \varphi_2}{\partial \theta \partial \eta} + (1 + m_s^2)\frac{\partial^3 \varphi_3}{\partial \eta^2 \partial r}\right),$$

$$\sigma_{\eta\theta} = \mu\left(\frac{2}{r}\frac{\partial^2 \varphi_1}{\partial \theta \partial \eta} - \frac{\partial^2 \varphi_2}{\partial r \partial \eta} + \frac{(1 + m_s^2)}{r}\frac{\partial^3 \varphi_3}{\partial \theta \partial \eta^2}\right),$$

$$\sigma_{r\theta} = 2\mu\left(\frac{1}{r}\frac{\partial^2 \varphi_1}{\partial \theta \partial r} - \frac{1}{r^2}\frac{\partial \varphi_1}{\partial \theta} - \frac{\partial^2 \varphi_2}{\partial r^2} - \frac{m_s^2}{2}\frac{\partial^2 \varphi_2}{\partial \eta^2} + \frac{1}{r}\frac{\partial^3 \varphi_3}{\partial r \partial \eta \partial \theta} - \frac{1}{r^2}\frac{\partial^2 \varphi_3}{\partial \eta \partial \theta}\right);$$

$$\sigma_{\eta\eta} = (2\mu + \lambda M_p^2)\frac{\partial^2 \varphi_1}{\partial \eta^2} + 2\mu m_s^2 \frac{\partial^3 \varphi_3}{\partial \eta^3},$$

$$\sigma_{yy} = \lambda M_p^2 \frac{\partial^2 \varphi_1}{\partial \eta^2} + 2\mu\left(\frac{\partial^2 \varphi_1}{\partial y^2} - \frac{\partial^2 \varphi_2}{\partial x \partial y} + \frac{\partial^3 \varphi_3}{\partial y^2 \partial \eta}\right),$$

$$\sigma_{xx} = \lambda M_p^2 \frac{\partial^2 \varphi_1}{\partial \eta^2} + 2\mu\left(\frac{\partial^2 \varphi_1}{\partial x^2} + \frac{\partial^2 \varphi_2}{\partial x \partial y} + \frac{\partial^3 \varphi_3}{\partial x^2 \partial \eta}\right),$$

$$\sigma_{x\eta} = \mu\left(2\frac{\partial^2 \varphi_1}{\partial \eta \partial x} + \frac{\partial^2 \varphi_2}{\partial y \partial \eta} + (1 + m_s^2)\frac{\partial^3 \varphi_3}{\partial \eta^2 \partial x}\right),$$

$$\sigma_{\eta y} = \mu\left(2\frac{\partial^2 \varphi_1}{\partial y \partial \eta} - \frac{\partial^2 \varphi_2}{\partial x \partial \eta} + (1 + m_s^2)\frac{\partial^3 \varphi_3}{\partial y \partial \eta^2}\right),$$

$$\sigma_{xy} = 2\mu\left(\frac{\partial^2 \varphi_1}{\partial x \partial y} - \frac{\partial^2 \varphi_2}{\partial x^2} - \frac{m_s^2}{2}\frac{\partial^2 \varphi_2}{\partial \eta^2} + \frac{\partial^3 \varphi_3}{\partial x \partial y \partial \eta}\right).$$

Thus, to determine the components of the stress-strain state of the medium, it is necessary to solve equations (9) together with the boundary conditions.

In cases where circular tunneling or underground pipelines are thin-walled structures, the considered model of the tunnel can be adopted as a design model, with the reinforcement of the cavity by a thin elastic cylindrical shell of thickness h_0 (Figure 1). Because of the small thickness of the shell, we assume that the surrounding array is in contact with the shell along its median surface. The load P, moving with a constant subsonic speed c in the direction of the Z-axis, acts on the inner surface of the shell.

To describe the motion of the shell, we use the classical equations of the theory of thin shells [21]

$$\frac{\partial^2 u_{0z}}{\partial z^2} + \frac{1-\nu_0}{2R^2}\frac{\partial^2 u_{0z}}{\partial \theta^2} + \frac{1+\nu_0}{2R}\frac{\partial^2 u_{0\theta}}{\partial z \partial \theta} + \frac{\nu_0}{R}\frac{\partial u_{0r}}{\partial z} = \rho_0 \frac{1-\nu_0}{2\mu_0}\frac{\partial^2 u_{0z}}{\partial t^2} + \frac{1-\nu_0}{2\mu_0 h_0}(P_z - q_z),$$

$$\frac{1+\nu_0}{2R}\frac{\partial^2 u_{0z}}{\partial z \partial \theta} + \frac{(1-\nu_0)}{2}\frac{\partial^2 u_{0\theta}}{\partial z^2} + \frac{1}{R^2}\frac{\partial^2 u_{0\theta}}{\partial \theta^2} + \frac{1}{R^2}\frac{\partial u_{0r}}{\partial \theta} = \rho_0 \frac{1-\nu_0}{2\mu_0}\frac{\partial^2 u_{0\theta}}{\partial t^2} + \frac{1-\nu_0}{2\mu_0 h_0}(P_\theta - q_\theta),$$

$$\frac{\nu_0}{R}\frac{\partial u_{0z}}{\partial z} + \frac{1}{R^2}\frac{\partial u_{0\theta}}{\partial \theta} + \frac{h_0^2}{12}\nabla^2\nabla^2 u_{0r} + \frac{u_{0r}}{R^2} = -\rho_0 \frac{1-\nu_0}{2\mu_0}\frac{\partial^2 u_{0r}}{\partial t^2} - \frac{1-\nu_0}{2\mu_0 h_0}(P_r - q_r) \qquad (13)$$

where u_{0z}, $u_{0\theta}$, u_{0r} are the displacements of the points of the middle surface of the shell; P_z, P_θ, P_r - components of the intensity of the mobile load P;

$$q_z = \sigma_{rz}\big|_{r=R}, \quad q_\theta = \sigma_{r\theta}\big|_{r=R}, \quad q_r = \sigma_{rr}\big|_{r=R}.$$

components of the reaction surrounding the shell environment; ν_0, μ_0, ρ_0 are the Poisson's ratio, the shear modulus and the density of the shell material, respectively. In the moving coordinate system, equations (13) are rewritten in the form

$$\left[1-\frac{(1-\nu_0)\rho_0 c^2}{2\mu_0}\right]\frac{\partial^2 u_{0\eta}}{\partial\eta^2}+\frac{1-\nu_0}{2R^2}\frac{\partial^2 u_{0\eta}}{\partial\theta^2}+\frac{1+\nu_0}{2R}\frac{\partial^2 u_{0\theta}}{\partial\eta\partial\theta}+\frac{\nu_0}{R}\frac{\partial w_{0r}}{\partial\eta}=\frac{1-\nu_0}{2\mu_0 h_0}(P_\eta-q_\eta),$$

$$\frac{1+\nu_0}{2R}\frac{\partial^2 u_{0\eta}}{\partial\eta\partial\theta}+\frac{(1-\nu_0)}{2}\left(1-\frac{\rho_0 c^2}{\mu_0}\right)\frac{\partial^2 u_{0\theta}}{\partial\eta^2}+\frac{1}{R^2}\frac{\partial^2 u_{0\theta}}{\partial\theta^2}+\frac{1}{R^2}\frac{\partial w_{0r}}{\partial\theta}=\frac{1-\nu_0}{2\mu_0 h_0}(P_\theta-q_\theta),$$

$$\frac{\nu_0}{R}\frac{\partial u_{0\eta}}{\partial\eta}+\frac{1}{R^2}\frac{\partial u_{0\theta}}{\partial\theta}+\frac{h_0^2}{12}\nabla^2\nabla^2 w_{0r}+\frac{(1-\nu_0)\rho_0 c^2}{2\mu_0}\frac{\partial^2 w_{0r}}{\partial\eta^2}+\frac{w_{0r}}{R^2}=-\frac{1-\nu_0}{2\mu_0 h_0}(P_r-q_r)$$

The motion of the half-space is described by the dynamic equations of elasticity theory in Lame potentials.

Let's consider two cases of conjugation of a shell with an environment: rigid and sliding. In these cases, the boundary conditions have the form:

- At sliding contact

$$\sigma_{rj}\big|_{r=R}=0,\ j=\eta,\theta,\quad w_r\big|_{r=R}=w_{0r},\qquad (14,a)$$

- At hard contact

$$u_j\big|_{r=R}=u_{0j},\ j=\eta,\theta,r\ .\qquad (14,б)$$

Thus, in this formulation, in order to determine the components of displacements and stresses of the medium, it is necessary to jointly solve Esq. (13), subject to the boundary conditions (14), depending on the conjugation condition of the shell with the medium.

In the moving coordinate system, we apply to the equations of motion and the boundary conditions a complex Fourier transform of the form [24-26].

$$\overline{\varphi}(\xi)=\int_{-\infty}^{\infty}\varphi(\eta)e^{-i\xi\eta}d\eta,\qquad (15)$$

$$\varphi(\eta)=-\frac{1}{2\pi}\int_{-\infty}^{\infty}\overline{\varphi}(\xi)e^{i\xi\eta}d\xi\ .$$

Writing general solutions of the transformed equations of motion of the tunnel in the form (4) - (15), we find the following system of algebraic equations for determining the dimensionless transform ants of displacements of an intermediate surface

$$-\xi^2 U_0+i\xi G_1 w_0=-\zeta^2\frac{1-G_1}{3}G_0^2 U_0;$$

$$i\xi G_1 U_0-\frac{1-G_1}{3}G_0^2\zeta^2 w_0+\left(1+\frac{k^2\zeta^4}{12}\right)w_0-$$

$$-\frac{1-G_1}{2k}\frac{\zeta G_{11}}{\gamma}w_0=C_2 P_{10}.$$

Where

$$G_1=G_2/G_1;\ k=h/a;\ P_{10}=P_0 a/Eh;$$

$$\{U_0,\ W_0\}=\frac{1}{h}\{U_1,\ W_1\};\quad C_0^2=C\left(\frac{3}{2}\frac{\rho_1}{G_1}\right);$$

The stress at the boundary of the soft layer and elastic among (r = b) in the dimensionless form has the form:

$$\sigma_{rr}^*=\int\frac{4}{\pi}\left\{-\frac{(1-\eta)H_1^{(1)}(\bar{\alpha}a)}{\delta_1}\sin\theta+\sum_{n=2}^{\infty}\frac{i^{n+1}H_n(\bar{a}\ a)}{\Delta n}\sin n\theta\right\}e^{i\xi\eta}d\xi$$

$$\sigma_{r\theta}^*=\int\frac{2}{\pi}\left\{-\frac{i\ \bar{\beta}a^2}{\bar{\beta}^3a^3H_1^{(1)}(\bar{\beta}a)+8\eta\left(\frac{\bar{\beta}^2a^2}{2}H^{(1)}{}_0(\beta a)-\bar{\beta}aH_1(\beta a)\right)}-\right.$$

$$-\frac{2}{\delta_1}\left[(1+\eta)H_1(\bar{\alpha}\ a)-\bar{\alpha}\ aH_0(\bar{\alpha}\ a)cos\theta\right]-$$

$$\left.-2\sum_{n=2}^{\infty}\frac{i^{n+1}\left[-nH_n^{(1)}(\bar{\alpha}\ a)+(\bar{\alpha}\ a)H_{n-11}(\bar{\alpha}\ a)\right]}{\Delta n}\cos n\theta\right\}e^{i\xi\eta}$$

where

$$\delta_1=-4\eta H_1^{(1)}(\bar{\alpha}\ a)H_1(\bar{\beta}\ a)+(1+\eta)\bar{\alpha}\ aH_0(\bar{\alpha}\ a)+H_0(\bar{\beta}\ a),$$

$$\Delta n=n\bar{\alpha}\ aH_{n-1}(\bar{\alpha}\ a)H_{n1}(\bar{\beta}\ a)+n(\bar{\beta}\ a)H_{n-1}(\bar{\beta}\ a)H_n(\bar{\alpha}\ a)-$$

$$-\bar{\alpha}\bar{\beta}a^2H_{n-1}^{(1)}(\bar{\alpha}\ a)H_{n-1}^{(1)}(\bar{\beta}\ a)$$

Here $\delta = c/c_в$ is the ratio of the density of the environment to the density of the soft layer; $\bar{\alpha},\bar{\beta}$ - are functions of ξ and η.

We find the following expression for the load transformer, which is transferred to the shell from the side of the soft layer

$$\bar{q}_{rc}=-G_1\frac{\xi}{q}C_1 w_0-C_2 P_0(\xi);$$

$$C_1=\sum_{j=1}^{4}\frac{A_{4j}\big|_{k_{c1}=0}B_{3j}}{\det\|A_{ke}\|};$$

$$C_2=\sum_{j=1}^{4}\frac{(-1)^j A_{4i}\big|_{k_{c1}=0}B_{3j}}{\det\|A_{ke}\|}.$$

Elements of the determinant $\det\|A_{ke}\|$ is computed then formula $A_{11}=-2M_1;\quad A_{12}=-a_{11};$

$$A_{13}=nM_{12};\ A_{14}=-A_{13};\ A_{21}=-S_1A_{11};$$

$$A_{22}=A_{12}*k_0(z_1)/k_1(z_1);$$

$$A_{23}=A_{13}*I_0(z_2)/I_2(z_2);$$

$$A_{24}=A_{13}*k_0(z_1)/k_1(z_2);\ A_{31}=\frac{1}{2}A_{11};\ A_{32}=-\frac{1}{2}A_{11};$$

$$A_{41}=n_1k_0(z_3)/k_1(z_4)-2A_{21}/(z_3/M_2);\ A_{31}=A_{13}/n_1;$$

$$A_{34}=-A_{13}/n_1;$$

$$A_{42}=n_1I_0(z_3)/I_1(z_4)-2M_1S_1(z_3)/I_1(z_4);$$

$A_{43} = -2M_{12}^2(k_0(z_5)/k_1(z_6) + I_1(z_5)/I_1(z_6)/(z_6/M_2))$;

$A_{44} = -2M_{12}^2(I_0(z_5)/k_1(z_6) + I_1(z_6)/k_1(z_6)/(z_6/M_2))$;

Where is $m_1 = \sqrt{1-M_p^2}$; $m_{12} = \sqrt{1-M_S^2}$;

$z_1 = M_1\eta$; $z_2 = M_{121}\eta$; $z_3 = M_1\eta$;

$z_4 = m_1\eta(1+k_{11})$; $z_5 = m_1\eta$; $k_{11} = (b-a)/a$;

k_{1_0} k_1 - Modified Neumann functions; I_{1_0} I_1 - modified Bessel functions; the general solution of the equations of the motion of the environment has the form

$$(C_f < C_S < C_p)$$

$$\varphi(r,\xi) = A_n(\xi)k_n(m_1\xi r) + B_n(\xi)I_4(m_1\xi r)$$

$$\psi(r,\xi) = C_n(\xi)k_n(m_{i2}\xi r) + D_n(\xi)I_4(m_{12}\xi r)\,. \quad (16)$$

His expression for the original transform of the normal displacement has the form

$$w_0 = -\frac{1-\nu}{m}\sum_{i=o}^{\infty}\left\{\int_{-\infty}^{\infty}\frac{\Delta_1[a\cos(\zeta\eta) - \zeta\lim(\zeta\eta)]d\xi}{[a^2+\zeta^2]\det|A_{ke}|}\right\} \quad (17)$$

Defining Δ_j $(j = 1.2.....5)$ is obtained from $\det\|A_{ke}\|$ by replacing j = 20 by the column C with the elements {0; 0; 1; 0; 0}.

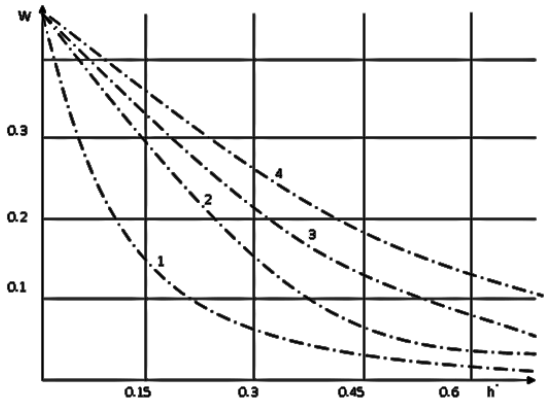

Fig. 2. Shell deflections as a function of thickness.

After this function $A(\zeta).....D(\zeta)$ from (16) can be calculated from formulas

$$\{A,B,C,D\} = \frac{a^2}{\xi^2\det\|A_{ke}\|}\left\{\frac{A_1^1}{k_1(m_1\xi)};\quad -\frac{A_2^1}{I_1(m_2\xi)};\quad -i\frac{aA_3^1}{\zeta k_1(m_{12}\xi)};\quad i\frac{aA_4^1}{\zeta I_1(m_{12}\xi)}\right\}$$

$$A_j^1 = \frac{\xi}{a}M_{3k}w_0 + P_0|m_{4k}|G_1\ (\kappa = 1,.....4)$$

m_{ie} – minors of the element Aje. For a specific value of the load velocity C, the denominators under the integral expressions in formulas (14) are transcendental functions with respect to ζ C real coefficients depending on C, as well as on the mechanical parameters of the shell and the layer. Analysis of the integrals of treatment must begin with consideration of cases [25] $D(\xi, C_0) = 0$, which is equivalent to the construction of the dispersion relation in the corresponding problem of propagation of free waves and the determination of the denominator from the dispersion curves of the roots for the chosen velocity of the load C. at C< C_5 are possible for cases. Figure 2 shows the change in the movement of the filler, depending on the thickness of the bodies for different values of the rigidity of the aggregate. As can be seen from the drawing (γ = 100, 50,10,2), that for a sufficiently rigid layer (γ = 100), the deflections of the shell essentially decrease [18-20, 21, 22]. For a given speed C, there are one or two different denominator roots. For some values of *C*, the denominator has a double root. This case corresponds to a minimum of the corresponding dispersion curve in Fig. Such a velocity is called resonance and is denoted by C^x.

A resonance effect appears, or which deflections and contact pressures tend to infinity. For a given value of C, the denominator has no roots on the real axis, as seen in Figure 2, this will be either, C<C_ϕ (up to resonance mode). At this speed of motion, the inversion integrals are not special and can be found by effective numerical methods.

Dividing the integral (17) into two terms

$$w_0 = \frac{1}{\pi}\int_0^{\infty} x_1(\Omega)d\Omega$$

and

$$w_0 = \frac{1}{\pi}\int_{\omega_1}^{\omega_2} x_1(\Omega)d\Omega \qquad (18)$$

The value of the integral (18) was found by the numerical method [23]. When the integral is calculated by the Romberg method, it is necessary to repeatedly calculate the integrand function. The inverse Fourier transform (29) was numerically fulfilled. It is shown that at an integration step of 1.01, the error of the procedure does not exceed 0.3-0.5%.

4. Conclusions.

1. From the analysis of these results it follows that for any conjugation of the shell with the array, the reinforcement of the tunnel leads to a decrease in radial displacements and compressive axial stresses ($\sigma_{\eta\eta}$). The effect of the shell on the nature of the change in normal stresses ($\sigma_{\theta\theta}$) is somewhat different: these stresses increase in the central parts of the tunnel arch. As the thickness and stiffness of the sheath material increase, the displacement and stresses decrease. Contact conditions also affect the stresses and permeations of the contour of the section.

2. All the considered load velocities, with a relatively small period T = p / 4 and the fluidity of the medium (0 <A <0.48), the components of the stress-strain state of the earth's surface are practically zero. With a decrease in the period (T/ h <0.4), as calculations have shown, an entire region of the array with zero components begins to form from the earth's surface, which covers the entire array with a sufficiently small period, except for a small thickness of the layer around the tunnel.

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TWELVE CATEGORIES OF GOVERNMENT'S MANAGING SYSTEM

Abstract: *It is known that the period of A. Temur's statehood plays a special role in the history of our people with its spirituality, potential, educational power and influence. His state was dominated by order, calm, and the rule of law, in many matters the unity of word and deed was achieved. His invaluable legacy of the Code was not only an important law complex in statehood, but also a breeding ground for satisfying spiritual needs. This article discusses the importance of the "Temur's Regulations" and the great statesman and politician A. Temur, his fair governance of the state.*

Key words: *A.Temur, Temur's Regulations, Saltanat, Sipoh, Mawaraunnahr, Transoxiana.*
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Introduction

Amir Temur, as the owner of an incredibly sharp mind, was a man with the skills to anticipate the causes of problems, more precisely, the desires of the public employee, the actions of the secretly and take reasonable measures against him. Amir Temur gave gifts and positions to state employees, and keeping them in the midst of fear and love. The fact that the leader had these qualities, formed in him a sense of voluntary-involuntary obedience and submission to the ruler in the state (Saltanat). The ruler strengthened respect for his judgment and served to ensure the unconditional fulfillment of the precept's decrees.

The management principles applied by Amir Temur are based on the laws of real social relations. He had a good understanding of the natural existing social relations between people, at the same time, the contradictions that can arise from it, and, accordingly, has developed the right plans and activities. Such conclusions were made due to the fact that the power and its management, the organization of effective activities, respectively, were able to coordinate the transparent aspirations of the ayons to power in accordance with the interests of the state. In particular, he says: "Taking these twelve rules as a slogan for myself, I sat on the throne of Empire (Saltanat) with the great confidence. I have learned from my own experience that if a certain king does not possess these twelve things, he will remain untouched from the Empire (Saltanat) [1]."

The establishment of public administration based on the requirements of justice is a natural necessity and serves to ensure a strong balance of power. The problem of the issue is the awareness of these laws at the level of state policy and the introduction of political and organizational norms in accordance with them. Such a device is a phenomenon connected not only with the ruler, but also with the culture of life of the people, which ensures the execution of this sentence. In this regard, the procedures developed by Amir Temur served to harmonize the interests of the ruler with the people, which was of great importance as a matter of public security.

Sahibkiran well understood and practiced that in order to rule the world, in addition to a powerful army, knowledgeable and strong consultants were needed. So we know that he paid special attention to scholars, sheikhs and Sayyids. In addition, merchants and dervishes also relied on their services as ravines that spread their victories across various state borders, as if with their own eyes [2].

Temur's teaching deserves special study, given that the concept of power is divided into 12 categories, which include the essence of the content of the narrative, the rationality of logic, consistent interdependence, purpose and interest, justice and truth. In fact, similar

principles of public administration determine the achievement of subordination of 27 countries. This issue was the result of an excellent policy related to state administration [3].

It is known that in the history of the state of Mawaraunnahr there was a huge legacy left before the Sahibkiron for the construction, organization, management and storage of the Empire. However, not all areas and directions of statehood, as in the "Temur's regulations", are covered completely and holistically. In this regard, the "Regulation" created by Amir Temur is considered a constructive concept of power, which is ideally regulated in this regard. He understood the functions of governing the empire (saltanat) at a high cultural level.

In this part, it is indicated that the owner was scored in the administration in 12 categories. For instance, the distribution of goods between the ruling classes in society and their balancing of the right distribution is an incredibly difficult task, while at the same time bringing them to balance at the point of justice is an important factor that guarantees the development of the state. For as long as the conflict of such interests does not lead to a balance, national priorities for the ruling classes will become secondary, and we will witness the result of such terrible consequences in our history. This raises a reasonable question: what political means will Amir Temur achieve in this regard to unite the interests of the ruling classes, who have become retailers as a real in Mawaraunnahr. At the moment, in this regard, why does he focus on the categorization of society and rely on them? Why does it attach great importance to the systematic organization of the hierarchy of its positions and levels in public administration? This approach to categories, which important and serious aspects of public policy, at the same time, are aimed at finding a solution to justice?

It should be noted that the presence of a ruling class in any period and state is a natural phenomenon. After all, there is a people, a nation, a state, there will be a sense of domination over it (possession), and there will also be a layer of inclined leadership. This is the law of necessity and need! Stratification of social strata means natural selection. The dominant classes are considered categories that have a certain property and influence state policy through this property, determining the future fate of the people. More precisely, they are considered the owners of the land. Such a social system actually occurs in the same way for all peoples.

It turned out that the ruling classes are individuals who determine the integrity and prospects of the state, and in the state they represent the nation, as well as represent and protect the interests of the people. When this happened, any shah paid attention to the fact that his policy was also related to the will of the country's rulers. The fairness of relations is determined by the fact that these relations are a kind of nationalistic. The philosophical aspects of this question, however, are neither an Alliance between the ruling classes, nor the sole purpose of the territory of Mawaraunnahr (Transoxiana) during the same period, than from the point of view of the situation of political power. We know very well that each of them seeks to rule.

Amir Temur achieved unite the rulers of different interests and levels around the idea of restoring a single goal – a powerful state, on the border of which there was a disunity. This idea was carried out with a sequence of certain political activities. In this regard, it involves managers and other parts of the public administration system in the activities of the Public service on the basis of clear obligations and responsibilities, laws and regulations, and seeks to harmonize their potential and interests in accordance with it with the General interests. These rules are formed mainly on the basis of the designation of the twelve categories of the empire (Saltanat).

Sahibkiran, first of all, pays great attention to the offspring of the State employee, their wisdom, intelligence, and personal human qualities. That is, based on the social background of civil servants, their ability to manage the state, he raised them to a certain task or level. This approach is systemic in nature and is aimed at preventing spiteful, disillusioned cowards from entering the public institution. In particular, he was able to define the individual tasks of the layers' activities, as well as their respective responsibilities. Currently, criteria have been set for one of their powers not to exceed the other or, on the contrary, not to fall, which has led to the discipline and effective operation of public authorities. Thus, he pays great attention to the preservation of everything and everyone in his career, determining the value of each, their position and the measure of everything.

Amir Temur is a wise, experienced statesman who wants to establish himself as an experienced statesman, which state Central authority and local authority, which social categories to rely on, officials and their attributes, will determine the range of duties and responsibilities. Each owner of the crown pays special attention to the management of the state and society on the basis of certain socio-political groups.

Amir Temur says about this: "If you can't keep everything and everyone in your career, it will get your empire (Saltanat) more harm and loss. So you need to determine the value of everyone, the position you hold, and the measure of everything and act accordingly."[4] We know that the factors that lead the state power to slavery noticing everything and not keeping everyone in their career lead to the fact that corrupt and selfish people, thieves, a generation of unscrupulous people come to the practice of state management. As a result, the resulting categories of dirt (groups) and the "policy" that encourages them will lead to the absorption of the development of any

state. The philosophy of this policy has not lost its relevance in today.

The most important aspect in the categorization part of the "Temur's regulations" that it has a clear regulation that allows you to quickly put into practice the selection of management personnel, appointment to positions, organization of activities and control over the order of work. In addition, this rules are brought to the attention of not only the leaders, but also the entire country, all citizens have been warned about this rules. Because of this, people in leadership positions were required educated, smart, entrepreneurial, and experienced [5]. That is, natural selection served the growth of potential persons in the hierarchy of power.

Amir Temur, who laid the foundations for managing society and its prospects in the interests of social strata, will succeed in creating a solid foundation for a huge state. He organized the management and conditions for direct participation in it in a practical way in accordance with the positions and capabilities of the divisions. Undoubtedly, those who had this opportunity were directly connected with the enthusiasm to enjoy the service of Amir and the desire to follow his statutes. And morality was the basis of this social contract. Thus, the organization of the social contract has established conditions for ensuring the participation of all categories of citizens in public administration and the benefits that exist in it, in accordance with the level and potential. At the same time, the state has also formed a system of labor resources and their target orientation. In particular, moral, transparent criteria have been created that categories and officials should not demand beyond their capabilities and needs.

12 categories listed in the Temur regulations:

The first category – Sayyids, Ulema (scientists), Sheikhs and Fazils (political elites).

The second category – the wise men and the owners of the council, cautious, resolute figures, the elderly and experienced.

The third category — the people who are prayers.

The fourth category Amirs, sarhang [6] (military officer), sipoh-solorlar (soldier)

The fifth category — Sipoh and raiyat.

The sixth category — reliable, truthful people

The seventh category — Ministers, Devon secretaries and munshi (secretary, creator)

The eighth category — Hakim (doctors), astrologers and engineers

The ninth category — mukhaddis, (prophet, his descendants and companions).

The tenth category — Mashayixs, Sufis, Arif.

The eleventh category — workers and craftsmen.

The twelfth category — travelers.

According to the "Temur's Regulations", the highest level of categories are Sayyids, Ulemas (learned men of Islam, clergy), Sheikhs (religious leader) and Fazils (erudite , learned men). In this regard, Amir Temur considers scientists as the highest rank of the category, while adhering to his previous teaching about the prestige of the people of science and religion in state politics. I have approached the seyids, the scholars , the sheikhs, and the fazils. He said: "I have addressed the Sayyids, the Ulema (scientists), the sheikhs, and the Fazils myself. They always came to my palace and decorated my meetings. They raised religious, legal, and intellectual issues and expressed valuable opinions. I learned from them what is Halal and Haram."[7] The question is, why does a ruler who owns half the world give the Sheikh, scholars, and fazils the highest rank of ruler of the State (Saltanat)? Is it the kindness, generosity, culture or any essence of law of Amir Temur?

Thinkers of the world (Arestotel, Plato, Avesto, Farabi, Yusuf Hos Hajib Nizamulmulk and many other thinkers) who left a huge legacy not only about how to manage the state, but also about whom it should be governed by. After all, if public administration is the goal, then its administration is considered as a tool. Management by its nature requires skill, ability, discretion, diligence, knowledge, and education. Therefore, a stable and effective government agency requires civil servants of this quality. Rules Farabi which in his day set the 12 qualities of Arif reveal the interrelated nature of these attributes. For instance, a person may be a skill, but talent is not. There may be knowledge, but there is no lack of courage. In this sense, one of these qualities is considered as a factor that complements the other, as a spiritual means that ensures and guarantees the sustainable management of the state.

In particular, A. N. Farabi – "citizens in many ways live by imitation of their leaders, if this is true, they are right, if they are unfair, they are also unfair." The bad influence of performers occurs for two reasons: the first is the impurity of the way of life of people who do not perform tasks that can benefit their society. Another is the presence of other (negative) leaders above them [8].

For this reason, thinkers support the ancient ideas that the state should be governed by Arifs, the military should be protected, and entrepreneurs-peasants should serve prosperity. But no society or nation still adheres to this legislation. In fact, the degradation of the human world began with this. The scientists and Arifs become by nature people who think about the end, who seek rewards, who hate wealth. For this reason, the service of power is seen as a means to bring them happiness. The fact that the military and performers are engaged in the execution of power, determines the entry of categories into this formation. For instance, the military have characteristics such as revenge for glory, committing violence and cruelty. Their rise to power increases the chances of meeting such inclinations. Entrepreneurs, on the other hand, find peace of mind with the acquisition of wealth. In

the same way, they use the means of power. If the last two categories are combined, there will be no room for enlightenment in society. The reason for the deterioration of the world is that these categories occupy the same place in society. Under the guise of "democracy" that corresponds to the interests of these categories, state systems and concepts of power were created, and this process continues to this day.

Another important aspect of the Sahibkiran classification rule is that scholars served as a filter between the ruler and the social strata. Whoever appeals to the ruler or authority is bound to observe the rules (Sharia) established by the upper class. At the same time, the Sahibkiran also ensured that in practice it was necessary to issue its decrees and judicial decisions that were inherent in these values. Such a system was defended by the state decrees and the will of the ruler against unfair decisions.

Yusuf Hos Hajib also repeated thoughts of Abu Nasr Farabi: that is, the temperament, characteristics of the head of state affect everyone who stands at its foot. How the leader and management behave, citizens also coordinate their work accordingly[9]. These views are not coincidental; they mean that scientists recognize the legitimacy of society. How entrepreneurs work in society....? As it turned out, people have already passed this way. At the same time, authorities were formed to meet these needs. Only they are not based on the inheritance passed down by our ancestors.

The second category is specific to those who are considered smart, wise, and the council of members cautious, persistent, experienced, attentive work who enrich the theoretical views of management and achieve its implementation. The complexity of the issue, in fact, is that if defining a policy aimed at the development of the state is an important issue, then implementing it in practice is an even more important task. That is, with the right choice of smart, experienced, business, event categories of participation in public administration that can practically implement it, the will of the authorities in the society (people) will be provided with harmony and values will be implemented.

As a third category, he values prayers and spiritual people. As their important services, they consider spiritual reinforcement in the implementation of the action plans established in the state, as the authorities and propagandists (ideologists) who give confidence in the name of god. In the work on clarifying the decisions taken and mobilizing them for this purpose, they were considered as one of the most important sections. However, Amir Temur himself said: "seeing the abundance of troops of Tukhtamishkhon , my army fell into confusion, then Mirziyouddin Sabzavoriy, who was a blessing man , took off his turban from head, opened his hands for prayer and wished me victory from the god. There was no end to his prayer, the effect of the prayer was seen immediately, and the enemy retreated."[10] It is known that god will not help if you do not take any action by raising your hand to the sky.

In this regard, Yunus Oguz – 1391 in one of the battles with Tuxtamishkhon on the threshold of a Kunduz, at some points he started to win. Then Sayid Baraka descended from his horse to the blessing and read the verses of the Koran, taking a bunch of sand and scattering towards the enemy. Seeing this, Amir Temur quickly realized the problem and shouted that his enemies were retreating. Inspired by this, the sipoh (soldiers) without thinking, achieve a decisive blow [11]. This is the power of spiritual influence on you. Servants of the Sharia is the ideologues who made up and inspired for the fighting spirit of sipoh (soldiers).

Islam acts as the state ideology for Amir Temur in the Turon Union. Sharia law plays an important role in eliminating internal conflicts and conspiracies, ensuring peace and stability in the country, and gaining the trust of citizens. Sharia judges force people to obey the same rules and be loyal to the ruler. As a result, they seek to unite hundreds of tribes of different values and professions and mobilize their own goals. Gradually, Sharia rules are also being integrated into the army. This meant that the military actions took place within the framework of the religion of Islam.

The fourth and fifth categories were brave, ambitious, with a bone in the military, experienced amirs, warriors and soldiers who included the heads of their troops as members of the State Council. Their level in the military Affairs of the state is determined by the corresponding material incentives and careers.

Representatives of the sixth category are considered reliable, correct, reasonable people from medium layer of society. Based on their opinion and goodwill, each layer of society has created opportunities to rely on state policy and assign responsibility to them, to participate in it. That is why Amir Temur revealed state secrets to them and realized how well the policy is being carried out in affairs of the government (saltanat).

The seventh category included Ministers, Munshi and secretaries of Devon. Such positions belong to the category of people who are brave, loyal, good warriors, entrepreneurs, enterprising, enterprising, with the potential to be perceived by their upbringing and virtues – those who are distinguished by their special qualities, nature, which are given from God.

Although the social layer of doctors, healers, astrologers and engineers, Sufis, artisans, merchants, and tourists is on the same level, depending on the functions performed, it is divided into four sections that are left separate. Amir Temur sees them as the "generators of the Saltanat enterprise"[12].

Government is formed from different views, goals, interests and desires in accordance with his

nature. Therefore, as we have already noted above, in the case of the government, ignoring the word and position of each person, leads to the migration of internal secretly contradictions in the state. Depending on the validity of different views and opinions, the possibilities of sustainable management were strengthened, guaranteed their generalization in public administration, and harmonization of the will of the Chairman with the will of the ruler. The achievement of this harmony of relations served to ensure the practical application of the fairness of public administration policy.

In General, as can be seen from the "regulations", no class or category in society was out of public service. They are assigned a specific task or responsibility. Thus, citizens have been mobilized at the level of their positions and opportunities for the development of the country, its prosperity and well-being of the country. The participation of these strata in public administration regulated the professional and moral potential of society, ensuring that the material distribution in accordance with this order is at the level of everyone's capabilities. As a result, the authorities were encouraged by the arrival of strong-willed specialists, as opposed to the participation of individuals by chance.

Categorization of the society's population had led to the view that public relations were based on the principles of equality and justice, regulation of labor resources. The most important thing is that there is no profession, no skill, at the same time, without knowledge and skills, a person was deprived of the opportunity to live in the upper or middle class. Everyone was at the service and complimented with respect to a high-class person at the level of his potential. As a result, mutual national integrity was established between citizens. Social relations have strengthened morally.

However, we still do not fully understand the need to categorize strata of society in public administration, its political and social significance and the theoretical significance of the issue. According to the Russian scientist O. Zotov [13], who studied the political activities of Amir Temur, the stratification of society is not just a an organization of a social hierarchical position, but also law that brings society into balance, binds the balance of forces, and regulates it. In his opinion, “bin fa”, the two Parallels, however, share with interrelated factors. That is, theoretical ideas are intertwined with practical solutions. In the geometric center of Amir Temur’s “regulations” invisible but there is a ruler of management with full power. The rest of the categories are intertwined in a half circle form in symmetric order. For example, 1 category (scientists) corresponds to 12 category (travelers). 2 category (wise), 11 category (wise).

It is no coincidence that the scholars' into travelers, the military into the historian are parallel. This order of Amir Temur served to inform scientists about the life of the people through tourists, while historians provided the military with information about the way of life of a particular people and opened up the geographical political possibilities of the state. The third category of prayers provide solidarity with the Sufis of the 10 category as a source of spiritual support and strength.

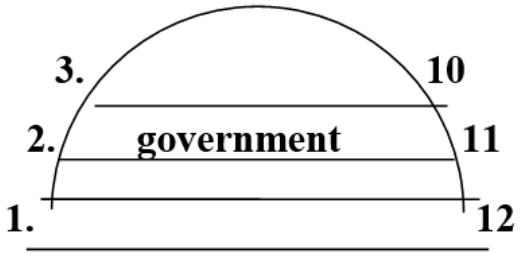

Figure 1. Parallel stratification system of society.

First category. Sayyids, Ulamas, Sheikhs and Fozils – into 12 category. Travelers, strangers**;**

Second category. Wise people and the owners of the council, cautious, resolute figures – into11 category. Profession owners;

Third category. Prayer peoples – into 10 category. Mashayixs, Sufis, Arifs;

Fourth category. Amirs, warriors, soldiers - into 9 category. Engineers, companions;

Fifth category. Warriors and soldiers –into 8 category. Doctors, healers, astrologers;

Sixth category. Reliable, unbiased smart-guards – into 7 category. Ministers, Devon secretaries and munshids.

In this way, the rest will also come in harmony with each other. If we draw this factors, we will face the philosophy of heaven and Earth:

Firstly, the intellectual potential of society is concentrated in a certain nuclear form. It does not flow in a secluded, poetic channel, management is controlled, subject to the purpose of the ruler. There is a harmony of managing the whole force. On the contrary, the stoic presence of such power leads to anarchy, social contradictions, and then to hostility.

Rulers who did not know the secrets of the same law and did not know how to use it wisely destroyed or expelled such enlightening forces. However, his "perspective" never produced positive results.

Secondly, the unification and mobilization of these forces towards the goal of establishing a sustainable rule policy, expanding the factors of growth and development are considered the most effective means of Public Administration. Just as there is a natural procedure of struggle for mutual existence in nature, and in society itself-the processes of self-renewal, purification, development, violation of its laws leads to negative consequences. In fact, humanity has always been in conflict with the fact that it abuses the law. At the same time, the cooperation of the categories that have come to gloss over each other creates conditions for the transformation of Science and education in society into a single profession, common goals. That is to say, praying was in collaboration with the Sufis, Arifs.

Thirdly, given the importance of the biological structure of the human body, the head leads to the activity of the rest of the body through the mind. If its main part is the head mentally, it disrupts the activity of the body parts. Unfortunately, in such cases we can't use the rest of the body instead of the head and the again of the mind. We cannot interfere in the Affairs of God. Amir Temur brings such dignitaries to the state administration that they become guardians of justice (power). In order for the other categories to participate in public Affairs and ensure their interests in practice, of course, it was necessary to pass the approval or approval of the highest category. In turn, Amir Temur also issued a decree on execution, confirming the fairness of his decisions. Of course, we do not claim to understand this approach as an absolute truth. However, the same compulsion ensures the balance of justice in the Kingdom. After all, what is justice for Saltanat and its evidence? Equity-this means the distribution of profits among the layers of society. Through it we come to order, regulation, discipline, stability, development, ascent, prosperity. This harmony serves to increase the ability of society to cope with healthy and social diseases as an immune system.

The "regulations" describe the managerial status of the Manager, which first sets the task of the Manager to study the managers and employees subordinate to him. Any team consists of people of different character. Accordingly, the styles and goals - the interests of the leaders in them are also colorful. According to Amir Temur, one of the important things that a Manager should know is that the Manager should classify his subordinates into categories, taking into account their goals, interests, knowledge and enterprise, business methods, requirements and needs. For instance, the leader should not go down the path of seeing one of these categories high, one after the other low, rather, each category at a certain level should be divided into jobs according to their level, they should refrain from providing jobs at a level that is higher than possible. Also, categorization should not be based on positions, but on knowledge and common sense, experience and enterprise.

We know from history that rulers who do not understand the path of truth are only those who, in the hope of saving their world, are friends with ignorance, but also those who, if there is evil. And rulers endowed with justice and enlightenment, faced with the hype of the political game, lost the Kingdom. In contrast, Amir Temur is considered one of the rulers who linked politics with the Arifs in the activities of the state and established the triumph of justice. Thus, the phenomenon of Amir Temur's personality, in contrast to the curses associated with war and occupation, penetrates into history as the creator of a great legal entity state.

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THE SIMILAR FEATURES IN DEPICTION OF ORPHANS' LIFE IN CHILDREN'S ADVENTURE NOVELS

Abstract: *American writer Mark Twain and Uzbek writer Gafur Gulom both are bright representatives of children`s literature. They successfully depicted the problems of social life through the adventures of orphan children in their great masterpieces "The adventures of Tom Sawyer" and "Shum Bola" (literally translated as "the Naughty boy"). Both heroes of these novels struggle against the cruelty and injustice of society and try to show everyone that they can achieve more than people expect from them. But they come across with several difficulties, make a number of mistakes trying to solve their problems. Because, they think with their mind of a child, an inexperienced and ignorant child. In these works there can be noticed a great deal of similarities, as Gafur Gulom wrote his work, inspired by "The adventures of Tom Sawyer" and "The adventures of Huckleberry Finn".*

Key words: *social life, orphan, street children, children's literature, adventure novels, orphanhood.*
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Introduction

Generally speaking, through the life of the cunning and desolate orphan heroes the reader gets closely acquainted with the particular period's social environment. The hardships of life are brought under satire in the "cunning novels". The writer tries to convict the social system which based on injustice. It focuses, especially, on those who are vulnerable, such as children, women, the elderly, orphans, the poor and the downtrodden. Because, hunger and poverty can make a person hypocritical and even can lead to the loss of his humanity. In children, particularly, this can trigger more severe disasters. That's why the characters of the "***villainous"*** novel usually succeed at the expense of losing their human qualities.

While talking about the novels of this type we remember about two famous works of Uzbek and American children's literature; "Shum bola" (literally translated as "the Naughty boy") by Gafur Gulom and "The adventures of Tom Sawyer" by Mark Twain. Both of these novels contain the features described above. These novels have the elements of humour, satire and social criticism hidden behind the runaway adventures of the boys (Tom and Koravoy).

I. LITERATURE REVIEW

Novels depicting ordinary life stories of cunning street children developed by the end of the 16th century in the world literature. These type of novels greatly differed from those works that illustrated the life of the knights and pastorals which were common at that period. The experience of creating fictional novels about cunning heroes in Spanish literature, initiated by Fernando de Roxas (the end of the XV century) in the

form of a dialogue, has been taken to a higher level by Francesco Gomez de Quevedo (1580-1645).

The emergence of the "cunning novels" was caused by the circumstances of the social life in the mid -16th century - the outbreak of poverty and the desire to live easy life. Because, it is natural that under such circumstances the violent try to rule over the helpless by defects like, extortion, fraud, oppression and theft. These works that deeply reflected the real conditions of life have been called "cunning novels" in literary studies. The characteristic features of these type of works can be seen in the followings:

- The protagonist runs away from home during his childhood;
- The protagonist's escape from home is caused by his family's poverty;
- The main protagonist is driven out to the street by his widow mother or aunt for his cheating and cunning deeds.
- The plot of the work consists of an interesting but painful adventure of a stray, abandoned, homeless orphan hero;
- The young hero does all he can to make a living, for this he is forced to use various tricks;
- The hero falls from one master's hand to another during his adventures;
- The important part of the plot is the motif of hero's serving in the hands of the greedy rich and ignorant priests, having severely beaten and expelled by them;
- The culmination of these works is stealing bread to survive and facing with robbers on his way;
- Though the protagonist serves on the doors of several people he never becomes full and never can afford his needs;
- The hero gains great experience by tasting the bitterness of life;
- These works are usually small in size, but satirically powerful.

II. METHODS AND METHODOLOGY

In Mark Twain's "The Adventures of Tom Sawyer "and in Gafur Gulom's "Shum Bola", travel of heroes is a necessity. Actually, it is the wish of neither the heroes of the works, nor the characters that surround them, this is the existing circumstances or accidents that force them to do so. More precisely, the reasons for undertaking such quests include the purpose of finding their place in the brutal world, to seek shelter and to provide food. And the heroes have to struggle against many obstacles in the pursuit of their dreams. While the hero of "Shum Bola" Koravoy is forced to leave home in disgrace when his mother reveals that he secretly stole oil and egg from his home, the hero of "The adventures of Tom Sawyer" Tom, who has similar event with stolen butter and bread, burns out with the desire to see the foreign countries and live as a pirate (he considers that being a pirate is good and heroic thing). But they can't go very far: all of the events which they undergo take place in their own country, around their birthplace.

III. DISCUSSION

As it is known from the sources Uzbek writer Gafur Gulom created his masterpiece in 1936. But at first he called the work with another name, later changing some episodes and description, the name was also changed. This story describes the writer's childhood and the image of Tashkent in the early 20th century. Although many of the events at the center of the work are taken from the writer's life (for example, the writer himself admitted that for the hero Hoji Bobo he simply chose an unusual features and words of his father), [13,37] the work can not be considered to be an autobiographical. In it, the artistic texture and the fantasy is stronger than the real historical facts. L.Bat said about this work the followings: *"In essence, this work, with deep national spirit, is close to Mark Twain's "The adventures of Tom Sawyer" and some of Dicken's novels*".[13,7]

In its turn, inspiration for many of the characters in Mark Twain's "The adventures of Tom Sawyer", which was written in 1876, comes from actual people. For example, he depicted his mother as Aunt Polly, his sister Pamela and brother Henry as Cousin Mary and Cousin Sid. The book also captures his school experience and his father's courtroom became the setting for the trial scene in the story. Mark Twain was famous as a great humorist, his sticking to American themes, settings and language set him apart from many other novelists of his time and these factors had a powerful effect on many later writers.

Though Mark Twain and Gafur Gulom lived in different places and at different times, the analysis shows that there are various artistic coincidences between some details of their works. In the works mentioned above the authors created realistic images of orphan children. The skills of both writers are evident in the creation of images. Tom lives with his younger brother and sister at Polly aunt's home. Koravoy also has a little brother and sister and lives with his single mother.

IV.ANALYSIS

In the beginning of the novels we can see that the heroes are young, energetic, mischievous boys, who don't feel any responsibilities before their family. Boys who prefer playing in the streets rather than studying at school. The following lines can prove that both Tom and Koravoy spend their whole time in the street playing with their peers:

Tom did play hookey, and he had a very good time. He got back home barely in season to help Jim, the small colored boy, saw next-day's wood and split the kindlings before supper — at least he was there in time to tell his adventures to Jim while Jim did three-fourths of the work.[3,5] (The adventures of Tom Sawyer)

Ertadan kechgacha ko`cha changitib hammaning joniga tegib, kampirlardan qarg`ish eshitib, o`spirinlardan kaltak yeb,sandiroqlab yuradigan o`vin-to`da bekorchi bolalarmiz. [2,6]

We are a bunch of idle children who dust the streets from morning till night, bothering everyone, hearing the curses of old women, and being beated by grown-ups. (Shum Bola - translated by the author of the article)

And the games they play are very different, with special types for morning, afternoon, evening, even they had seasonal games. The games they create were unusual and funny, and the items they used for their games were unusual even more.

By the time Ben was fagged out, Tom had traded the next chance to Billy Fisher for a kite, in good repair; and when he played out, Johnny Miller bought in for a dead rat and a string to swing it with — and so on, and so on, hour after hour. And when the middle of the afternoon came, from being a poor poverty-stricken boy in the morning, Tom was literally rolling in wealth. He had besides the things before mentioned, twelve marbles, part of a jews-harp, a piece of blue bottle-glass to look through, a spool cannon, a key that wouldn't unlock anything, a fragment of chalk, a glass stopper of a decanter, a tin soldier, a couple of tadpoles, six fire-crackers, a kitten with only one eye, a brass doorknob……[3,18]

In the second novel we can also read the lines where the hero describes unnecessary items as being their great treasure. The illustration of their diverse range of games is given like this:

Bular hammasi oqshom o`yinlari, kunduzgi o`yinlar boshqacha: har xil oshiq o`yinlari, yong`oq o`yini, to`p o`yini, o`q-kamalak otish, yalang`och poyga, ot o`g`risi va hokazo. …… Ramazon oyida o`yinimizning turlari yana ko`payib ketadi. Oqshomlari eshikma-eshik yurib Ramazon aytamiz.[2,6]

These are all evening games, daytime games are different: nut game, ball game, arrow throwing, naked race, horse thief and so on. ……. During the month of Ramadan, the variety of our games will increase again. In the evening we go door to door in the neighborhood and say Ramadan. (Shum Bola - translated by the author of the article)

The development of the events that led to heroes' departure can be taken as an example. In "The adventures of Tom Sawyer" Mark Twain choose the motif of stealing bread and butter and being exposed by his aunt as the reason for Tom's departure:

"And here was Aunty pegging away at the questions, and me a shaking all over and ready to sink down in my tracks I was that scared; and the place getting hotter and hotter, the butter beginning to melt and run down my neck and behind my ears; and pretty soon, when one of them says, „I'm for going and getting in the cabin FIRST and right NOW, and catching them when they come ", I most dropped; and a streak of butter come a-trickling down my forehead, and Aunt Sally she see it, and turns white as a sheet, and says: "For the land's sake, what is the matter with the child? He's got the brain-fever as shore as you're born, they're oozing out! " [1]

In Gafur Gulom's "Shum Bola" we can see the following situation which is very similar to the above mentioned description:

Noiloj qoldim, tuxumni qalpoqchamga solib, kiyib oldim-da,oshxonaga kirdim. Onam meni tergay boshladi. Men jimgina quloq solib, o`choqning yoniga cho`qqayib o`t qalashtirmoqqa boshladim. Men bilmagan ekanman. O`tning taftiga lippamdagi yog` erib, pochamdan oqmoqda ekan. Oyim qo`lidagi xamir yoyib o`tirgan o`qlov bilan boshimga astagina urdi. Oyim boshimga o`qlov bilan urganda qalpoq tagida bo`lgan tuxum pachaqlangan edi. Uning oqi sarig`i bilan aralashib chakkamdan sirqib, yuzimga oqmoqda edi. Oyim: "Bola bechoraning boshini yorib, qatig`ini chiqarib yubordimmi", deb esi chiqib ketgan ekan. [2,11]

*Desperately, I put the egg under my hat and went into the kitchen. My mother started scolding me. I listened quitely, slipping beside the furnace and starting to stir the fire. I was not aware that from the heat of the fire the butter had melted and leaked out of my pants. Mother slapped me on my head with the dough-roller which was in her hand. When my mother hit me the egg that was under my hat was crushed. The mixture of egg's yolk and white began flowing through my cheeks. My mother was frightened thinking that she had damaged my brain. (*Shum Bola - translated by the author of the article)

As it is proved by the examples, there can be noticed exact similarities in the style of the writers: both boys steal butter from their home, both women think that the boy's brain is flowing and in both works these motifs were the reason for the heroes' departure and the start of their adventures. The authors who worked on the field of children's literature tried to reveal the mentality of orphan images through their collision with social environment.

The use of children's perspective by writers in describing social conditions and injustice is an important factor that unites both works. In Tom Sawyer's adventures we can see that Tom was beaten and punished for his trivial mischief, like taking sugar from his aunt's house or eating jam. However, when he takes someone else's gold as his own he was respected, admired and envied by the adults. Through this Mark Twain tries to reveal the social life of Western Europe, where a person was imprisoned for stealing a piece of bread and a person who stole millions of money from ordinary people was respected by all. The protagonists are embarrased and ashamed when they steal chicken, but when they steal someone's treasure they call themselves as heroes.

Gafur Gulom uses the same style for depicting social life of his period. The rich who used to exploit

ordinary people lived in a comfort being respected by everybody and noone paid attention that they were flourishing by plundering the poor common people.

The main heroes depicted in these works are able to get out of any difficult situation, for these they can forge all sorts of lies in a single moment.

Let's remember the scene connected with the punishment of Tom when he returned from school on Friday fighting with his friends and durtying his clothes. Tom was made to whitewash the fence as punishment on Saturday. At first, he was disappointed by having to forfeit his day off. However, he soon cleverly persuades his friend to trade him small treasures for the privilege of doing his work.

But Tom's energy did not last. He began to think of the fun he had planned for this day, and his sorrows multiplied. Soon the free boys would come tripping along on all sorts of delicious expeditions, and they would make a world of fun of him for having to work — the very thought of it burnt him like fire. He got out his worldly wealth and examined it — bits of toys, marbles, and trash; enough to buy an exchange of WORK, maybe, but not half enough to buy so much as half an hour of pure freedom. So he returned his straitened means to his pocket, and gave up the idea of trying to buy the boys.[3,15]

The same case can be seen in "Shum Bola". It happened when Koravoy and his friend Omon were serving at one of their rich master. The first day Omon stayed inside the house to do the house work and Koravoy went to graze the cow. He retuned home being extremely exhausted after he had chased the stubborn cow the whole day. Considering that Omon spent his day in a comfort without any difficulty, he tries to tease his friend. At the same time, Omon had also suffered from tough works ordered by his master. So, both boys started to boast that they had a wonderful day. The next day they exchange their duties. Unfortunately, staying and doing housework turned to be not so enjoyable as Koravoy had expected. He understood that he was deceived by his friend.

The analysis of the works by Mark Twain and Gafur Gulom clearly indicate that their writing style are very similar to each other with describing people and characters, setting and events, social issues and problems.

V. CONCLUSION

Having thoroughly analyzed the two masterpieces of American and Uzbek literature we came into the following conclusion:

A. As it is evident from the examples, "The adventures of Tom Sawyer" and "Shum Bola" have a number of similar features in setting, character description, plot development and so on.

B. American novelist Mark Twain and Uzbek writer Gafur Gulom are outstanding representatives of realism, who could create a vivid picture of social life of their time by exposing the bitter truth of it in a sharp humoristic way. For their work they equally used their own experiences.

C. At the beginning of the events the authors presented the discription of streets, games and items that both heroes valued, thus demonstrating their the sincere feelings and innocent wishes.

D. Both writers used the life and adventures of orphan children as a tool for revealing the darkness of society.

E. Their work differs from other writers by simplicity, naivety and childish cheerfulness of their protagonists.

F. In both works orphanhood and poverty are portrayed as a huge obstacle for children to achieve their dreams and find their place in life.

G. The departure of the heroes from their home was caused by their failure of stealing some food. They were caught on a shameful crime.

H. During their adventures the boys come across with a variety of people, who tried to get advantage of their labour in an cruel and unfair way.

I. In their adventures these heroes accompanied by a friend who shared similar life, dreams and problems.

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QR – Issue QR – Article

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PECULIAR FEATURES OF WILLIAM BUTLER YEATS' POETRY

Abstract: *William Butler Yeats is widely considered to be one of the greatest poets of the 20th century. He was one of the modern poets, who influenced his contemporaries as well as successors. By nature he was a dreamer, a thinker, who fell under the spell of the folklore and the superstition of the Irish peasantry. He felt himself as stranger in the world of technology and rationalists. In this article sense of moral wholeness and humanity of a prominent poet is discussed. Through analysis of the poem "Sailing to Byzantium" Yeats' creative way, peculiarities of his style and interpretation of symbols, their connection with author's intellectual condition have been studied.*

Key words: *modern poetry, poetic sensibility, symbolism, mysticism, mythology, individual style, poetry analyses, interpretation of poetic images.*

Language: *English*

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Introduction

Yeats was the greatest poet in the history of Ireland and the most prominent poet to write in English during the twentieth century. His themes, images, symbols, metaphors and poetic sensibilities depict his personal and his nation's experience during one of its most troubled times. Yeats' great poetic feature was to recreate his own life, his thoughts, feelings, conclusions, dreams in his poetry. He rendered all of himself into his poetry. His elaborate style takes elements from Irish and Greek mythology, nineteenth-century occultism, English literature, European politics and Christian imagery. All these features would together depict his own experience and interpretive understanding.

Yeats is known for the contradictions in both his life and work, particularly between his romanticism and his modernism. He is considered as one of the last romantics, but he stands as a part of the modernist movement as well. His identification with Romanticism is evident in his work through elaboration of Irish myth and legend, the supernatural and pastoral themes. "The Lake Isle of Innisfree" is a poem that is connected to this period, where idealizes a small island of his youth as a place of escape.

As modernist author he adopted various schemes of rhythm, used demotic, strong language. The most important of all, symbolic techniques and abundance of political themes instead of emotional testify his attachment to modernistic trend. The poem "Sailing to Byzantium" opens modernistic features of Yeats as rebellion against tradition and celebrated self-discovery.

Yeats wanted poetry to engage the full complexity of life. He was, from first to last, a poet who tried to transform the local concerns of his own life by embodying them in the universal language of his poems. His brilliant imaginative accomplishments, strengthened by his power of rhythm and poetic phrase, have earned wide praise from readers and, especially, from fellow poets.

Main part

Yeats started his long literary career as a romantic poet and gradually evolved into a modernist poet. When he began publishing poetry in the 1880s, his poems had a lyrical, romantic style, and they focused on love, longing and loss, and Irish myths. His early writing follows the conventions of romantic verse, utilizing familiar rhyme schemes, metric patterns, and poetic structures. Although it is lighter than his later writings, his early poetry is still accomplished. Several factors contributed to his poetic evolution: his interest in mysticism and the

occult led him to explore spiritually and philosophically complex subjects.

The poetry of Yeats is permanent and enduringly popular, because it is more coherent, and more traditional than that of his other great contemporaries. His poetry deals with a variety of themes ranging from ancient legend, mythology, folklore, politics, history, love and constantly creates new myths of his own. His work is uniformly good and his creations are quite extensive and he writes with ease on themes adopted from every sphere of life. The sustained and continuous development of art and genius is the chief point in Yeats' poetry.

Yeats wanted to write realistic poems: poems as urgent and as uncluttered as a newspaper article. He even wrote a poem about his decision - "A Coat". But to see the difference between a traditional and a modernist poem from Yeats, it would be better to compare "He wishes for the cloths of heaven" with "The Second Coming". In the first poem a disappointed lover whines gracefully about how very sad he is. And in the second poem Yeats prophesies that fascism will be both an exhilaration and a disaster for Europe [1; 31].

The complexity and fullness of William Butler Yeats' life was more than matched by the complexity and fullness of his imaginative thought. There are few poets writing in English whose works are more difficult to understand or explain. The basic problems lie in the multiplicity of Yeats' own preoccupations and poetic techniques.

Yeats frustrated romantic relationship with Maud Gonne caused the starry-eyed romantic idealism of his early work. Additionally, his concern with Irish subjects evolved as he became more closely connected to nationalist political causes. As a result, Yeats shifted his focus from myth and folklore to contemporary politics, often linking the two to make potent statements that reflected political agitation and turbulence in Ireland and abroad. Finally, and most significantly, Yeats' connection with the changing face of literary culture in the early twentieth century led him to pick up some of the styles and conventions of the modernist poets.

The period of poetic activity in his case extended over fifty years, and during this long span of time he was constantly maturing and growing different from what he was at the beginning. There is no sudden change or break in continuity, but a slow evolution, and the seeds of the future are to be found in what has gone before. Moreover *The Collected Poems* where each poem lights up its predecessor and is in turn illuminated by its successor. All obscurities disappear if Yeats' poetry is read as a whole, and such reading gives an aesthetic pleasure, such as is derived from the writings of even a few of the greatest poets. [3;67] The poems for which he is famous, however even those which present difficulties of understanding are masterpieces, transformations of the raw material of his art.

Analysis

One of the famous and priceless works of W.B.Yeats is the poem "Sailing to Byzantium". This poem is written in 1927. The poem is broken into four stanzas, each containing eight lines. There is a set rhyme scheme throughout the poem of *abababcc*.[4;56] Yeats wrote the poem in iambic pentameter, and there is a rhyming couplet at the end of each stanza.

Several critics have gone so far as to say that "Sailing to Byzantium" explains itself or needs no extensive clarification. But if it were actually such a case, it would not generate greatest amount of commentaries. The general reader would firstly ask inevitable question, "Why Byzantium?" Byzantium was an ancient city later named Constantinople, which is situated where Istanbul, Turkey, now stands. During his life the author has travelled there. And the impact of that voyage could inspire him to choose that city as the ideal imaginary place of his poem.

It starts with following lines:

That's no country for old man. The young
In one another's arm, birds in the trees,
- Those dying generations- at their song,
The salmon-falls, the mackerel-crowded seas,
Fish, flesh, or fowl, commend all summer long
Whatever is begotten, born, and dies.
Caught in that sensual music all neglect
Monuments of unageing intellect

He says that young people's generation is busy with unnecessary activities like birds which are singing about only love, not nature. Dying generation indicates cruel people who want only entertainment as birds are singing about only love, do not do other exercises. He says all of these men, women, waterfalls, fish, birds and all creatures are enjoying the summer with happiness. They are singing the songs of senses and beauty and joy. All creatures are bound to born and death. They are unable to escape the cycle of life. But the idea of the poet is that they all have neglected this process, because they are with sensual joys of beauties.

An aged man is but a paltry thing,
A tattered coat upon a stick, unless
Soul clap its hands and sing, and louder sing
For every tatter in its mortal dress,
Nor is there singing school but studying
Monuments of its own magnificence;
And therefore I have sailed the seas and come
To the holy city of Byzantium

The poet starts with idea that old man is only busy with unnecessary smallest sings. But in our life business or another jobs are not important as real meaning of life. He compares the old man to *a worn out coat which is hanging on stick having no use.* Similarly, the old man has no use in this life and only

destination that awaits him is death. The only available choice for the old man is being educated. Once his soul is educated he will sing and sing louder, because he will get the whole picture and true essence of life.

It is also interesting to consider when Yeats wrote this poem: he wrote it fewer than ten years before his death, which means he was an old man. This is important since the speaker in this poem feels he is not appreciated in his homeland due to his advanced age. Perhaps Yeats was feeling alienated from his society for the same reasons.

O sages standing in God's holy fire
As in the gold mosaic of a wall,
Come from the holy fire, perne in a gyre,
And be the singing-masters of my soul.
Consume my heart away; sick with desire
And fastened to a dying animal
It knows not what it is; and gather me
Into the artifice of eternity.

Now in the third stanza poet stands before a brilliant mosaic, arguing the Byzantine sages and "God's sacred flame" to enlighten his spirit. He understands that his heart is trapped inside an animal. The poet needs to leave this world and enter the universe of timeless symbolization through his melodic poetry.

Once out of nature I shall never take
My bodily form from any natural thing,
But such a form as Grecian goldsmiths make
Of hammered gold and gold enamelling
To keep a drowsy Emperor awake;
Or set upon a golden bough to sing
To lords and ladies of Byzantium
Of what is past, or passing, or to come.

In the fourth stanza Yeats has revoked his natural body. He would take the state of the brilliant fowl, the sort of winged animal which Grecian goldsmiths are accepted to believe. His melody, when he turns into a brilliant flying creature, will be that of profound euphoria. In Byzantium, he will have no age; past, present and future are every one of the one there.

The poem's real topic is the transformative force of artist; the capacity of craftsmanship to express the unutterable and to venture outside the limits of self. Some points of the poem may be interpreted personally, for example, the speaker's yearning to leave his nation, references to himself as an old man, "a wear cover upon a stick", and showing at least a bit of kindness "debilitated with longing. The speaker feels the longing to cruise to Byzantium. He needs to change his awareness and find enchanted union with the brilliant mosaics of a medieval realm.

"Sailing to Byzantium" is a richly symbolic poem, it generates literal level as well. This poem can be considered as written in modernistic style. As here we may witness rebellion against tradition and celebrated self-discovery. This poem absolutely challenges poetic conventions and the literary traditions, and rejects the notion that poetry should simply be lyrical and beautiful.

Modernistic influences caused his poetry to become darker, edgier, and more concise. Although he never abandoned the verse forms that provided the sounds and rhythms of his earlier poetry, there is still a noticeable shift in style and tone over the course of his career.

Conclusion

In spirit and belief, Yeats remained romantic and imaginative as he lived on into the increasingly positivistic and empirical twentieth century. It was in form, not content, that he gradually allowed himself to develop in keeping with his times, although he didn't follow verse libre and never wholly relinquished his attachment to various traditional poetic modes.[3;83] In the direction of modernism, he adopted or employed at various times irregular rhythms, writing by ear, declaring his ignorance of the technicalities of conventional metrics, approximate rhymes, colloquial diction, most important of all, symbolic techniques much like those of the French movement, though not from its influence alone. His creativity, however, remained a certain romantic quality, what he called passionate, that remarkable gift for just the right turn of phrase to express emotional intensity or to describe impassioned heroic action.

Yeats wasn't just one of old conservative poets. He truly believed in the ability of old forms to modify themselves for the new challenges and possibilities of his modern world. After you read "Sailing to Byzantium," you'll see that this was a pretty huge theme in his poetry. Where Eliot and Pound broke down poetic form completely [3;87], Yeats tried to breathe new life into an aging shell.

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RECOMMENDATIONS FOR ASSESSMENT OF STRESS-STRAIN STATE OF THE METAL CYLINDRICAL SPECIMEN WHEN PERFORMING THE TENSILE TEST

Abstract: *Results of the tensile test of the metal cylindrical specimen obtained by the computer simulation are presented in the article. Intensity of stress and strain of material over the entire time of stretching the specimen is calculated. The dependencies of strain and stress from variable load and elongation of the specimen, taking into account changing the temperature of material in the zone of predicted destruction, are obtained.*

Key words: *the specimen, the tensile test, strain, stress, the time.*

Language: *English*

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Introduction

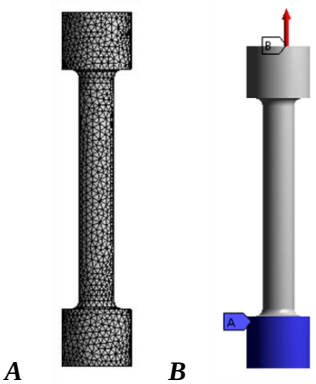
Determination of the number of the mechanical properties of metals is performed by the standard laboratory tests for tensile or compression of the specimens on the special machines [1-10]. The flat or cylindrical metal specimens are subjected to variable load until material is partially destroyed. Essence of the method is in determining elongation of the specimen under load and building the diagram of conditional stresses from the strain degree of material.

The mechanical properties of metals and alloys are obtained on the basis of the large number of the performed tests for tensile or compression of the specimens. The neck on the specimen, formed during plastic deformation, allows determining the destruction place of material. The laboratory tests of the specimens allow determining stress-strain state of materials in the general form. Volumetric deformed state of the specimen material can be represented by the computer simulation of the stretching process in the three-dimensional statement. This will allow obtaining the dependencies for calculating strain and stress, taking into account changing the temperature of the specimen material.

Materials and methods

The simulation of the stretching process of the cylindrical specimen on the testing machine was performed in the Ansys software environment. The three-dimensional solid model of the steel specimen with the following dimensions was built for implementation of the experiment: the overall length of the specimen – 62 mm, the initial diameter of the specimen – 6 mm, the distance between shoulders of the specimen – 42 mm, the diameter of the grip section – 12 mm, the length of the grip section – 10 mm, the radius of fillet – 1.5 mm. The specimen material had the following properties: density – 7850 kg/m^3, the coefficient of thermal expansion – 1.2×10^{-5}, specific heat – 434 J/(kg×K), thermal conductivity – 60.5 W/(m×K), resistivity – 1.7×10^{-7} Ohm×m, compressive yield strength – 250 MPa, tensile yield strength – 250 MPa, tensile ultimate strength – 460 MPa, the reference temperature – 22 °C, alternating stress in the range of 10…1×10^6 cycles – 3999…86.2 MPa, the strength coefficient – 920 MPa, the strength exponent – -0.106, the ductility coefficient – 0.213, the ductility exponent – -0.47, the cyclic strength coefficient – 1000 MPa, the cyclic strain hardening exponent – 0.2, the Young's modulus – 2×10^5 MPa, the Poisson's ratio – 0.3, the bulk modulus – 1.6667×10^5 MPa, the shear modulus – 76923 MPa, relative permeability – 10000.

The initial conditions for modeling the stretching process of the metal specimen are presented in the Fig. 1.



A ***B***

Figure 1 – The initial conditions for modeling: *A* – dividing the specimen model into the finite elements; *B* – setting the specimen fixation (A) and direction of load application on the specimen (B).

The solid model of the cylindrical specimen was divided into 16107 finite elements, which allowed to obtain the detailed display of stress-strain state of material. The specimen model was positioned vertically. The lower part of the specimen was rigidly fixed in the device of the testing machine (not shown). Variable load along the axial line acted on the upper part of the specimen. Changing load from the stretching time of the cylindrical specimen is presented in the table 1.

Table 1. Changing load from the stretching time.

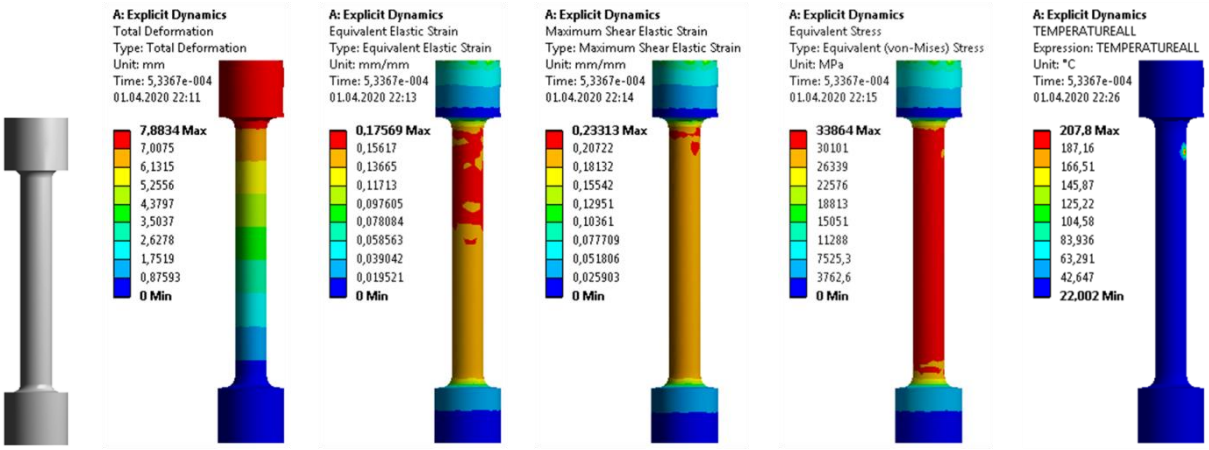
Time, s	0	5×10^{-5}	1×10^{-4}	1.5×10^{-4}	2×10^{-4}	2.5×10^{-4}	3×10^{-4}	3.5×10^{-4}	4×10^{-4}
Force, N	70000	1.4×10^5	2.1×10^5	2.8×10^5	3.5×10^5	4.2×10^5	4.9×10^5	5.6×10^5	6.3×10^5
Time, s	4.5×10^{-4}	5×10^{-4}	5.5×10^{-4}						
Force, N	7×10^5	7.7×10^5	8.4×10^5						

The maximum energy error of 0.1 was taken into account in the calculation. The shell shear correction factor was accepted 0.8333. The solver target is the AUTODYN.

Results and discussion

The specimen model was subjected to elongation under the action of variable increasing load. The degree of strain and stress of material was determined based on the calculated contours applied to the specimen model after stretching. Stress-strain state of the specimen model after stretching is presented in the Fig. 2.

Maximum deformation occurred in the volume of the grip section of the specimen. The specimen lengthened by 12.6% of the overall length. The contours of maximum shear elastic strain of the red indicate the place of probable partial destruction of the specimen material. Destruction occurred below the radius of fillet. The initial diameter of the specimen is subjected to equivalent stress along the entire length at the moment of destruction. The radii reduce stress of the specimen material by 1.5 times. Destruction of the specimen was accompanied by increasing the material temperature in the deformation zone by almost 10 times.



A ***B*** ***C*** ***D*** ***E*** ***F***

Figure 2 – Stress-strain state of the specimen model after stretching: *A* – the specimen model before stretching; *B* – total deformation of the specimen; *C* – equivalent elastic strain of the specimen; *D* – maximum shear elastic strain of the specimen; *E* – equivalent stress of the specimen; *F* – the temperature of the specimen after deformation.

Equivalent elastic strain $\bar{\varepsilon}_{el}$, maximum shear elastic strain γ_{el}, equivalent stress σ_{eq} and the temperature T of the specimen material can be expressed through the specimen elongation Δl and variable load F (kN). The calculated formulas (1-4) are valid if the ratio of the initial diameter to the distance between shoulders of the specimen is 1:7.

$$\bar{\varepsilon}_{el} = \frac{3F + 4960\Delta l + 690}{250000} \quad (1)$$

$$\gamma_{el} = \frac{F + 28050\Delta l + 4520}{1000000} \quad (2)$$

$$\sigma_{eq} = \frac{13125F - 4.2584455 \cdot 10^7 \Delta l - 8.484988 \cdot 10^6}{10000} \quad (3)$$

$$T = \frac{5442F - 424765\Delta l - 222082}{10000} \quad (4)$$

The dependencies of total deformation, equivalent stress, pressure, and strain velocity of material from the specimen stretching time are presented in the Figs. 3-6.

Total deformation and equivalent stress of the specimen material change by one function. The values of these parameters increase and decrease (for the some time ranges of the stretching process). This indicates that elastic strains occur in the specimen material when stretching. The range of minimum pressure in material has the negative values that characterize the specimen stretching, the range of maximum pressure in material has the positive values that characterize the specimen compression. So as destruction of the specimen occurs at the end of the time range of the stretching process then strain velocity of material at this moment will be the highest.

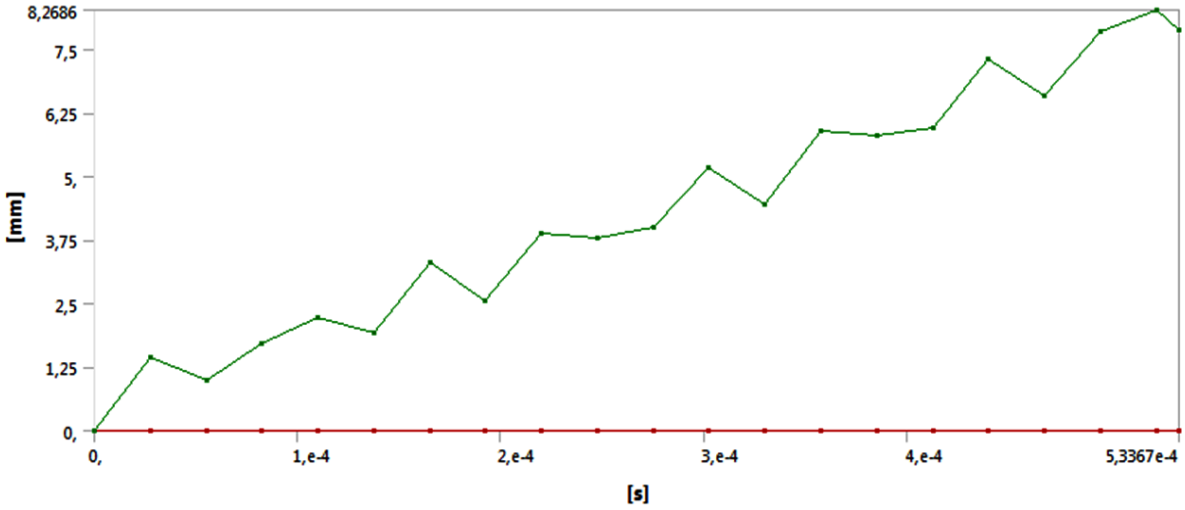


Figure 3 – The dependencies of total deformation of material from the specimen stretching time.

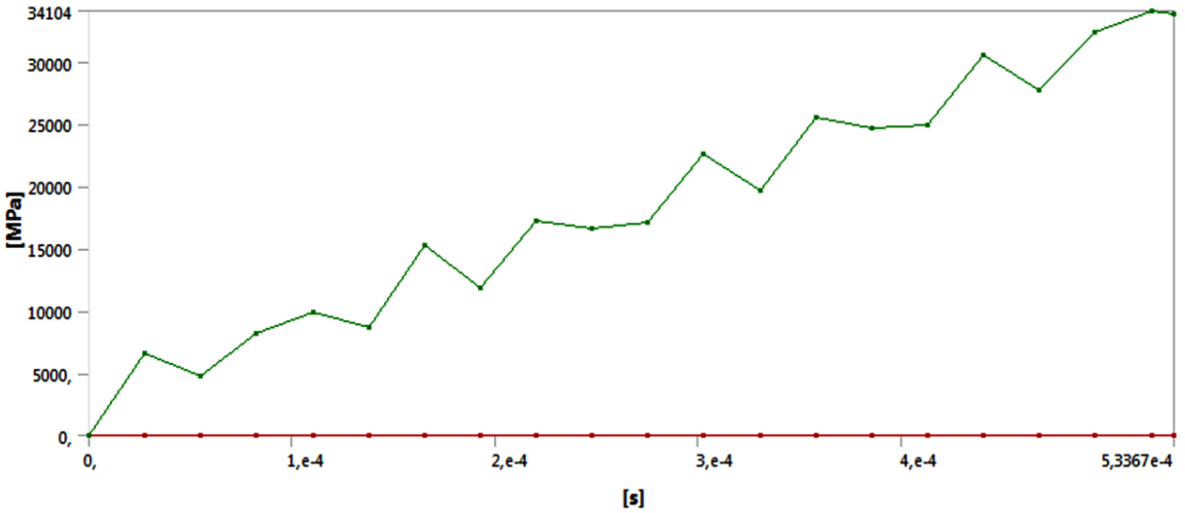


Figure 4 – The dependencies of equivalent stress of material from the specimen stretching time.

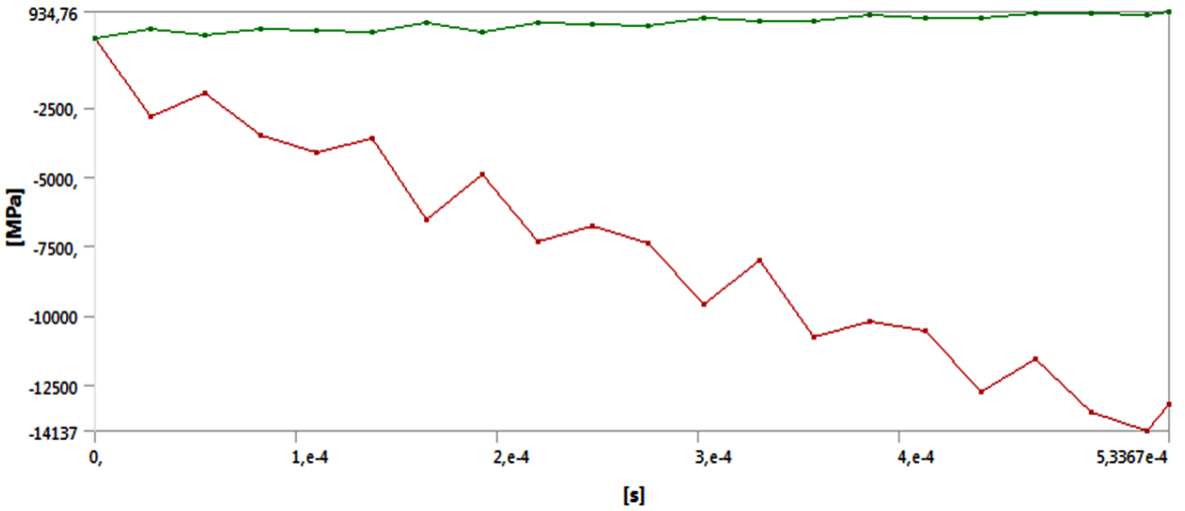


Figure 5 – The dependencies of pressure in material from the specimen stretching time.

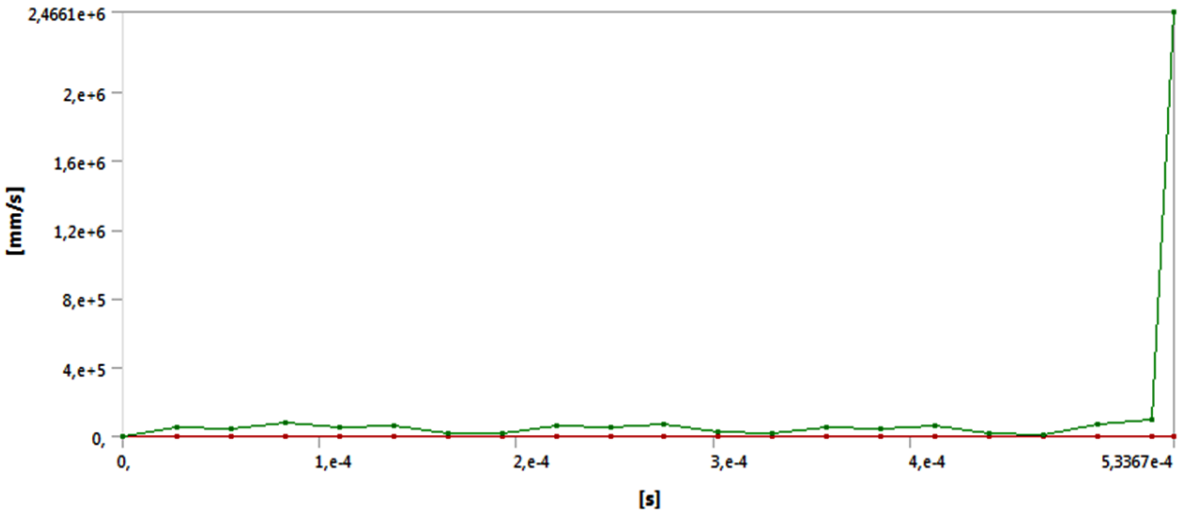


Figure 6 – The dependencies of strain velocity of material from the specimen stretching time.

Conclusion

The following recommendations were formulated based on the analysis of modeling the stretching process of the cylindrical specimen on the testing machine:

1. Maximum plastic deformation occurred in the specimen material, where variable load was applied.

2. The calculated values of equivalent elastic strain, maximum shear elastic strain, equivalent stress and the temperature of material can be obtained by substituting the known values of load and elongation of the specimen into the analytical formulas (1-4). The temperature of material increases by 10 times when maximum shear elastic strain of the specimen is 0.233 mm/mm.

3. Material is subjected to plastic and elastic strains during stretching the specimen. Elastic strains occur up to destruction of the specimen material.

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GANJA SEBZIKAR GRAVE-YARD AS THE HISTORICAL-ETHNOGRAPHIC SOURCE

Abstract: *Scientific paper deals with the research of ancient Sebzikar grave-yard as an important medieval monument of Ganja city in study of historical past of this old cultural center of Azerbaijan. Also this sacred place was investigated from the historical and ethnographic point of view based on investigation of various academic lists, literary materials, ancient sources. For the first time in this research, significance of Sebzikar monument was studied in investigation of multicultural values in Ganja city, which has an ancient and rich historical past, as well as in the formation and preservation of the traditions of a culture of tolerance. Along with the ancient tombs preserved in this unique historical and architectural complex to this day, the characteristic features of the gradually destroyed tombs were studied on the basis of various written sources, scientific works, archival documents and historical sources.*

Key words: *Azerbaijan, historical-ethnographic research, Ganja, Sebzikar cemetery, architecture, multidisciplinary research, innovative methods, urban culture.*

Language: *English*

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Introduction

Sebzikar cemetery, located in the ancient quarter Sebzevad, is a historical and architectural complex of local importance. Grave-yard has preserved many material and cultural samples, historical sources - tombstones, epitaphs, ancient tombstones - epigraphic sources. This important monument has a rich history of more than five centuries. There are more than one hundred tombs and graves in Sebzikar grave-yard. Among these monuments, tombs and graves of the descendants of the city's outstanding clans have the main importance. Significance of Sebzikar monument as an important example of pan-Islamic spiritual and material culture, an open-air museum, its importance as a material source in the study of tolerance traditions in Ganja, as well as in the development of architectural and local craft traditions, which are the important indicators of urban culture, were also investigated in scientific article based on academic sources [3, 110-117; 4, 120].

This ancient monument is one the basic symbols of Ganja city. Initially, Ganja was located on the left bank of the Ganjachay (fortress - Gala Yeri) in the territory near the village of Gedemish, located 5 km from the village of Zurnabad. From the historical sources it is known that in VI BC of the Akhamenides II Cyrus was defeated near the fortress of Ganja by the brave woman-commander Tomris. Ancient Ganja from the VI century BC to the V century AD was located in the specified territory. As a result of the earthquake in 427 and the Sassanid wars with the Huns, the ancient Ganja was destroyed. The second time the city changed its location 8-9 miles from the place called Gizil Gaya (Golden Rock), that is, 10-11 km to the north of the present Ganja. In the VII century, Arab troops invaded the territory of our homeland. During this period, the city was again

destroyed by the Arab conquerors. Then, for the third time, Ganja was inhabited in the territory of "Sheherburnu", located on the left bank of the Kur River. Natural disaster in 1139 for the fourth time destroyed Ganja. As noted in his works, an outstanding scientist, Orientalist, academician E. Bertels, as a result of the earthquake in Ganja, more than 300 thousand people died. This fact confirms that Ganja in the XII century was a magnificent city on the cultural heritage and in terms of population, also larger than such large cities as London, Paris, etc. After this disaster, the city settled in the present sanctuary of Imamzadeh, that is, Shikh Plain [1, 16-21; 24].

Finally, for the fifth time the city of Ganja during the Safavid-Ottoman wars in the late XVI - early XVII centuries were moved to the territory of the present Ganja. Here in 1588 the Ottoman commander Farhad Pasha built a fortress that has survived to our days. It should be noted that after the resettlement of the city by Shah Abbas I, by his order, Ganja was completely landscapedby the project of the outstanding scientist, architect Sheikh Bakhaaddin Mohammed Amuli, unique pearl of Ganja architecture like Juma mosque, Chekek-hamam (Ancient bathhouse), Karavansaray etc.

The ancient center of tolerance and multiculturalism, Ganja is the second city of the East, where to this day hundreds of Muslim, Christian, Lutheran and pre-Islamic tombs, tombstones, mausoleums in the ancient sanctuary "Imamzadeh" and the cemetery "Sebzikar" are preserved. One of the main historical monuments of Ganja - Imamzadeh tomb-complex attracts the attention of a number of features from the point of multiculturalism view. Ganja Imamzadeh is an important pilgrimage shrine. This place is visited by thousands of people every year. It should be noted that the number of visitors is increasing every year as well as foreign countries.

The above facts prove that, since ancient times Ganja was famous for its high development of trade, crafts, was considered one of the main centers of science, education, culture and was noted for its intellectual potential. Starting from the VII-VIII centuries there were such prominent scientific and educational centers as Ganja's Houses, "Centers of Healing" in Ganja, in addition there were quite a few madrasah schools in mosques. It was in such centers of science that numerous teacher-pedagogues, outstanding figures of science of their time, were taught.

Thanks to such personalities, the geniuses of all times lived and created geniuses of all times-the great philosopher of Oriental poetry Nizami Ganjavi, the first woman philosopher, the poetess Mehseti Ganjavi, the first women representatives of medieval poetry of the East-the poetess Siti Ganjavi, Raziya Ganjavi, Dokhtari Ganjavi, the head of the Council of Arran poets XII century Abul Ula Ganjavi, the outstanding poet of the XIX century Mirza Shafi Vazeh, whose verses were written by world famous composers of the world - Strauss, Tchaikovsky, Bach. Also in the city there were many libraries, the most famous of which was the "Dar El Kutub", which existed already in the X-XI centuries. It is important to note that even today in the city there is a centralized library system, a children's central library, the only branch of the Miniature Museum in the region [15, 11-14].

Materials and Methods

As a natural result of the historical process of the development of urban culture in Ganja in the early Middle Ages, along with Muslim burial rituals, a new type of tombs and especially tombstones gradually spread. These gravestones can be classified as follows:

- tombs of the sarcophagus type;
- gravestones;
- tombstones.

One of the important features of both the sarcophagus and tombstones and tombstones, along with their structure, was the epitaph in the Arabic alphabet, as well as the carving and embossing of floral and geometric patterns. Graves and tombstones, which are distinguished by their originality, especially by their bulge (or, more precisely, by their reliefs, reliefs and patterned elements) and are considered new for the first medieval period under consideration, are very important in the study of urban culture in Islam. Despite the widespread use in the geographical region, religious and national values that have developed on the basis of centuries-old traditions in the territory of Azerbaijan, especially in the city of Ganja, which has always maintained its position as a cultural center, have not passed over funeral customs. As a result, our centuries-old craft and architectural traditions have enriched Muslim funeral customs and rituals from the medieval period, creating the conditions for the erection of tombstones, provided that the new functions relate to ancient traditions [13, 45-51; 22, 344].

Ganja is one of the oldest corners of our country's culture. Azerbaijan is located between Europe and Asia and has a favorable natural-geographic economy, mild climate, fertile soil, rich mineral resources. This territory is actually famous as the first shelter of human civilization. Two million years ago there were every condition for the habitation, life, creation, development and advancement of primitive people. The ancient city of Ganja is one of the first centers of urban civilization (urbanization) is not only the Muslim East and the world [1, s. 42, 51-58].

Ganja has a history of at least 4000 years of the Muslim Orient and here are old monuments, tomb of Aposlels, a valuable sanctuary. Sebizkar tomb is considered to be the most important symbol of the

city. Important historical source of the yearbook was revealed from this monument.

On the territory of the ancient, historical and architectural complex of modern times to save more than 100 ancient and unique tombstones. These tombstones are mausoleums Serdabe (local sarcophagi). Ganja Sebizkar tomb was for centuries the sanctuary of the Muslims, who had come not only from Azerbaijan, but also from other countries.

Here you can follow the development of the craft and architecture based on the study of the grave. The architectural monuments of this ancient city preserve the traditions of multiculturalism and tolerant values. This cemetery is included in the list of protected cultural and historical monuments in the country. The decorative art applied mainly relates to everyday life. The field is divided into two parts in terms of raw materials: metal, ceramics, textiles and wood and technology: carving, casting, embossing and weaving [3, 119-124, 189-192; 15, 12-16].

Working in applied arts reflects the perspective of society, daily life, customs, traditions and aesthetic vision. The various areas of applied decorative art in Ganja include ceramics, copper work, carpet knotting, jewel weaving, carving and stonework [2, 11; 3, 42; 5 ,45].

Ganja is one of the few cities in which residential areas such as "Jewish Street", "Lezgy Quarter", "Lagich (Lahydzh)" district etc. existed, in which representatives of other nations lived in peace and tranquility [12, 11-14].

Our country, in which our largest lider Heydar Aliyev founded the State Policy Priority, has deepest multicultural tribe, tolerance traditions and preservation of various religious, cultural and historical monuments. President of the Sovereigns of Azerbaijan Republic Ilham Aliyev, the successor of big eyelids, successfully continues smart, national politics.

Azerbaijan is one of the rare countries in the world where multiculturalism and intercultural dialogue are one of the priorities of state policy, and Azerbaijani President Ilham Aliyev is one of rare heads of state who contribute to the development of dialogue and cooperation between different cultures and campaign more intensively for this process.

Multidisciplinary significance of research

Ganja is one of the most ancient cultural centers of our country. Azerbaijan is located on the border of Europe and Asia and has good natural geographical conditions – a mild climate, fertile lands, natural underground and over ground resources.

This land is recognized to be one of the most ancient centers of civilizations. Two million years ago there were necessary conditions on these lands for the primitive man's living, creation, evolution and progress.

The ancient city – Ganja is one of the first centers of urban civilization (urbanization) not only of the Muslim East, but whole of the World.

This ancient cultural and scientific center – Ganja city has more than 4000 years old and here there is one of the main and ancient historical-architectural monuments of Muslim East civilization –Sebzikar. **S**ebzikar grave-yard is recognized as one of the basic symbols of city.

At this monument were found some important historical sources – epitaphes. **S**ebzikar was completely built in the end of XVII century – the beginning of XIX century.

This main historic-cultural complex has more than 500 years old. But in XVII-XVIII centuries there were built a mosque, some temples and other constructions. On the territory of the ancient historical and architectural complex of modern times to store more than 100 ancient and unique tombstones. These tombstones are mausoleums Serdabe (local sarcophags) [1, 23-29; 3, 7-11].

During the centuries many visitors, guests from different parts of Azerbaijan, also from the other Muslim countries visit Ganja **S**ebzikar monument (grave-yard).

This monument is one the main samples of multiculturalism and tolerance. The modern functioning of multicultural categories is directed towards socially adapted multicultural landmarks. The concept of multiculturalism is based on an important methodological paradigm in Azerbaijani science, according to which the binary concept of multiculturalism is primary. Thus, the ideas of multiculturalism in Azerbaijan appeal to the ethnogenetic ability of the people to integrate cultural ethnocodes, on the one hand, and to preserve their national identity, on the other hand. We emphasize that the internal consistency of the multicultural model has significant potential.

Modern society of Azerbaijan is a society of open dialogue with representatives of other nations and religions, for multiculturalism in Azerbaijan is both a state policy and a way of life. Thus, a close relationship is born between society and the priorities of socio-political development. In the light of the foregoing, we emphasize that multiculturalism in Azerbaijan has deep historical roots and is closely connected with the mentality. The tolerance of the Azerbaijani people was formed over a long historical time [3, 18-19; 11, 56-59, 78-82].

At different stages of the history of the capital city of Ganja status while maintaining the traditions of the ancient statehood and independence was of great importance. The city is in the province of the Caliphate of the seventh century, the X century and Shaddadis capital of Arran, in the eleventh century Seljuk, was the twelfth and thirteenth centuries' residence in Atabaylar state. The famous Ganja Gate manufactured by renowned local blacksmith

Osmanoghlu Ibrahim in 1063 and taken away by invaders in the aftermath of the earthquake in 1139, was thoroughly restored to its original view by the Heydar Aliyev Foundation in 2008.

Adorned by the national ornaments, the Gate was re-installed at the city's entrance. The city reached prosperity in the XII-XIII centuries as it became the second capital of the Atabay state and one of the outposts of Persian civilization. An exclusive fabric called "Ganja silk" was manufactured here. It was highly valued in the neighboring countries and in the Middle East.

In spite of numerous destructions suffered through the history, Ganja remains a beautiful city with many ancient sites. Among them are the Big and Small Bridges (XII century), the Palace of Darus Sultan (XII century), towers, the Friday Mosque, the madrasah, hamams and caravanserais, as well as Imamzadeh complex (XVI century) – a picturesque building with blue domes, constructed as a Mausoleum of Imam Bagir ibn Ibrahim.

The historical and architectural complex, built in the XVII century by the famous scientist and architect Sheikh Bahaaddin (Sheikh Muhammad Bahaaddin Amuli), is also worth mentioning. It includes Juma Mosque (called Shah Abbas Mosque), Chekak-Hamam (medieval bath) and a caravanserai [3, 18-19; 6, 27; 11, 78-82, 115-121].

Conclusion

Sebzikar grave-yard as one of the historical symbol of Ganja city, also sample of the ancient material-cultural source in research of tolerance culture in our country has a great importance. The historical heritage, rich past of this city has similar features with Sebzikar monuments. Because in the territory of this ancient grave-yard have been preserved so many samples, monuments of multicultural heritage, urban culture characteristics of Ganja city for centuries.

Summarize some of the systemic components of multiculturalism:

1. State policy as the basis of multicultural processes in Azerbaijan;
2. Multiculturalism as a synthesis of national and universal;
3. Multiculturalism is a product of a democratic society;
4. Multicultural significant openness to the world community;
5. Multiculturalism determines the willingness to engage in dialogue within the framework of public policy;
6. Multiculturalism defines new processes of Azerbaijan's integration into the modern world;
7. Parity of civil rights;
8. Ensuring the security of a democratic state.

The importance of multiculturalism in Azerbaijani society is high.

Multiculturalism creates the prerequisites for successful intercultural dialogue in modern Azerbaijan, allow you to rely on the positive trends of intercultural dialogue. Moreover, it is the guarantor of the unity and cohesion of society, for it ensures the equal rights of all citizens of Azerbaijan regardless of religious and ethnicity [4, 120; 7, 377].

Thanks to the scientific study of centuries-old tombs of the Sebzikar Ganja cemetery, you can study in more detail the multicultural values and traditions of tolerance in this ancient city based on new material, cultural, scientific sources.

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THE USE OF IRONY IN LITERATURE

Abstract*: ironically, on the surface, it means something words and phrases that, when thought about more deeply, make the reader laugh the alarm has an internal meaning.*

Key words*: irony, satire, humor, comedy, phrases, internal meaning.*

Language*: English*

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Introduction

Irony in Mark Twain's Novel Pudd'nhead Wilson "David Wilson, the title character of Pudd'nhead Wilson, is a master of irony. In fact, his use of irony permanently marks him. When he first arrives in Dawson's Landing in 1830, he makes an ironic remark that the villagers cannot understand. Distracted by the annoying yelping of an unseen dog, he says, 'I wished I owned half of that dog.' When asked why, he replies, 'Because I would kill my half.' He does not really want to own half the dog, and he probably does not really want to kill it; he merely wants to silence it and knows killing half the dog would kill the whole animal and achieve the desired effect. His remark is a simple example of irony, and the failure of the villagers to understand it causes them immediately to brand Wilson a fool and nickname him 'pudd'nhead.' The very title of the novel is, therefore, based on irony, and that irony is compounded by the fact that Wilson is anything but a fool." — R. Kent Rasmussen, Bloom's How to Write About Mark Twain. Infobase, 2008

II.Literature review

Irony in Shakespeare's Play Julius Caesar "A classic example of irony is Mark Antony's speech in Shakespeare's Julius Caesar. Although Antony declares, 'I come to bury Caesar, not to praise him,' and declares that the assassins are 'honorable men,' he means just the opposite." — Bryan Garner, Garner's Modern American Usage. Oxford University Press, 2009

Uses and Characteristics of Irony. "Irony may be used as a rhetorical device to enforce one's meaning. It may be used . . . as a satiric device to attack a point of view or to expose folly, hypocrisy, or vanity. It may be used as a heuristic device to lead one's readers to see that things are not so simple or certain as they seem, or perhaps not so complex or doubtful as they seem. It is probable that most irony is rhetorical, satirical, or heuristic. ...

III.Analysis

"In the first place irony is a double-layered or two-story phenomenon. ... In the second place, there is always some kind of opposition that may take the form of contradiction, incongruity, or incompatibility. ... In the third place, there is in irony an element of

'innocence'."— D.C. Muecke, The Compass of Irony. Methuen, 1969

An Age of Irony. "It is sometimes said that we live in an age of irony. Irony in this sense may be found, for example, all throughout The Daily Show with Jon Stewart. Suppose you hear a political candidate give a terribly long speech, one that rambles on and on without end. Afterward, you might turn to a friend sitting next to you, roll your eyes, and say, 'Well, that was short and to the point, wasn't it?' You are being ironic. You are counting on your friend to turn the literal meaning of your expression, to read it as exactly the opposite of what your words actually mean. ..."

"When irony works, it helps to cement social bonds and mutual understanding because the speaker and hearer of irony both know to turn the utterance, and they know that the other one knows they will turn the utterance. ..."

"Irony is a kind of winking at each other, as we all understand the game of meaning reversal that is being played." — Barry Brummett, Techniques of Close Reading. Sage, 2010

Irony as Mass Therapy. "Irony has always been a primary tool the under-powered use to tear at the over-powered in our culture. But now irony has become the bait that media corporations use to appeal to educated consumers. ... It's almost an ultimate irony that those who say they don't like TV will sit and watch TV as long as the hosts of their favorite shows act like they don't like TV, either. Somewhere in this swirl of droll poses and pseudo-insights, irony itself becomes a kind of mass therapy for a politically confused culture. It offers a comfortable space where complicity doesn't feel like complicity. It makes you feel like you are counter-cultural while never requiring you to leave the mainstream culture it has so much fun teasing. We are happy enough with this therapy that we feel no need to enact social change." — Dan French, review of The Daily Show, 2001.

IV.Discussion

Alanis Morissette's "Ironic", "Alanis Morissette's 'Ironic,' in which situations purporting to be ironic are merely sad, random, or annoying (a traffic jam when you're late, a no-smoking sign on your cigarette break) perpetuates widespread misuse of the word and outrages irony prescriptivists. It is, of course, ironic that 'Ironic' is an unironic song about irony. Bonus irony: 'Ironic' is widely cited as an example of how Americans don't get irony, despite the fact that Alanis Morissette is Canadian." — Jon Winokur, The Big Book of Irony. St. Martin's, 2007

"Direct expression, with no tricks, gimmickry, or irony, has come to be interpreted ironically because the default interpretive apparatus says, 'He can't really mean THAT!' When a culture becomes ironic about itself en masse, simple statements of brutal fact, simple judgments of hate or dislike become humorous because they unveil the absurdity, 'friendliness,' and caution of normal public expression. It's funny because it's true. Honestly. We're all upside down now." — R. Jay Magill, Jr., Chic Ironic Bitterness. University of Michigan Press, 2007.

Alan Bennett on Irony. "We're conceived in irony. We float in it from the womb. It's the amniotic fluid. It's the silver sea. It's the waters at their priest-like task, washing away guilt and purpose and responsibility. Joking but not joking. Caring but not caring. Serious but not serious." — Hilary in The Old Country by Alan Bennett, 1977

"Mobsters are reputedly huge fans of The Godfather. They don't see it as a tale of individual moral corruption. They see it as a nostalgia trip to better days for the mob."— Jonah Goldberg, "The Irony of Irony." National Review, April 28, 1999

"Irony deficiency is directly proportional to the strength of the political commitment or religious fervor. True believers of all persuasions are irony deficient. ..."

"Brutal dictators are irony deficient—take Hitler, Stalin, Kim Jong-il, and Saddam Hussein, a world-class vulgarian whose art collection consisted of kitsch paintings displayed unironically." —Jon Winokur, The Big Book of Irony. Macmillan, 2007

"Here is something ironic: We live at a time when our diets are richer in irony than ever before in human history, yet millions of us suffer from that silent crippler, irony deficiency ... not so much a deficiency in irony itself, but an inability to utilize the abundance of irony all around us." —Swami Beyondananda, Duck Soup for the Soul. Hysteria, 1999

"Will people who detect a lack of irony in other cultures never stop to consider that this may be a sign of their own irony deficiency? Maybe it's defensible when the apes detect a lack of irony in Charlton Heston in Planet of the Apes, but not when, say, Brits detect it in, say, Americans as a race . ... The point of irony, after all, is to say things behind people's backs to their faces. If you look around the poker table and can't tell who the pigeon is, it's you." — Roy Blount, Jr., "How to Talk Southern." The New York Times, Nov. 21, 2004

The Lighter Side of Irony. Rachel Berry: Mr. Schuester, do you have any idea how ridiculous it is to give the lead solo in "Sit Down, You're Rocking the Boat" to a boy in a wheelchair?

Artie Abrams: I think Mr. Schue is using irony to enhance the performance.

Rachel Berry: There's nothing ironic about show choir!— Pilot episode of Glee, 2009

V.Conclusion

Woman: I started riding these trains in the '40s. Those days a man would give up his seat for a woman. Now we're liberated and we have to stand.

Elaine: It's ironic.

Woman: What's ironic?

Elaine: This, that we've come all this way, we have made all this progress, but you know we've lost the little things, the niceties.

Woman: No, I mean what does ironic mean?

Elaine: Oh.

— "The Subway," Seinfeld, Jan. 8 1992

"I'm aware of the irony of appearing on TV in order to decry it." — Sideshow Bob, The Simpsons

"Math was my worst subject because I could never persuade the teacher that my answers were meant ironically."— Calvin Trillin

Lyn Cassady: It's okay, you can "attack" me.

Bob Wilton: What's with the quotation fingers? It's like saying I'm only capable of ironic attacking or something.— The Men Who Stare at Goats, 200

Irony is the use of words to convey the opposite of their literal meaning. Similarly, irony may be a statement or situation where the meaning is contradicted by the appearance or presentation of the idea.

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QR – Issue QR – Article

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CLUSTER TOOLS FOR ORGANIZING PILGRIMAGE TOURISM AT THE MESO LEVEL

Abstract: *The article discusses the main cluster tools for organizing pilgrimage tourism and identifies ways of their practical application at the meso (regional) level.*

Key words: *Pilgrimage tourism, pilgrimage cluster, territorial concentration, vertical integration, horizontal cooperation, chain of added value, competitive benchmarking, destination marketing.*

Language: *English*

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Introduction

Uzbekistan is an attractive destination for both domestic and international pilgrimage tourism. There are over 8,200 objects of cultural heritage, of which, unfortunately, only 500 objects are included in tourist routes. In the Address of the President of the Republic of Uzbekistan Shavkat Mirziyoyev Oliy Majlis in 2020, paying particular attention to the accelerated development of pilgrimage tourism, the Government of Uzbekistan was tasked with developing measures to bring the number of objects included in the pilgrimage and traditional tourism routes to 800 [11]. For the accelerated development of pilgrimage tourism in the country, innovative approaches to its effective organization are required, among which, in our opinion, a cluster approach can be attributed.

Pilgrimage is the desire of believers to bow to holy places. Pilgrimage tourism refers to the totality of trips of believers for pilgrimage purposes. Pilgrimage clusters are varieties of tourist clusters associated with structural units designed to serve pilgrims by providing them with tourist and pilgrimage services. Studying the various models for the formation of regional pilgrimage-tourist clusters has allowed us to identify key tools for their formation at the meso level. These tools, in our opinion, include the following:

1. Territorial concentration.
2. Vertical integration.
3. Horizontal cooperation.
4. Value chain.
5. Competitive benchmarking.
6. Destination marketing.

Below, we will consider in more detail the contents of each of these cluster tools and formulate recommendations for their practical application in the field of pilgrimage tourism at the regional level.

Territorial concentration

One of the important signs of cluster formation is the territorial proximity of the economic entities that make up the cluster. This aspect of the cluster was first noticed by Harvard University professor Michael Porter, who describes the cluster as “geographical concentration in a certain area of interconnected companies and institutions”[12]. The specificity of the cluster lies precisely in the direct dependence of the success of joint activities of related enterprises and institutions on their geographical proximity. The fact is that the tourist cluster is essentially “a production system localized by territorial and sectoral characteristics, including companies of related activities that unite around a food hub, form portfolios of goods, services and work related to each other by consumer value» [18, 6 c].

A condition for the creation of a regional tourist cluster is the presence of tourist and infrastructure

facilities on the territory. The tourism cluster is characterized by the degree of concentration of interconnected enterprises and organizations that provide tourism services within one limited territory. The territorial proximity of the pilgrimage-tourist cluster is associated with holy places. As a pilgrim first based on the purpose of travel forms his own "pilgrimage destination", and then makes a direct trip to the place of pilgrimage. N.V. Rubtsova rightly points out that “changes in the boundaries and role of tourist destinations determine the geographical concentration of the tourist cluster” [13, 64 b]. Pilgrimage destination, in our opinion, is that fundamental basis on the basis of which the cluster core will be formed.

The implementation of the cluster tool “Territorial Concentration” into the practice of cluster formation requires the transformation of a holy place, first into an average quality state - into an interesting shrine, then turning it into a better state - an attractive pilgrimage destination, and then on their basis the opportunity will be created to form a competitive pilgrim cluster. Moreover, by pilgrimage destination we mean "a pilgrimage-tourist region where the purpose of travel is realized."

A characteristic feature of the category “pilgrimage destination” is its components. If the holy places of interest characterize only pilgrimage and tourist offers, i.e. attractive holy places from the perspective of potential travelers, attractive pilgrim destinations include both its geographical and marketing components. The geographical component of the destination appears in the form of interesting holy places. As for its marketing component, it appears in the form of a pilgrimage goal. Thus, the pilgrimage destination as a fundamental component of the cluster expresses the degree of organic connection of the pilgrimage demand for destinations with the pilgrimage offer of a certain region. The transformation of holy places into pilgrimage clusters requires the adoption of comprehensive measures related to the improvement and overhaul of the most holy sites, creating the necessary conditions for performing religious rituals in holy places, the development of general and tourist infrastructure.

Vertical integration

The cluster organization of pilgrim tourism requires the creation of the technological chain of a complex of pilgrim tourism services. This requires a merger into a single all participants in the service delivery process. Such cluster merger is carried out in the framework of vertical integration. Vertical integration is an economic, financial and organizational merger of previously independent business entities involved in various technological stages of the production process in the production, distribution and marketing of products in order to obtain additional competitive advantages in the market [7]. With this integration, the pilgrimage cluster begins to control all the links in the chain of services. She no longer buys services from suppliers, but turns the supplier into an integral part of the company. As a result of such integration, a reduction in the cost of services occurs due to a reduction in transaction costs and acceleration of the entire process of providing services.

Transaction" from the Latin word "Transactio" - means "interaction". Transaction costs are costs that are not related to the creation of services directly (creating a travel package, salary, meals, transportation, etc.), but with the attendant services, indirect costs of collecting and searching for all the information necessary for the activity, making various transactions, contracts, contracts, etc. [17]. Such types of transaction costs are distinguished as - information search costs (about prices, suppliers, customers, intermediaries, competitors); the costs of concluding a business contract (negotiating and making decisions, monitoring the progress of contract execution); measurement costs (measurement costs associated with the purchase of measuring equipment); costs of specification and protection of property rights; costs of opportunistic behavior (i.e., costs associated with dishonesty and deceit, hiding information that economic agents may encounter in their activities several types of transaction costs) [14].

It should be noted that in the process of creating a pilgrimage cluster, attention should be paid to the selection of an adequate form of formation of such integration of its units. Two types of vertical integration are distinguished [5]:

1) “backward integration” (reverse) - the company gains or strengthens control over suppliers, which helps to reduce the dependence of its business on price fluctuations for components and other requests from suppliers, to lower their prices and improve the quality of raw materials.

2) “integration forward” (direct) - integration with the subsequent stages of the value chain (by consumers of manufactured products). The company joins the organization that performs marketing functions (transportation, logistics, service, actually selling).

The main advantages of vertical integration within the framework of cluster formation are the following: cluster formation should not rely on suppliers; cluster formation enjoy vertical integration when its suppliers have great market power and can dictate conditions; vertical integration gives the cluster formation economies of scale and then the size of the business reduces costs; cluster formation with vertical integration can reduce costs and prices of services [19].

The economic entities that make up the cluster do not function in isolation, independently of each other, but need constant interconnections and interaction, i.e., the process of cooperation is characteristic of cluster formation. Collaboration

contributes to the division of labor in the cluster and specialization, thereby increasing productivity and resource return [16, 133 c.].

A feature of cluster formation, unlike firms, companies, concerns, is the predominance of small and medium-sized enterprises, which are the main participants in cooperative associations. Within the framework of pilgrimage clusters, it is possible to organize consumer, agricultural, transport cooperatives. As a result of the organization of the cluster's activities in the form of various cooperatives, opportunities are created "to optimize the activities of its participants and strengthen market positions both through competition and through cooperation (saving on costs common to all cluster members) [22, 68 c.].

Cooperatives within the cluster have their own characteristics. According to N.G. Volodin, the cooperative differs from another organization and sole proprietorship in the ownership structure and control system. Its differences with a company owned by investors are the result of different goals: the first one provides the best services to its owners, and the second one brings them a high return on investment. In contrast to the sole farm, the cooperative has many members, and they all have equal rights [20, 10 c.].

The basis of the cooperative relationships of business partners within the cluster is horizontal integration. Horizontal integration is one of the varieties of the combination of enterprises within one industry or several sub-industries. Such integration occurs when one company takes control or takes over another company located in the same service sector and at the same level of service as the absorbing company. This type of integration of firms located at the same stages of production, on one link of the trading chain, working and competing in the same market segment, in the same industry and specializing in the production of similar or similar products or the provision of similar or similar services [6].

The positive effects of horizontal integration include: a decrease in the number of manufacturers; obtaining a synergistic effect; decrease in the impact on the market of suppliers and consumers; obtaining competitive advantages; risk reduction from competitive confrontation in order to protect its production process and ensure the stability of its position [15].

Value chain

Within the cluster, the role of value added is increasing as a factor in its competitiveness. The more value added is created in the process of creating and rendering pilgrimage services in the cluster units, the higher the competitive advantage and the degree of effectiveness of the tourist cluster. By value added is understood the increment of the cost of a product or service created by an economic entity to the cost of goods used in the production or provision of services material resources [3, 72 c.]. Value added is equal to the "difference between the value of goods and services produced that were used in the production process (i.e. intermediate consumption). As an economic indicator, value added includes the sum of the costs of wages and interest on capital, rent and profit [4].

The value chain, as Michael Porter notes, allows you to see what makes up value; it consists of activities to create value (internal and external logistics, production process, marketing and retail; service) and profit or margins [9, 871 p.]. The value chain within the cluster reflects the economic cooperation between the main and additional organizations providing tourism services and the economic benefits of this cooperation. The fact is that entities providing pilgrimage services, united in one geographical region, are associated with the value chain.

In the pilgrim-tourist cluster, the value chain system consists of four types of chains: 1) the value chain of suppliers (transport and communication companies); 2) the chain of accommodation and entertainment; 3) a chain of channels for the sale of tourist products (tour operators, travel agents); 4) a chain of tourists themselves [1, 53 p.].

Competitive benchmarking

The cluster, unlike firms, companies, corporations, and other forms of management, has a favorable opportunity for internal competition between high-ranking units. The synergistic effect of clustering is due to pre-competitive consolidation [8, 98 p.]. Inside the cluster competition is designed to provide a cluster tool - "Competitive Benchmarking". Benchmarking (from the English. "Bench" - "level", "mark" - "mark") is the study of other companies in order to obtain knowledge and information from them to improve their business. Benchmarking is the process of finding and learning the best of the known methods of managing and conducting business.

Benchmarking is the art of finding or identifying what others do best, followed by the study, improvement, and application of other people's working methods. The most common types of benchmarking include: internal, functional, global, general and associative benchmarking, competitive benchmarking; process benchmarking [21].

The competitive benchmarking process consists of the following eight stages of sequential actions [2]:

Stage 1. Identification of functions and business processes in need of improvement.

Stage 2. Definition of the analyzed indicators. Stage 3. Identification of the best economic entities inside and outside the industry.

Stage 4. Evaluation of the collected indicators in the selected direction.

Step 5. Preparation of measurement information.

Stage 6. Comparison and analysis of leadership and own indicators.

Stage 7. Work on errors based on the study. Stage 8. Implementation, study and debriefing.

Destination Marketing

Destination marketing is the regional methods and forms of organizing tourism demand for pilgrimage services. Its task is to determine the time and place of occurrence of destination demand, the formation of the volume and structure of demand for tourism services of pilgrimage destinations. Destination marketing concept, in our opinion, can be formed on the basis of two theoretical principles. First, the provisions of marketing theory related to the formation and development of demand. Secondly, the provisions of the theory of regional management related to the creation and management of a regional product supply system. The concept of destination marketing, in our opinion, consists of four marketing activities related to the pilgrimage and tourism services market:

ϖ the creation of attractive pilgrimage destinations;

ϖ setting an acceptable price for a destination product;

ϖ commercial travel organization for destinations;

ϖ advertising, travel promotion and brand development for pilgrim destinations.

The application of the concept of destination marketing in the field of religious tourism based on Sufi interests involves the development of its tools. Let us consider the content of these marketing tools in relation to the new, Sufi-pilgrim destination "Homeland of the Sultan of Sufism - Bahouddin Naqshband" (abbreviated as "Sufi Hajj"), which geographically covers Sufi-holy places located on the territory of Uzbekistan's cities - Tashkent, Samarkand and Bukhara. The recommended destination will be twofold:

1. Pilgrimage, providing the opportunity for Sufis to carry out Sufi-religious rites in Sufi shrines. 2. Cognitive nature, expressed in a visit to Sufi shrines in order to study the philosophy of Sufism or an informative visit of these shrines by various categories of tourists in other types of tourism. Therefore, we call the destination "Sufi Hajj" - pilgrim-cognitive [10].

An important tool of marketing activity is market knowledge. This process is carried out in two stages: comprehensive market research, market segmentation and product positioning in the market. First of all, it is important to determine the market capacity of the pilgrim-cognitive destination "Sufi Hajj". If more than 4 million Muslims annually carry out the rite of a great Hajj in Mecca and Medina at a strictly defined time, then many of them, with sufficient and reliable marketing information and an imposed service system, could perform "Sufi Hajj for them at any convenient time of the year" "In Tashkent, Samarkand and Bukhara. The capacity of the market of the pilgrim-cognitive destination "Sufi Hajj" per year can reach more than 500 thousand people.

The formation of a product marketing policy for the pilgrimage-cognitive destination "Sufi Hajj" is associated with the creation of a pilgrimage product that can satisfy the needs of Sufi pilgrims. Taking into account the peculiarities of the pilgrimage demand and the possibility of its qualitative satisfaction, we have compiled the program of the "Sufi tour" to the destination "Sufi Hajj".Thus, the destination marketing development of religious tourism based on Sufi interests allows the implementation of commodity diversification of tourist services in Uzbekistan by creating the prestigious pilgrimage and religious-cognitive destination "Sufi Hajj", which can attract hundreds of thousands of foreign pilgrims to the Sultan of Sufism - Bahouddin Naqshband interested in the idea of Sufism.

Conclusions and offers

Based on the results of the above studies, we came to the following general conclusions and practical recommendations:

1. Taking into account the regional geographical transformation of holy places, vertical integration, horizontal cooperation and the possibility of creating a value chain as important tools to ensure the competitive advantage of clusters, it becomes necessary to study its new aspect - the "organic structure" of the cluster. At the same time, the organic structure of the cluster differs from its economic and organizational structure. If the economic structure of the cluster characterizes its vertical structure, and the organizational structure of the cluster is a horizontal structure that represents regional cooperation within the cluster, then the organic structure of the cluster can be determined on the basis of two criteria for cluster formation: "territorial proximity" and "value chain" of service providers in a cluster.

2. In order to increase the flow of pilgrims visiting the holy places of Uzbekistan, it is advisable to create new pilgrimage clusters based on attractive pilgrimage sites located geographically close to each other. In particular, we recommend the creation of an innovative pilgrimage cluster - "Seven Feasts of Noble Bukhara" on the basis of the holy places of seven such sacred persons of the Islamic religion as - 1) Abdukhalik Gijduvani; 2) Muhammad Orif Revgari; 3) Mahmoud Anjir Fagnawi; 4) Hodge Ali Romitani; 5) Muhammad Boboi Samosi; 6) Sayyid Amir Kulol and 7) Bahouddin Naqshbandi. These shrines are inextricably linked with the golden chain of Islamic teachings of Naqshbandi and are geographically located within the five administrative regions of the Bukhara region of the Republic of Uzbekistan.

3) The cluster tool "Competitive Benchmarking" can serve as a mechanism for the development of competition within the cluster, comparing the real

with the reference state of the serving activities of various structural units of the cluster. In order to increase the competitiveness of the newly created pilgrimage cluster "Seven Feasts of Noble Bukhara", we recommend the development of a methodology and criteria for the comparative evaluation of the pilgrimage capacity of the reference shrine - the Bahouddin Naqshbandi memorial complex with the other six holy places included in the golden chain of Islamic teachings of Sufism.

4) The use of the Destination Marketing cluster tool in organizing pilgrimage tourism within the framework of the "Seven Feasts of Noble Bukhara" cluster, you can use the seven-day pilgrimage program "Sufi tour of the Sufi shrines of Uzbekistan with an advertising login:" Travel to Holy Bukhara - Homeland of the Sufi Sultan Bahouddin Naqshanda , which can attract hundreds of thousands of foreign pilgrims to Saint Bukhara who are interested in the idea of Sufism.

5) For the effective organization of food for pilgrims during their stay as part of a seven-day Sufi tour, it is recommended that an agricultural and consumer cooperative be established at the cluster of "Seven Feasts of Noble Bukhara". For the agricultural cooperative, you can attach the sowing land located on the territory of seven holy places, each of which currently has 2-4 hectares of irrigated land. This agricultural cooperative will be engaged in the cultivation of organic agricultural products, vegetables and fruits, and will supply them to all restaurants in the cluster. As for the consumer cooperative, its task will include supplying the catering system of the cluster with consumer products of the Halal type (permitted by Sharia).

6) One of the varieties of services needed by pilgrims is accommodation during their stay in the pilgrimage destination. To improve the quality of hotel services for pilgrims, we recommend the creation of a single chain of hotels, hostels and guest houses near holy places, which are vertically-integration structures of the Seven Feast of Noble Bukhara cluster. Combine all the lodging places located in and around the seven holy places into a single chain of accommodation facilities and introduce them into the structure of this cluster. This practice of placing pilgrims helps to increase the number of local jobs due to the organization of small B & B hotels, hostels and guest houses.

Thus, for the effective organization and accelerated development of pilgrimage tourism in Uzbekistan, it is necessary to develop and implement a set of special measures related to the widespread use of the above cluster tools that enhance the international prestige of thousands of holy places of the country and a sharp increase in the flow of internal and external pilgrims.

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QR – Issue QR – Article

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FLORA IN EDMUND SPENSER'S POETRY

Abstract: *In literature, plants and flowers often represent emotions, beauty and its symbolic meaning can take on new depths beyond the silky texture of the flower or its fragrance. The pain often accompanying love, found in the bloom's thorns, can express the dual nature of love and other expressions. As time passed, poets expressed their ideas via flora in various ways. This article focuses on how Edmund Spenser, the representative of the sixteenth century poetry used flora to describe people and their characters in his poems and analyses them carefully by giving some examples.*

Key words: *comparison, symbolic meanings, rose, lily, gillyflower, pinks, bellamoure, jasmine, apple, cherry.*
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Introduction

Flowers with their all beaty and sweet fragrance have been called "stars of the earth" and "alphabet of the angels". It is difficult to disagree to Mr. Howitts words that of all the minor creations of God, they seem to be most completely the effusion of his love of beauty, grace and joy[1]. For many centuries plants, specifically flowers have charmed almost all human not speaking about delicate taste of poets. In literature, the colour, number, placement and cut of the flower all have an influence upon its intended meaning. They became increasingly entwined with nature, love, human character, even legends and religious symbolism. In poetry they referred to flowers which carried certain meaning in certain context depending on culture, history, geographical position of the place and many other factors. One of the prominent representatives of the 16th century English literature William Spenser liked to use plants, especially flowers in his poems. We can come up with several books written by Frances S. Osgood, John Ingram and F.H.Halme which are devoted to the use of flowers and flower symbolisms in poetry[2] of a lot of different poets' works. In this article we will investigate how Edmund Spenser utilized flowers to describe human physical appearance and feelings. Analysis of some sonnets, and examples from "Epithalamion", "The Faerie Queen" and other poems are brought.

During the Early modern English period Edmund Spenser was known to have a keen interest in flowers and loved to use them within his poems. When t is spoken about his "Amoretti" sonnets, most consider that it came into existence as a result of his mature love towards Elizabeth Boyle whom he married. However William C. Johson finds it to be the last in the list and insists that as Dante and Petrarch Edmund Spenser's sonnets were means of self recognition. His passion and writing ability deliberately increases simultaneously with his love[3]. Peculiar feature of Spenser's is that it doesn't follow sorrows of courtly love where the poet cannot be together with his lover. In the poet's case it is different as he achieves his love's affection. While reading his sonnets we can observe that he puts his beloved not

[1] Fransec S. Osgood. (1858). Poetry of flowers. New York: Derby and Jackson,19
[2] Fransec S. Osgood. (1858). Poetry of flowers. New York: Derby and Jackson, 336; Ingram J. Flora Symbolica or the language and Sentiment of Flowers. London: Frederick Warne and Co,460; Hulme F.E. (1877). Bards and Blossoms or the Poetry, History and Associations of Flowers. London: Marcus Ward,262
[3] William C.J., Spenser's Amoretti: Analogies of Love. London and Taronta: Associated University Press-1990,281

only prior himself but also prior of nature's beauties, flowers. Sonnet 64 of the Amoretti is about the desire he feels about his lover , when he begins to kiss her, he describes the aromas coming from different parts of her body.

Coming to kiss her lips, (such grace I found)
Me seemed I smelt a garden of sweet flowers:
Her lips did smell like unto Gillyflowers[4],

As we know carnations and "gillyflowers" belong to the same species. Being considered as one of the most loved flowers for many centuries, they are believed to be brought by the Romans in 55 B.C. Though there are many different spellings of the flower (Chaucer called it "gylofre", in France it was called "girofle"), there is a great probability that all of them are rooted from Latin "Caryophyllus" which means "cloves"[5]. Because of its sharp pungent fragrance , it was also called "clove-gillyflower" and used to make delicious wine which resulted earning the name "sops in wine"[6]. Describing his beloved to the reader, he gave intensification of her lips' feature and Gillyflowers which is built on common property as intoxicating smell. The reason why the poet chooses gillyflowers to emphasize lips' aroma is its rich pungent smell as well as the symbolic meaning attached to the flower. This flower is associated with the themes of "bliss" and "everlasting love". Suzie Canale claims that this flower can also stand for accepting and enjoying the life you have been given, endless purity, beauty and adoration[7]. As we have already mentioned above Spenser dedicated his sonnets to Elizabeth Boyle and succeeded in gaining her love which was different from other poets' sonnets where they spoke about unachievable affection. Given in the first line when he started to kiss her, aroma of her lips made him feel bliss and he adored her beauty enjoying the gift or life he was given.

Her ruddy cheekes, like unto Roses red:

In the line above Spenser compares his beloved cheeks to roses. Of two concepts brought together in simile – one characterized (cheeks), and the other characterizing (roses red)—the feature intensified is more inherent in the second one. It is clear that Spenser wants to express how her cheeks were delicately red as roses. Being the queen of flowers rose has always had a special pace in English culture and literature. One can observe that in the sixteenth century English literature poets often compared roses to human lips, cheeks, and used them to suggest to blush of shame or anger. Shakespeare himself mentions them at least seventy times in his plays and sonnets[8].

Her snowy brows like budded Bellamoures

In this line Bellamoures is a flower which is named after one of Spenser's own characters in the Faerie Queen. While Collins dictionary gives the definition "obsolete, a beloved person", some sources say that it is the name of a flower which is unknown. The word has originated from French word and signifies "fair love". In order to understand intensification of meaning between brows and budded Bellamour, we looked up the meaning of the word "bud" in Merriam-Webster dictionary where it is defined as to produce buds, an incompletely opened flower. From this one can understand that Spenser is comparing his sweetheart's brows to budded Bellamoure and their denoting thin and delicate shape.

Her lovely eyes like Pinks but newly spread,

Pinks are one type of carnation but small in size. They have earned this name due to the petal edges looking as if they have been "cut with pinking shears"[9]. Spenser compares lady's eyes not just to the Pinks but newly spread. He might want to denote the beauty of her eyes which matured in blossom or freshness as well as rich fragrance. Moreover, as they symbolize pride beauty and ardent love, he one more time emphasizes his beloved features.

Her goodly bosom like a Strawberry bed,

In the next line 'goodly bosom' like strawberries which stands for perfection as they are regarded as having "perfume with the bud of the sweetest flowers, delights the eye, the taste and the smell"[10]. Spenser characterizes her bosom in a quite a new and unexpected light, because the poet imposes strawberry's feature as shape and smell on it. It is said that strawberry family is very close to rose's family. Thus the comparison helps to capture the senses with its sweet aroma and provokes the thoughts of romantic feelings.

Her neck like to a bunch of Collambynes

Belonging to buttercup family Columbine's leaves have a characteristic arrow base that flares out to scalloped edges. In fact, this flower represent

[4] www.genious.com
[5] Kerr,J. Shakespeare's flowers. Johnson's books Press-1997. Retrived from file:///C:/Users/User/Downloads/[Jessica_Kerr]_Shakespeare's_Flowers(BookFi)%20(1).epub
[6] Gillyflowers were used for making a fine wine for their rich scent and that's why called "sops in wine". It can be observed in "The Lay to Eliza" by Edmund Spenser where he writes:"Bring hether Pincke and Purple Cullambine, With Gelliflowers:……. Bring Coronation, and Sops in wine, Worne of Paramoures.
[7] Canale S.(2017). The Symbolic meaning of the Gillyflower. Retrieved from http://blog.exoticflowers.com/blog-0/the-symbolic-meanng-of-the-gillyflower
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[10] Shoberl, F. (1848). *The Language of Flowers.* Philadelphia: Lea & Blanchard, p133

foolishness and deserted due to its likeness of a jester's hat and bells[11].

Her breast like lillies, ere their leaves be shed,

Spenser's choice of the lily for breast description can be lightened by the following: lilies are said to have come from the split milk from Hera's breast that splashed upon the earth when she had been tricked into suckling Hercules, the demi-god son of Zeus[12]. So the poet alludes not only to the pleasant odour diffused by the flower and similarity of the colour, but also privileging his beloved' beauty to much higher than ordinary human beings. Lily is the flower which has the most prominent position among flowers dedicated to religious purposes by people of antiquity. In India it is closely associated with God of Love, the evidence of which we can find in Moore's lines. Moore alludes to the poetical legend of the Hindoos youthful God of Love being first seen "seated on a lotus flower":"As bards have seen him in their dreams…..Down the blue Ganges, laughing, glide……Upon a rosy lotus wreath,"[13]. Lilies represents chastity and virtue and closely associates with love and purity.

Her nipples like young blossomed Jessemynes,

Jasmines with delicate beauty and delicious scent are believed to be introduced in European flora in 1560 by Spanish people who brought the seeds from India. When Europeans first visit India they were quite overpowered by the influence of perfumes emitted by plants, especially jasmine[14].As Ingram J. states in his *Flora Symbolica*:"The early fragrance of these flowers is described as delicious, one authority stating that even the dews are impregnated with their odour, rendering a morning walk delightful"[15].These descriptions make it clear why Spenser uses jasmine in his sonnet. He wanted to give crystal clear depiction of his beloved and wanted the reader feel the smell that he felt from her. Jasmine above is replacing many adjectives that could be used instead and creating poetic image.

Such fragrant flowers do give most odorous smell,

But her sweet odour did them all excel.

Comparing his sweetheart's scent to the flowers as pinks, gillyflower, rose, lily, bellamoure, strawberry and jasmine most of which is described to be flowers of Eden, Spenser still confesses that her aroma excels them all put together. The whole sonnet is built on description of his beloved which is achieved by comparison of flowers' features, especially fragrance. We can see Edmund Spenser's art of using plants in other works as well. Further we will bring some examples from "Epithalamion" where the poet masterly describes a bride.

Her cheeckes lyke apples which the sun hath rudded,

Her lips lyke cherryes charming men to byte,

Her brest like to a bowle of creame uncrudded,

Her paps lyke lyllies budded,[16]

This time Edmund Spenser is comparing the girl's cheeks to red apples. It is quite obvious that similar feature between these two concepts of "cheeks" and "apples" is their colour. The same similarity of colour can be observed in the line where is comparison of lips and cherries are give. However it wouldn't be right to claim that only colour is of big domain here. If it were so, then could they be used for replacing each other? So far we haven't observed lines where cheeks are described with cherries and lips with apples. Thinking this way we can come to conclusion that comparison is not only made on color, but also shape and structure. Apples are bigger in size than cherries which is true about the size of cheeks and lips. Cherries usually come with pair joined in a bud, like paired lips. Cherries also as lips have thin skin if bitten flesh like substance comes out. The juice of the fruit looks like real blood from bitten lips. While in the last line Spenser refers to lily again to describe a part of breast, nipples. As we have mentioned above, Spenser used lily to depict breast where comparison was built on the color and size of the flower (leaves be shed), but this time he is using it for the nipples and comparing it to the size and shape as this time it is "lilies budded".

How the red roses flush up in her cheeks,

And the pure snow with goodly vermill stayne[17],

In the later lines of the work we can observe another resemblance of meaning which is achieved with the help of rose. Spenser one more time wants to describe blushed face of bride as a result of excitement. When we look at the rich history of the flower we came across with some interesting believes. Stated in *Flora Symbolica*, some sources say that roses originally were white but received a rosy hue from blood drawn by the thorn from the foot of Venus, as she was hastening to the aid of her adored Adonis[18]. Symbolizing love rose was often used by Edmund Spenser to express different meanings and to create different images. Let us have a look at the samples from *The Faerie Queen (Bower of Bliss)*.

The whiles some one did chaunt this lovely lay;

Ah see, who so faire thing doest faine to see,

[11] Shoberl, F. (1848). *The Language of Flowers.* Philadelphia: Lea & Blanchard, p280

[12] Shoberl, F. (1848). *The Language of Flowers.* Philadelphia: Lea & Blanchard, p228

[13] Ingram J. Flora Symbolica or the language and Sentiment of Flowers. London: Frederick Warne and Co-p 280

[14] Ingram J. Flora Symbolica or the language and Sentiment of Flowers. London: Frederick Warne and Co-p 70

[15] Ingram J. Flora Symbolica or the language and Sentiment of Flowers. London: Frederick Warne and Co-p 71

[16] Gardner,H.(1985). The New Oxford Book of English Verse. New York: Oxford University press, 68 p

[17] Gardner,H.(1985). The New Oxford Book of English Verse. New York: Oxford University press, 69 p

[18] Ingram J. Flora Symbolica or the language and Sentiment of Flowers. London: Frederick Warne and Co-p 25

In springing flowre the image of thy day;
Ah see the Virgin Rose, how sweetly shee[19]

With the penetration of Christianity in Europe, the devotional verse which was about religious themes as Jesus Christ also appeared. In this verse Virgin Mary was referred to as "rose without thorns". Harrison N. claims that in fact, the five petals of the wild rose are often equated with the five joys of Mary (the five key moments that gave Mary joy, which were the Annunciation, the Nativity, the Resurrection, the Ascension and the Assumption) and the five letters in her full name, Maria[20]. In this way rose gained another meaning which is "Virginity".The poet is calling women as "Virgin Rose" and considering her to be the sweetest among other flowers, women.

Of many a Ladie, and many of Paramowre:
Gather therefore the Rose, whilest yet is prime,
For soone comes age, that will her pride deflower:
Gather the Rose of love, whilest yet is time,
Whilest lovig thou mayst loved be with equal crime[21].

The Rose which appears in the second life represents woman, while the Rose in the fourth line depicts love feelings. Author is hinting that among ladies Rose must be preferred (as she is Virgin) at this time. She can lose her pride after a while. Let your feelings of love act though it can be the same as crime. Spenser masterly used the flower to allude the meaning he intended.

Discussion

Spenser skillfully used flora in his poetry as other members of the sixteenth century English literature. Comparison of the features or resemblance of the meaning were built on different factors which characterize certain plant. Being of different size, color, shape, texture, smell flowers were masterly selected to describe human appearance and character, particularly of women. Comparison was not achieved only by one feature, other qualities of characterizing concepts also had somehow impacted on it as we saw in the examples where cheeks are compared to apples and lips to cherries. Symbolic meanings that each plant carries also influences the poets choice of them, as well as historical background of the flora which one can witness in the analysis of lilies and roses. As time passed they have gained new prospects and widened their use in literature. Coming up from its various features the same flower can denote different meanings in different situations. Flowers used in these poems illustrate some important characteristics, such as fidelity, beauty and perfect excellence, to be found in the pursuit of a female companion; it could be considered that with these poems, Spenser is describing his perfect woman, who is suitable for the role of lover , if not wife. It is possible then that the usage of the columbine demonstrates the fact that no one, even the object of his affections, is perfect in every sense. As the poet have said that this should not prevent the realization of such feelings and we should all learn that accept people the way they are, flaws and all.

Conclusion

The conclusion is that in The Early Modern English lyrics not only flowers, but also various fruit conveyed different meanings. From early periods till now this flora is second to none aid for poets which comes in handy in giving voice to untold emotions. As above analysis, one can understand that without doubt flora can symbolize various human character, emotions and ,even, their attitudes, and physical actions.

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FEATURES OF NON-SPECIFIC ADAPTATION OF BLOOD CELLS TO THE DOSED PHYSICAL LOAD IN YOUNG MEN WITH DIFFERENT LEVELS OF PHYSICAL TRAINING

Abstract: *The paper presents the results of a study of the effect of physical stress on the white blood of a person. The object of the study was peripheral blood taken from the surveyed men aged 20 to 35 years before and after training. The strength of the influence of physical load is estimated, the content of leukocytes and their percentage distribution in the leukogram. The dynamics of the urgent adaptation of white blood cells to the action of physical activity and its relation to the physical performance of a group of young men who do not have professional sports skills has been studied.*

Key words: *maximal oxygen consumption, physical load, leukogram.*

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ОСОБЕННОСТИ АДАПТАЦИИ КРОВИ НА ДОЗИРОВАННУЮ ФИЗИЧЕСКУЮ НАГРУЗКУ У МОЛОДЫХ МУЖЧИН С РАЗНЫМ УРОВНЕМ ФИЗИЧЕСКОЙ ПОДГОТОВКИ

Аннотация: *В работе представлены результаты исследования влияния физической нагрузки на показатели белой крови человека. В качестве объекта исследования рассматривалась периферическая кровь, взятая у обследованных мужчин в возрасте от 20 до 35 лет до и после тренировки. Оценена сила влияние физической нагрузки содержание лейкоцитов и их процентное распределение в лейкограмме. Изучена динамика срочной адаптации клеток белой крови к действию физической нагрузки и ее связь с физической работоспособностью группы молодых мужчин, не имеющих профессиональных спортивных навыков.*

Ключевые слова: *максимальное потребление кислорода, физическая нагрузка, лейкограмма.*

Введение

Для организма человека физическая нагрузка является уникальным фактором способным индуцировать обратимые изменения активности разных органов и систем организма. Возникновение устойчивых изменений

сопровождается длительными и регулярными дозированными нагрузками. Увеличения уровня физической активности сопровождается биохимическими и физиологическими сдвигами, проявление которых находит свое отражение не только в уровне функциональной активности внутренних органов и работоспособности, но и системе крови. В основе изменений, возникающих при выполнении физической нагрузки, лежит изменение направленности метаболизма. В организме увеличивается интенсивность энергетического обмена, которая сопровождается выделением энергии и синтезом АТФ, при одновременном снижении скорости пластического обмена. Эти изменения улучшают энергообеспечение работающих мышц, повышают мощность и продолжительность выполняемой работы [1]. Стандартной реакцией крови на физическую нагрузку, является включение механизма срочной адаптации, имеющего характер неспецифического системного ответ, вызванного сдвигом гомеостатических констант. Посредством нервного и гуморального компонента регуляции происходит активация симпатического контура, который обеспечивает формирование адаптационного синдрома (или стресс-реакцию по Г. Селье, 1960). Не подготовленный организм сталкивается с ситуацией мобилизации и крайней степенью напряжения работы внутренних органов и большинства систем организма [2].

Механизмы реактивности и выработки устойчивого ответа системы крови на физическую нагрузку представляют отдельную область исследования. Многочисленные работы (Hartmann, Jokl, 1930, Горшкова, 1960, Ефименко, 1978, Miashita, 1981, Гаркави, 1982, Yansen, 2001, Нехвядович, 2006, Александров, 2010 и др.), перечень которых с каждым годом увеличивается, подтверждают актуальность этой области исследования. В научной литературе сформировалось устойчивое представление о влиянии физической нагрузки на газотранспортную систему крови (Hartmann, 1930) и лейкоцитарную реакцию (миогенный лейкоцитоз, E. Grawitz, 1910, Егорова, 1926), механизмы, которых все еще недостаточно изучены. Дополнительным фактором являются генетические предпосылки развития физических качеств, например силы и выносливости (Н. В. Назаров, 2001, С. В. Рогозкин, 2006, И. И. Ахметов, 2009 и др.). Кроме того, определенный вклад вносят индивидуальные особенности каждого человека, его физическое и психоэмоциональное состояние.

Большинство публикуемых работ приводят результаты на спортсменах, т.е. людях которые имеют продолжительный стаж тренировок или специализирующихся в том или ином виде спорта [3-5]. Их подготовка ведется по определенной программе, направленной на достижение личного или командного результата. В то же время имеется большая категория людей, занимающихся в спортивных секциях и клубах любительского спорта. Такого рода занятия имеют иной режим тренировок, а, следовательно, и другой характер реактивности организма, другую степень адаптации к нагрузке. Еще одной группой являются люди, которые не систематическими занимаются физическими упражнениями, для поддержания физической формы. Каждая группа отличается уровнем метаболической активности, особенностями реактивности и адаптацией на действие физической нагрузки.

В этой связи изучение особенности реакции крови у лиц с разным уровнем физической подготовки и системной адаптацией к нагрузке представляет научный и практический интерес. Изучение закономерностей формирования клеточного ответа на дозированную физическую нагрузку позволяет оценить индивидуальные особенности, и выделить наиболее типичные формы неспецифической адаптационной реакции крови. Возможность подобного рода типизаций может использоваться не только для разработки современных методов и подходов организации тренировок [6], но и в активационной терапии [7, 8]. Цель работы изучить особенности неспецифической адаптационной реакции форменных элементов крови на дозированную физическую нагрузку у молодых мужчин с разным уровнем физической подготовки.

Материал и методика исследования.

В исследовании приняли участие 58 мужчин в возрасте 20 – 35 лет, не имеющие профессионального спортивного опыта. Все участники на момент обследования были здоровы, показатели опорно-двигательной, сердечно-сосудистой и дыхательной системы находились в границах физиологической нормы. Для исключения алиментарного влияния на динамику показателей крови, участники эксперимента в течение 3 – 4 часов воздерживались от приёма пищи. Исследование проводилось на базе спортивного клуба «Пауер» (г. Гомель), последующий лабораторный анализ производится в условиях УЗ ГГКБ №2 г. Гомеля. По прибытию, у каждого участника производился забор крови из пальца на общий анализ. Взятие проб крови производилось в антисептических условиях фельдшером-лаборантом УЗ ГГКБ №2 г. Гомеля, с соблюдением санитарно-гигиенических норм [9]. Участники эксперимента проходили испытание на беговой дорожке AppleGate T30ADC, со скоростью 6 км/ч и протяжённостью 3 км. Посредством встроенного пульсометра производили замер интенсивности субмаксимальной нагрузки, которую поддерживали на уровне 120 – 140 уд/мин.

Сразу после испытания у каждого участника повторно производили забор кровь. Образцы помещали в миниконтейнер с антикоагулянтом трилон-Б, в этот же день доставляли в клинико-диагностическую лабораторию УЗ ГГКБ №2. В каждом образце определяли содержание форменных элементов крови автоматическим гематологическим анализатором SX10000i. Для дифференцировки лейкоцитов и определения процентного соотношения клеточных популяций, готовили мазки крови с фиксацией и окраской по Романовскому-Гимзе. В окрашенных и высушенных мазках с помощью иммерсионного микроскопа производился подсчёт лейкоцитарной формулы в расчёте на 100 клеток. По полученным результатам была сформирована сводная таблица, данные из которой и использовались для дальнейшей интерпретации результатов.

Выборка состояла из мужчин с разным уровнем физической подготовки. В связи с этим при проведении последующего анализа и статистической обработки результатов исследования были сформированы 3 группы: 1-я – мужчины, чей стаж занятий не превышал 1-го года, 2-я группа – стаж занятий составлял от 1-го года до 3-х лет, 3-я группа – стаж занятий составлял более 3-х лет. Для контроля и оценки индивидуальных особенностей неспецифической адаптационной реакции форменных элементов крови на дозированную физическую нагрузку согласно [6, 7], использовался показатель отношения процентного содержания лимфоцитов в периферической крови к сегментоядерным нейтрофилам. Оценка достоверности различий осуществлялась исходя из нормального распределения значений на основе t-критерия Стьюдента. Влияние физической нагрузки на показатели крови оценено методом однофакторного дисперсионного анализа (*ANOVA*). Статистическая обработка результатов исследования выполнена с помощью прикладных программ *MS Office Excel 2007* и *Statistica for Windows 6.0*.

Результаты исследований и их обсуждение. Количественные изменения форменных элементов крови под действием физической нагрузки наиболее отчетливо выражены в динамике лейкоцитов. Лейкоцитоз характеризуется преимущественным увеличением лимфоцитов и нейтрофилов в кровотоке. Одновременно происходит разрушение части лейкоцитов: при напряженной физической нагрузке резко уменьшается число эозинофилов [12]. Разрушение этих клеток обеспечивает восстановление и биосинтез клеточных структур. Адаптационные изменения в системе крови к физической нагрузке обеспечиваются не только изменением количества клеток, но и изменение соотношения в результате перераспределения популяций лейкоцитов. Физическая нагрузка ускоряет миграцию лимфоцитов в костный мозг, что стимулирует кроветворение, в результате чего в кровь поступает дополнительное количество эритроцитов и лимфоцитов. Динамика эритроцитов и тромбоцитов крови участников эксперимента была рассмотрена нами ранее в работах [10, 11].

Таблица 1 – Показатели крови до выполнения физической нагрузки

Форменные элементы	Группа					
	1-я		2-я		3-я	
	X±m	Cv*,%	X±m	Cv,%	X±m	Cv,%
Эритроциты, 10^{12}	4,76±0,21 (0,34)**	7,13	4,87±0,14 (0,42)	8,51	5,08±0,17 (0,34)	6,73
Гемоглобин, г/л	152,91±3,08 (4,93)	3,22	151,45±2,62 (7,68)	5,07	149,08±2,36 (4,70)	3,15
Тромбоциты, 10^9/л	183,09±10,02 (16,06)	8,77	190,88±6,14 (18,00)	9,43	189,15±14,24 (7,15)	7,83
Лейкоциты, 10^9/л	5,69±1,56 (0,67)	15,65	6,85±1,07 (0,37)	15,67	6,82±1,49 (0,86)	15,75
Сегменты, %	59,35 (47-72)***	2,96	63,54 (47-72)	23,80	57,07 (47-72)	22,77
Лимфоциты, %	25,22 (19-37)	5,20	26,11 (19-37)	26,43	28,00 (19-37)	30,48
Моноциты, %	6,00 (3-11)	10,84	6,45 (3-11)	**48,33**	7,21 (3-11)	**49,16**
Палочки, %	4,87 (1-6)	7,64	1,76 (1-6)	31,88	3,14 (1-6)	**35,84**
Эозинофилы, %	4,26 (0,5-5)	4,79	1,51 (0,5-5)	33,73	3,86 (0,5-5)	**33,46**
Базофилы, %	0,30 (0-1)	42,33	0,63 (0-1)	14,06	0,71 (0-1)	**58,44**

* - коэффициент вариации; ** - стандартное отклонение; *** - границы нормы [11]

В таблице 1 представлены результаты общего анализа крови и лейкоцитарной формулы, полученные в 3-х группах участников исследования до выполнения физической нагрузки. Предварительно был проведен анализ индивидуальных значений показателей крови и установлено, что для 98 % участников показатели соответствуют границам возрастной физиологической нормы. Достоверность различия индивидуальных значений с табличными нормами во всех случаях превышала доверительную вероятность 0,05. Два процента участников имели превышение количества лейкоцитов и эритроцитов, у 5 % содержание лейкоцитов имели значения соответствующие верхней границе нормы (8 – 9×10^9 /л). Такие результаты были получены для участников, входящих в 3-ю группу, где стаж занятий в секции превышал 3 года. Достоверного различия между участника исследования, имеющими разных стаж занятий в секции, установлено не было. Однако наблюдается увеличение в пределах стандартной ошибки большинства показателей.

Показатели лейкоцитарной формулы в каждой группе отличались соотношением сегментоядерных нейтрофилов (S), лимфо- (L), моноцитов (M), палочкоядерных нейтрофилов (P), эозинофилов (E) и базофилов (B): в 1-й группе – 200 : 80 : 20 : 15 : 15 : 1; во 2-й группе – 100 : 40 : 10 : 3 : 2 : 1; в 3-й группе – 80 : 40 : 10 : 5 : 5 : 1. Полученные соотношения указывают на явное распределение популяций лейкоцитов в пользу сегментов, лимфоцитов и моноцитов. По результатам таблицы 1 видно, что большинство показателей наиболее вариабельным показателем крови в 1-й группе являются лейкоциты, из них наибольшая вариация наблюдалась у моноцитов и базофилов. Во 2-й группе вариация показателей по абсолютным значениям увеличивается в среднем в 1,5 раза, тогда как в лейкоцитарной формуле в среднем в 6 раз. Наиболее вариативными показателями второй группы являются моноциты и эозинофилы. В 3-й группе вариация усилилась для моноцитов, палочкоядерных нейтрофилов и базофилом. В целом при переходе из группы в группу наблюдается увеличение показателей лейкоцитарной формулы.

Действие физической нагрузки сопровождается появлением юных и увеличением палочкоядерных форм лейкоцитов (лейкоцитарная формула сдвигается влево, при уменьшении числа эозинофилов). Абсолютное число лейкоцитов у участников 1-й группы увеличилось в 2 раза (на 105 %) от исходного уровня, во 2-й и 3-й группе эта разница значительно снижается до 10 %. Эти результаты могут свидетельствовать от адаптации белой крови к нагрузке уже после первого года тренировок. В таблице 2 представлены изменения показателей крови у участников эксперимента под действием физической нагрузки.

Таблица 2 – Показатели крови после выполнения физической нагрузки

Форменные элементы	Группа					
	1-я		2-я		3-я	
	X±m	Cv, %*	X±m	Cv, %*	X±m	Cv, %*
Эритроциты, 10^{12}	5,32±0,13 (0,21)**	4,01	5,51±0,14 (0,40)	7,19	5,73±0,45 (0,89)	15,61
Гемоглобин, г/л	159,55±3,19 (5,11)	3,20	160,27±2,70 (7,90)	4,93	157,23±3,58 (7,13)	4,54
Тромбоциты, 10^9/л	200,91±25,74 (16,06)	12,81	209,85±10,18 (29,85)	14,22	209,08±9,53 (18,98)	9,08
Лейкоциты, 10^9/л	11,70±1,73 (0,74)	12,20	7,46±1,13 (0,39)	15,14	7,45±2,98 (1,71)	11,75
Сегменты, %	63,43 (47-72)***	2,12	52,77 (47-72)	13,76	56,18 (47-72)	**49,34**
Лимфоциты, %	27,88 (19-37)	2,05	35,45 (19-37)	32,77	30,88 (19-37)	31,75
Моноциты, %	5,52 (3-11)	6,49	6,36 (3-11)	**50,42**	5,79 (3-11)	**60,85**
Эозинофилы, %	1,48 (1-6)	13,15	3,92 (1-6)	**58,46**	4,36 (1-6)	**74,03**
Палочки, %	1,39 (0,5-5)	9,98	0,88 (0,5-5)	**56,00**	2,15 (0,5-5)	**111,09**
Базофилы, %	0,3 (0-1)	22,80	0,63 (0-1)	8,47	0,64 (0-1)	**73,65**

* - коэффициент вариации; ** - стандартное отклонение; *** - границы нормы [11]

Из таблицы 2 видно, что под действием физической нагрузки происходит изменение всех клеточных популяций. В 1-й группе число эритроцитов увеличилось на 12 %, содержание гемоглобина – на 4 %, тромбоцитов – на 10 %; во 2-й группе число эритроцитов увеличилось на 13 %,

содержание гемоглобина – на 6 %, тромбоцитов на 11 %; в 3-й группе число эритроцитов увеличилось на 13 %, содержание гемоглобина – на 5 %, тромбоцитов на 11 %. С помощью t-критерия Стьюдента показано, что между количеством эритроцитов, тромбоцитов и лейкоцитов, а также содержанием гемоглобина до и после физической нагрузки имеется достоверного различие ($p<0,05$). Для эритроцитов установлено достоверное превышение нормативного показателя ($p<0,05$). Полученные результаты достаточно хорошо согласуются как с литературными источниками, так и с проведенными нами ранее исследованиями [11-13]. Сравнительный анализ достоверности различий средних показателей крови между группами показал отсутствие различия для эритроцитов, гемоглобина и тромбоцитов ($p>0,05$). Для лейкоцитов установлено достоверное различие средних между участниками 1-й группы в сравнение со 2-й и 3-й группой ($p<0,05$). Достоверного различия среднего содержания лейкоцитов во 2-й и 3-й группе не установлено ($p>0,05$).

Данные таблицы 2 показывают, что под действием физической нагрузки происходит изменение соотношения клеток лейкоцитарной формулы: в 1-й группе – 210 : 90 : 20 : 5 : 5 : 1; во 2-й группе – 90 : 60 : 10 : 5 : 1 : 1; в 3-й группе – 90 : 50 : 10 : 7 : 3 : 1. Полученные соотношения указывают на перераспределение клеточных популяций в пользу сегментов и лимфоцитов. По результатам таблицы 2 видно, что вариация большинства показателей в 1-й и 2-й группе после нагрузки снижается, исключение составляют тромбоциты, вариация которых увеличивается в 1,5 раза. В 3-й группе наоборот происходит увеличение вариации эритроцитов, гемоглобина и тромбоцитов на фоне снижения вариации лейкоцитов. Максимальные значения коэффициентов вариации характерны для 3-й группы, где у палочковидных нейтрофилов значение превысило 100 %, у эозинофилов, базофилов 70 %, у моноцитов 60 %.

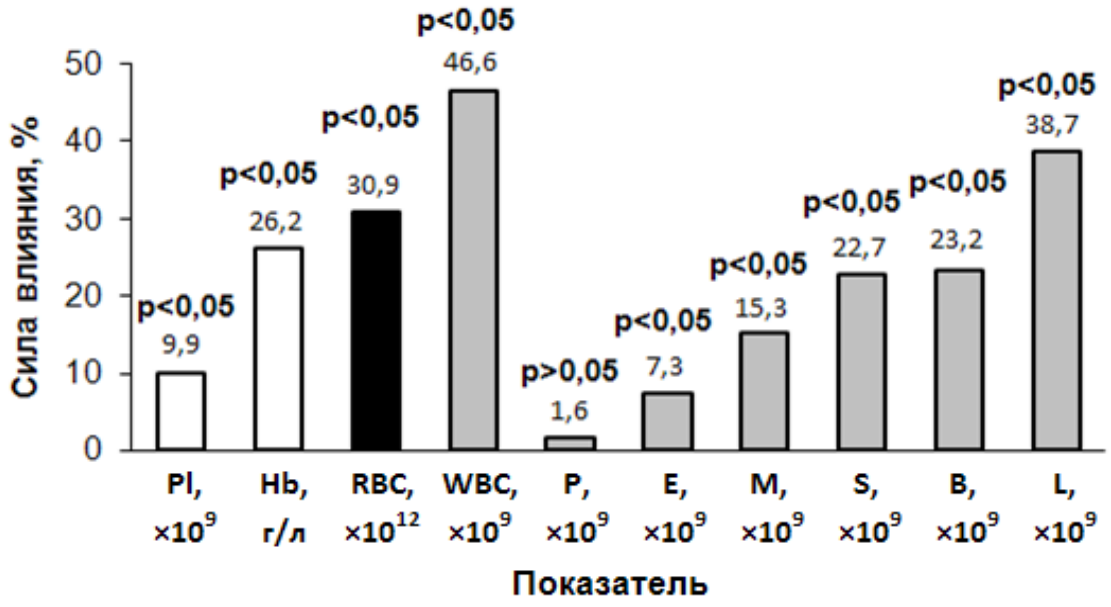

Рисунок 1 – Распределение чувствительности форменных элементов крови к физической нагрузке

Методом однофакторного дисперсионного анализа определена сила влияния фактора физической нагрузки на динамику каждого форменного элемента. Результаты анализа представлены на рисунке 1. С помощью рисунка можно распределить форменные элементы по степени их чувствительности к фактору физической нагрузки WBC > L > RBC > Hb > B > S > M > Pl > E. Палочкоядерные нейтрофилы в эту последовательность не включены, поскольку для них не установлено достоверного влияния фактора физической нагрузки ($p>0,05$). На основание ряда приоритета чувствительности форменных элементов крови проведен корреляционный анализ, по результатам которого произведена оценка силы связи между показателями до и после выполнения физической нагрузки. В результате анализа установлено, что между показателями красной крови, тромбоцитами и показателями белой крови имеет место слабая степень связи, максимальное значение коэффициента корреляции составило 0,55 как до, так и после выполнения физической нагрузки.

Статистически значимые коэффициенты корреляции сильной степени связи были получены для клеток белой крови. В этой клеточной популяции выделяются две характерные группы: 1-я имеет сильную степень связи с общим содержанием лейкоцитов как до, так и после нагрузки, 2-я обнаруживают сильную степень связи с сегментами только после нагрузки. В 1-ю группу вошли: сегменты (r=0,9), лимфоциты (r=0,84), базофилы (r=0,68) и моноциты (r=0,65), во 2-ю группу вошли моноциты (r=0,78) и базофилы (r=0,80). Во всех случаях для этих показателей наблюдается линейный рост значений, который зависит от интенсивности общего лейкоцитоза. Следует отметить, что после выполнения физической нагрузки сила связи между показателями 1-й группы усиливается – для базофилов до r=0,93, для сегментов до r=0,88, а для моноцитов до r=0,73. Сила связи между лимфоцитами и лейкоцитами после нагрузки заметно снизилась до r=0,51.

Для оценки возможности использования индивидуальных значений наиболее чувствительных показателей крови и классификации участников в группы по степени их адаптации к физической нагрузке, мы использовали первую группу показателей (сегменты, лимфоциты, моноциты и базофилы). Значения каждого показателя было отнесено к абсолютному количеству лейкоцитов. Кроме того, согласно концепции Л. Х. Гаркави [7], а также работе [6], где показана возможность использования процентного соотношения лимфоцитов к сегментам, для каждого участника был определен тип адаптационной реакции. В результате были получены 4 коэффициента, характеризующие состояние адаптации системы крови участников эксперимента, к физической нагрузке. Для классификации участников эксперимента на группы по степени адаптации крови мы использовали следующее выражение (1):

$$\frac{L}{S} : \frac{B + S + M}{WBC} \qquad (1)$$

где L – количество лимфоцитов, %; S – количество сегментов, %; B – количество базофилов, 10^9/л; S – количество сегментов, 10^9/л; M – количество моноцитов, 10^9/л; WBC – абсолютное количество лейкоцитов, 10^9/л.

Значения, рассчитанные с помощью выражения 1, позволили распределить всех участников на 3-и кластера по степени адаптации белой крови к физической нагрузке. В первый кластер вошли участники, чей показатель адаптации лейкоцитов (ПАЛ) вошел в диапазон 0,3 – 0,6. Во второй кластер вошли участники, где ПАЛ составил 0,4 – 1,0, в третьем кластере значение ПАЛ было больше 1,0. Отношение лимфоцитов к сегментам (по Гаркави) в первом кластере составило 0,343, что указывает на реакцию хронического стресса, во втором кластере 0,516 – реакция тренировки, в третьем кластере 0,697 – реакция спокойной адаптации.

Используя ПАЛ в группах с разным стажем занятий в секции, было установлено, что в 1-й группе 52 % участников находятся в состоянии хронического стресса, 43 % находятся с состояние тренировки и 4 % соответствуют реакции спокойной адаптации. Во 2-й группе у 25 % участников сохраняется состояние хронического стресса, 17 % участников находятся в состояние тренировки и 58 % имеют реакцию спокойной активации. В 3-й группе соотношение меняется в пользу состояния тренировки (43 %), количество участников находящихся в состояние хронического стресса и адаптации распределились поровну и составили по 29 %.

Выводы.

Изучена динамика форменных элементов крови у мужчин с разным уровнем физической подготовки и установлено, что под действием физической нагрузки происходит изменение всех клеточных популяций крови и перераспределение соотношения лейкоцитарной формулы в пользу сегментов и лимфоцитов. У участников эксперимента 1-й группы, где стаж занятий не превышает одного года, наблюдается резкое увеличение числа лейкоцитов (более 100 %), во 2-й и 3-й группе (стаж занятий более года), эта разница значительно ниже, и составляет менее 10 %. Полученный результат может свидетельствовать о том, что адаптация крови к физической нагрузке формируется в первой год тренировок. Действие фактора физической нагрузки вызывает изменение не только средних значений форменных элементов крови, но и характер их варьирования. Установлено, что наибольшие значения коэффициентов вариации характерны для 2-й и 3-й группы участников, где у палочковидных нейтрофилов значение коэффициента превысило 100 %, у эозинофилов, базофилов 70 %, у моноцитов 60 %. Кроме популяции лейкоцитов не установлено достоверного различия в содержание эритроцитов и тромбоцитов между участниками разных групп.

Анализ реактивности показателей общего анализа крови и лейкоцитарной формулы показал, что наибольшее влияние физическая нагрузка оказывает на динамику общего количества лейкоцитов и эритроцитов, а также уровень гемоглобина. В лейкоцитарной формуле наибольшую чувствительность к физической нагрузке показали лимфоциты базофилы и сегменты. В результате статистического анализа был получен ряд приоритета чувствительности

форменных элементов крови: WBC > L > RBC > Hb > B > S > M > Pl > E. Методом корреляционного анализа оценена связь наиболее чувствительных к физической нагрузке показателей, установлено, что клеточной популяции лейкоцитов выделяются две группы показателей – 1-я имеет сильную степень связи с общим содержанием лейкоцитов до и после нагрузки (сегменты (r=0,9), лимфоциты (r=0,84), базофилы (r=0,68) и моноциты (r=0,65), 2-я обнаруживают сильную степень связи с сегментами только после нагрузки (моноциты (r=0,78) и базофилы (r=0,80). Сила связи между показателями 1-й группы после физической нагрузки усиливается – для базофилов до r=0,93, для сегментов до r=0,88, для моноцитов до r=0,73.

Оценка возможности использования индивидуальных наиболее чувствительных форменных показателей белой крови позволила получить коэффициент, способный учитывать не только динамику лимфоцитов и сегментов, но и моноцитов и базофилов. Формализованное выражение позволило рассчитать индивидуальный показатель адаптации лейкоцитов, по значению которого участники эксперимента распределились на 3-и кластера по степени адаптации крови к физической нагрузке. Значения ПАЛ в 1-м кластере 0,3 – 0,6, указывают на наличие состояния хронического стресса во 2-м 0,7 – 1,0 – состояние тренировки, в 3-м, где значения больше 1,0 – на реакцию спокойной адаптации. В группах с разным стажем занятий имеются представители каждого кластера.

Физическая нагрузка запускает механизмы адаптации системы крови схожие с механизмами стресса, что отражается на их динамике не только в момент выполнения физических упражнений, но и на протяжении всего периода адаптации. Индивидуальные особенности динамики форменных элементов крови на дозированную физическую нагрузку в группах с разным уровнем физической подготовки позволяют вывить людей неспецифической адаптационной реакции крови, которой находится в состояние стресса, что позволяет адекватно скорректировать режим тренировок. Полученные результаты могут быть основой для дальнейшего исследования, направленного на разработку простой, но достоверной методики определения степени адаптации и выносливости организма к физическим нагрузкам.

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MAIN INDEXES TO ETHNIC COMPOSITION OF TURKIC TRIBES AND NATIONALITIES

Abstract: *In this article it is enlightened the significance of folk traditions, including clan names and tamgas as the signs of ethnic composition of the Turkic tribes.*

Key words: *tamga, language, borrowed words, interpret, experience, history, foundation, anthropology, translation.*

Language: *English*

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Introduction

The investigation of folk traditions, generic names and tamgas[1] as indexes to ethnic composition of Turkic tribes and nationalities is important. About 26 million Turks inhabiting in vast area beginning from the sea of Okhotsk and the Antarctic ocean till the Adriatic Sea, speak the same language differentiating only in dialects existing in the system of the language, therefore a Central Asian Turk can understand both a yakut and a *turk-ottoman*. Of course with considerable attention, cleverness and the exception of words borrowed from other languages. Academic Betling probably exaggerated the importance of dialect peculiarities in the Yakut language suggesting even to name the Turkic language the family of Yakut-Turkic languages and quite abruptly rejected the opinions of a famous scientist traveler along the north of Siberia Erman, who claimed that: "a Yakut who was born on the banks of the Lena or the Aldan without any difficulties inter-explained with a citizen from Constantinople" [16, p. 415; 433-434].

However Middendorf, getting a little introduced with the Yakut language in the north-east of Siberia within 1844 and 1845 and delivering Mr. Betling a part of materials for his Grammar and Dictionary, after more than thirty years could inter-explain with the Turks of Central Asia, in Fergana with the help of scanty remnants of forgotten Yakut words: "When the interpreter left me, I, in the last resort was able to inter-explain with my Kara-Kyrgyz, if I could remember necessary Yakut words for it." [15, p. 406]. On another point, Vambery assures, from his own experience, that a Turk from Anatolia with a little attention understands a Turk from East Turkestan [13, p. 466].

On the contrary, physical types of Turkic tribes and nationalities are very various and in the experience of south-western Turks have very little common with the Turkic tribes in Central Asia and even more so the east Siberian. Of course, changes in types of race and nationalities happen, in some extend, under the pressure of climate and other environmental conditions and under the influence of culture, and also, probably in the result of evolution composing every of this anthropological type of elements, but such kind of changes, with the exception of rare cases, generally insignificant or at least, require very long

[1] The generic name taken from the Turkish word, "tamga" meaning seal or cattle brand.

period of time. Incomparably faster, abrupt and deep are those changes in national and tribal types that are the result of crossbreeding with other races and nationalities. If we don't doubt that various types of Turk-ottaman is the result of crossbreeding of the Turks who arrived at Asia Minor from Central Asia no less than nine centuries and later at Balkan Peninsula with the local Kurds, Greeks and Slavs and etc. than it can be assumed that other Turkic tribes gained their anthropological differences from each other also, mainly, in the result of crossbreeding with different nationalities, not only under the influence of natural and cultural conditions that were for them monotonous enough. In view of all this, explanation of the origin of the Turkic tribes and nationalities in considerable degree corresponds to the definition of outside admixture, crossbreeding with which gave peculiarities to the Turkic tribes.

DISCUSSION: Historical information about northern and Central Asia begins some centuries before the birth of Jesus Christ and doesn't differ in abundance in later times. For this, they thought of finding explanations to the origin of Turkic tribes, especially to old ones in folk traditions.

According to the finest and one of the oldest national traditions, a record in Chinese nearly at the same time with emergence in the history the name of Turks itself, forefather of Turks by birth from "the lands of So lying in the north of the lands of the Huns". One of his descendants I-tchi-ni-sse-tou who was born by she-wolf and he was gifted with supernatural qualities, had two wives: Heaven Spirit's daughter and Winter Spirit's daughter. He had four sons born by the former and one of his sons turned into a swan; the other one named Chi-ko established a state between the rivers A-pou and Kien; and the third one laid the foundation for a kingdom on the banks of the river Tchou-tche; and the fourth son No-tou-lou-che lived in the mountains Tsien-sse-tchou-tche-chi; and in this mountains inhabited a Horde descended from the above mentioned general Turkish forefather; people of this Horde would suffer hard from cold of dew; No-tou-lou-che taught to make a fire to this Horde, heated and nourished, and this way saved the lives; for this the above mentioned Horde obeyed him, recognized as the Head and took the name of toukioue. His generation Tou-muen VI was the first ruler of the Turk (toukioue) who entered into relations with China in the first half of the VIth century. F. Iakinf Bichurin giving right enough Chinese transcription of *toukioue*, and even more so often writes this name as *dolga*, because, together with Schmid they took the *toukioue* for Mongols and produced their name from the Mongolian dodolga, i.e. a helmet. Klaprot and Abel Remus unsuccessfully compared the name *toukioue* with takia i.e. a cap, but it turned out there is a quite suitable Turkish equivalent terk meaning *a helmet* [5, p. 383; 3, p. 72]. According to Vambery, "it would be logical enough if the the word "*turk* meant *a man* or creation", but this wish has no etymological foundation [11, p. 21].

The cited legend is placed in the Chinese "The history of northern Wei dynasty" (from 386 till 558) and (according to the interpretation by Stan. Julien'a), generally agreeing with the translation of F. Ia. Bichurin outlined with some abbreviations from which Russian transcriptions of names are taken [2, p. 327-328; 6, p. 258-259]. The dynasty history was compiled by the Chinese on the basis of annals and documents and current events, and therefore it should be supposed that the legend introducedin the history of Wei Dynasty was recorded within the years of 535-558, probably from the words of Turkish messengers. Accuracy of the records is seen by apparent misunderstanding By the Chinese, some at least in geographical and ethnic with details.

The reign of So, lying in the North of the Huns country i.e. current Mongolia must have been situated in the North side of the Altai, for its southern slopes were part of the Huns' lands. Nowadays one of the two genera of which consist of the upper Kumandi vòlost (*vòlost* means "small rural district") on the Bi river near the fall into it the Lebed river, carries the name of So and the other does Kuban or Kumand [7: 211-212]. From it it can be concluded with enough probability that legendary forefather of Turks was from the tribe So living in the North of Altai and the clan So is a small reminder of it, probably, in prehistoric times a tribe with no few number. Further, the Turkic word *cu* means "swan". The Turks living on the river Lebed call themselves *cu-cshi*, i.e. the people of "Lebed River" [7: 212].

It is not difficult to deduce from this that Chinese historians made a son of I-tchi-ni-sse-tou turn into a swan in vain: he as his other three brothers who settled in known places and founded their kingdoms (tribes), settled on the River Ku (a swan) and became the ancestor of the tribe Ku, whose remnants have been inhabiting so far on the Lebed River and in the vòlosts of Upper and Lower Kumand. So, *Chi-ko* is one of the Chinese transcriptions of the name of Kirghiz, (for instance, we can discover the Chinese names of the Kirghiz as Ki-ko, Kie-Ko in Degin) in the second there omitted the letter "r" that does not exist in the Chinese[2] and the last consonant as it was often done in Chinese till the time of Manjurian dynasty; besides, the A-pou river is probably the Abakan river and it was the main settlement of the Kirghiz, and the river *Gien* or *Kien* is really the river *Kem*, i.e. the remaining from the old times indigenous name of the River Yenisei [1, p.

[2] So, instead of tu-r-k in Chinese occurred tu-kyu; kyu for not having a sign for a sound k without a vowel.

379]. The river Tchou-tche must be the river *Chu* (in Russian "Chuya") the inflow of Katun serving and currently as lands of nomads of Chuy Turks (chukshi). And at last, Basi-Chu from the Turkish is translated as "upper (river) Chu": because, if *chi* from Chinese means "stone", then the place where the eldest son settled, is the essence of pasture with "stone (or rocky) mountains in the upper river Chu".

Generally, it goes out according to geographical and ethnic data of the legend the Turk toukioues (more precisely according to F. Iakinf, "dulgak house", i.e. actually Khan's clan) descended from the tribe So inhabiting in the North of Altai, after their relocation in Altai and in the result of breeding they separated into four branches: one of them affirmed on the North slope of the Altai with the name Chu (*ben* or *men* meant perhaps "land", "country", subsequently turned into a prefix having collective meaning, as for example the nouns turkman or turkmen), the second branch founded on the Yenisei and Abakan with the name of Kirghiz, the third one remained roaming within the Altai on the river Chu, and the fourth formed a tribe taking the name of Turk. And the last who became known among Chinese in the second quarter of the VIth century coming into political intercourse with them, in 536 subdued the Gaogeans in the number of 50 thousand nomad tents, then put the end the dominiond of the Juan by 556 had taken possession of all Mongolia and Central Asia to Hindikush and the Black sea [6, p. 266-268]. Tomashek who passingby touched the legend under discussion, not satisfying of turning "the eldest son" into a Swan, made him to fly "far away" to the Yakuts who worship Kuba-khatun. But the Swan's worship to the queen is not quite enough to ascribe such a connection to the Yakuts with the most ancient Turkic legend moreover in the legend there is no any word about or a hint at any fly of a swan. It is true, then guessing in "Tchou-tche" the river Chui, Tomashek supposes in the name of the youngest son "No-tou-lou-che" Turkic "the fourteenth" (ондурчи), but the number of the sons was only four, not fourteen and No-tou-lou-che was the eldest son not the youngest one [10, p. 64-65].

With all the interest, through the presented by the legend under consideration it can be seen that it serves only as the picture of the Turk toukioues in the VIth century regarding their origin of their own and the closest neighboring Turkic tribes from whom only some had historical future. In the legend the absence of various information and even mentions about such kind of old and numerous Turkic tribes as the Huns, the Changli, the Gaogeans who had come onto the history stage a lot years earlier than the appearance of toukioues makes the story only a legend about the origin of the Turk toukioues, but not about all the Turkic people and its main tribes. Perhaps, of course, in the legend in is pictured remote and vague memories about ancestral home of all the Turks in the North of the Altai, but the legend mainly presents only the tradition of the origin of the Khanate clan or rather dominant generations who united the disparate Turkic genera living in the southern slopes of the Altai and gave their unions and tribes admitted or given name of Turk.

This legend given with some details about the origin of the Turks is not a single and the most ancient one. A century before it, in the Vth century by the Chinese a legend about the Gaogeans was recorded, as it narrates this Turkish tribe is the generation of a wolf and a daughter of one of the Huns' rulers [6, p. 248-249]. At the same time with the above mentioned legend created in the VIth century, the Chinese have also a heritage and as it recorded there the Turk toukioues are the descendant born by a she-wolf and a boy of ten who was from the tribe of the Huns that had been exterminated by the enemies of the clan. The boy's legs and arms had been chopped off. A she-wolf fed him, until the enemies found out about miraculous conservation of the boy's life and killed him; then the she-wolf had to escape in a valley surrounded by the impassable mountains from all sides (Altai) and there gave birth to twelve sons of whom the Turk toukioues originated [6, p. 256-257]. All these legends as a legend about the Mongolians origin from "the sky born by a brown wolf and a grey doe" and other ones like that don't give for determining the origin of the nations and tribes and their ethnic structure besides vague and mysterious allusions representing echoes of that remote evolution phase of human society when primitive clans worshiped different animals considering themselves their descendants.

Folk legends kept for us by Muslim authors Juvaini, Rashiddiddin, Abulgozi Bahadir-khan and others in the XIII and XIVth centuries is much richer in fit ethnic materials. To these authors didn't reach ancient folk legends about the origin of Turkic tribes that have historical, ethnic and social foundation; they were content with naïve etymology: the Uighur is the essence of a tribe that was allies or followers of legendary Oguz-khan, for the word "uighur" must mean "follower", "united" from the Turkic language; the Changli come from those warriors of Oguz-khan who made carts to carry prey and reserves, for "changli" means "a cart" in Turkic; the Quarlique went from Oguz-khan's people showered with snow for "quarlique" means "a snowman" and so on [17]. The later is a written legend about the origin of the Turkic tribes and the more it undergoes literary processing the less value it has as a reliable material. With interest but with no quite success attempt was made by a mayer H. G. Raverty to systemize these legends by the muslim authors in the article "On the Turks, Tattars and Mughals". The author of the article stopped at some sort of partly agreement with a lot of contradictions between versions the authors had, but he didn't approach critically to legendary stories and study additives and fictions raising the question how

much the data in the legends corresponded the truth [9, p. 74].

Only simple, plain, mostly oral, genealogical legends that can be found in those Turkic tribes who still kept nomadic and firm genera lifestyle playing the most important role in their life haven't lost their great value. These tribes still hold firmly on to the memory of degrees of consanguinity or the blood ties and relationships between generations that they imagine.

In the VIIIth century the Turk toukioues forgot these legends that had been written by the Chinese two centuries before. At least in the memorial Kultegin in 732 their history begins straightly with Tou-muen-khan. "When the blue sky established above and the dark earth below, between them appeared Sons of Man. Between the Sons of man Chumpai Bumin-Khagan, the famous khan rose. He established clans (Stämme) and laws of the Turkic people and ruled them all" [8, p. 17-22]. At the top of heroic works of Bumin-Khagan is put organization of clans. Though we had to alter the presented translation, (Later V.V. Radlov gave such a look to the part of his initial translation: "Between the Sons of Man my forefather Bumin-khan, the famous khan rose as a ruler. Er hielt die Stämme und Gesetze des Türkenvolks in Ordnung and verbesserte sie" [17, p. 439]. According to prof. Thomson: Au-dessus des fils des hommes seleverent mes ancètres Boumin khagan et I-tèmi kagan. Après ètre devenus maitres, ils gouvernèrent et tixerent I'empire et les institutions du peuple ture [4, p. 97].

According to prof. Thomson's interpretation: киси оглында бзе ечюм апам бумын каган истеми каган олурмыш, олурыпан тюрк будынынг илик тёрюсин тута бирмие ити бирмис – the closest translation form is: "As the head of the Sons of man rose my ancestors Bumin-khagan and Istemi-khagan. Becoming the rulers, they established and strengthened independent (*state*) governing (*ilin*) and traditions (*laws*) of the Turkic nations." – "il" in this and other places of the records, as in the title "il-khan" which according to the words of the Chinese was adopted by Tou-muen-khan, expresses the meaning of independent governing tribe or state living in genera nomadic lifestyle. Such kind of tribes are called in the records "illig" for example: *иллиг илеиретмис, каганлыгыг кагансиретмис*, i.e. those who gain independent governing, who gained khagan would deprive them from it [4, p. 102]. As for Istemi-khagan, in different places of "Tien-shu" the name of Che-tie-mii [6, p. 354] is mentioned as the ancestor of the western-turkic khanates, from what it can be with probability concluded that this Che-tie-mii [1, p. 463], (he-tie-mi, is a brother of Tou-muen-khan; according to the opinion of Visdelou, Che-tie-mii or Se-ti-mii was the second son of Tou-muen-khan [14, p. 109]) was a brother of the powerful founder of the Turk and Che-tie-mii, Se-ti-mii or Istemi-khan in the records and his generation got the western half of the possessions of the Turk toukioues, as the eastern part was the possession of Tou-muen-khan's generation) but with the patriarchal tribal life of nomads, clans and the combination of clans and their parts in genera and tribal unions really had predominant role in every way. A strong, numerous, friendly clan had a great opportunity to occupy better pastures, to protect their members from external enemies, to create an opportunity to their chief for firm political influence in tribal and state affairs and to provide bigger amount of prey and tribute incoming for the benefit of the tribe or state.

Though numerous of the clan gave it strength, because of the household terms of using pastures and other reasons didn't give the way to the clan to keep its unity for indefinite period of time and sooner or later made it divide more or less independent parts. In the result of it in every clan there stood, from one point, the terms demanding to keep genera unity, and from the other point there existed much or little strong aspiration to division. The struggle of these opposing currents usually complicated and intensified because of the rivalry between the chiefs and people in the clan, the one from which wishing to keep the whole powers of the clan they ruled, defended the clan unity, and the other ones counting on supremacy in falling parts of the clan, sought fragmentation. Aspiration to division would often take over, but too small and powerless units finding no benefit would call to form much bigger genera units usually consisting of various clans or even tribes. But such kind of units having weak blood ties were inclined to disintegrate with even greater speed and ease. V. V. Radlov rightly deduced from his observations over the Russian and Chinese Kyrgyz - Kazakh of whom the last took advantage of almost independence, because the Chinese government didn't interfere their internal affairs, as the structural movement within the clan and tribe is "a vital need of nomads" and in these regular structural changes "the vitality of the whole nation is supported". Impossibility of making up new genera and tribal units among nomads deprived from their independence, to his mind, causes "stagnation undermining their well-being"[12, p. 72].

The history of the Turkic nomads, succeeded in Mongolia shows that they arose as a result of the reinforcement of one of the tribes at the head stood brave, clever and lucky in their work founders who could subjugate the clans of his tribe to their influence and conquer the rest of the tribes. They succeeded in consolidating their power through putting at the head of their clans and tribes their relatives or righteous who would be obliged for their promotion before them. The fall of the Turkic tribes usually happened during internal feuds in a khanate house, but always under the predominant influence of aspirations of clans and tribes to independence when their chiefs already united their interests with the clans' interests. After the fall of the dominant tribe more or less time

duration of isolation of clan unions came, until one of the tribes grew stronger and subjugated the rest to its influence, founding a new state. This way arose and fell in Mongolia the state of the Huns, the Turk toukioues and the Uighur. The same aspiration of the clans and tribes to independence played predominant role in the fall of uluses juchi and jagatay based by the Mongolians and their political weakness and insolvency of Kyrgyz-Kazakh union arose in their place.

In this way the clans not only took advantage of universal significance in everyday life of the Turkic nomads, but played quite important role and in their political history. It is natural that with such importance of a clan, when the whole life and fate of a nomad was determined by his affiliation to a clan, clan names should have been extremely firm. The clans could join different unions wholly or partly, but they were to keep their original name firmly. And in fact, as we can see, names of clans recorded many centuries ago by the Chinese historians, of course in the result of political significance of clans carrying them and nowadays exist partly. This condition gives opportunity of finding out, to a large extent, ethnic composition of those of currently existing Turkic tribes and nationalities who have kept a nomadic and tribal lifestyle, and at the same time generic names. Among the Turks who long before had gone over to settled lifestyle and lost tribal one, generic names have disappeared also that's why in order to find out the ethnic composition of these settled Turks one has to use only those data about their genera composition belonging to the time when happened their settled lifestyle.

Besides generic names another index to ethnic composition of Turk-nomads and also related to tribe genera can serve clan tamgas, i.e. signs of clan property, primarily imposed on cattle but also found on other property of the clan and its members and used in the form of emblems, seals instead of signs and so on. It seems the oldest mention about tamgas among Turks (especially among the Gaogeans) goes back to the Vth century: "Mainly on the domestic livestock they put signs, and though it clings to someone else's, nobody takes it" [6, p. 250]. But no doubt that clan tamgas existed incomparably more distant times among Turk cattle breeds. Very likely clan tamgas initially were the description of generic gods or patron spirits and only later turned into clan property signs, for this accepted forms of the simplest geometric figures as the most comfortable to cut up or burn. According to numerous observations among the East Finnish tribes whose tribal life began to fall long time ago a tamga for a new family separated from the old one is created through adjoining prefixes to the tamga of the former family. This case leads to a thought that in this way went creation of tamgas of separated branches at their initial separation. If it is true then existing clan tamgas must introduce from which clans the current generic units come from. So in the Dulat branch of the Big Horde the main tamga (of the Dulat generation) is a circle **O**.

Genera of the mentioned tribes have tamgas from the main tamgas with different additional lines or impose general tribal tamga on the special part of animals for every clan.

It can be summed up that in the result of historical events in the multi-centurial life of the Turkic tribes there aren't thoroughbred tribes and clans and the unions of different origins consisting of units from various blood ties prevail.

If the tamgas, especially of the Turkic tribes and nationalities that have kept their tribal and nomadic lifestyle, were collected and investigated, they would serve as the most important means giving much information about ethnic composition of the tribes and nationalities.

Specific peculiarities of lifestyle, dialects, observation of physical features, general ethnographic, archeological, linguistic and anthropological investigations, of course, can be considerably conductive to explore ethnic composition of various nationalities, but regarding the Turkic tribes, the amount of our knowledge in these fields of science is so little (though it was done much), that at the time being ethnography, archeology, linguistics and anthropology cannot provide with enough information about it. Therefore, only clan names and tamgas are remaining to be the main indexes to ethnic composition of the Turkic tribes and nationalities.

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COGNITIVE GRAMMAR IN ENGLISH LESSONS

Abstract: *Every English teacher who teaches Uzbek-speaking students knows that the main grammatical difficulties they face in the classroom are related to the acquisition of articles, prepositions and grammatical forms of the verb. As for articles, everything is clear: there are no articles in Uzbek, so the student should understand why they are needed in English and what their function is. The situation with prepositions is somewhat different: prepositions are also present in Uzbek, but the student is usually confused by their large number and the peculiarities of their use in English. Finally, as for the so-called tenses – or rather, the form of the verb-many students experience significant difficulties in mastering the skills of their correct use for a simple reason that we describe in this article.*

Key words: *cognitive grammar, sensory contextualization, observer, view, time.*
Language: *English*
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Introduction

Conventional descriptive and pedagogical grammars that interpret the meaning of various grammatical phenomena based on so-called semantic categories often do not help to shed light on the mystery of the functioning of the same articles or verb forms. That is why, as for the reliance on the native language in explaining the phenomena of another language, we do not have to talk about it at all, since there is simply no such reliance – especially given the fact that universities are increasingly preferring authentic textbooks published in England or America. At the same time - and this is also a fact-in foreign universities, when hiring teachers of English as a foreign language, preference is usually given to those for whom English is not their native language.

The logic here is simple: those who have mastered a foreign language themselves will be better able to take into account and help overcome the difficulties that students face in the learning process, and if the native language of students is the same as that of the teacher, the teacher can very effectively organize the educational process, based on their own experience of mastering a foreign language and overcoming difficulties caused by significant inter-linguistic differences. If, in addition, it will also rely on modern achievements in the field of language research as a cognitive activity, many of the so-called difficulties that students face will turn out to be imaginary and easily overcome. However, to do this, we need to understand well why such categories as, say, time and type are needed in a language at all, in order to clearly and simply explain the principles of functioning of the corresponding forms. This understanding provides a cognitive approach to language as an activity rooted in sensory experience.

The imaginary and real difficulties

Anyone who speaks Uzbek as a native language knows that there are three tenses, so when they start learning English and learn that there are twelve tenses, the student finds himself in a state of perplexity, which often remains with him for life, preventing the functional mastery of verbal grammar. However, if you ask the question, what other tenses are there in the English language besides the present, past, and future, it turns out that it is impossible to answer it positively - because what is commonly called “tenses”, in fact, are not tenses, but species-modern forms (see table. 1), which are classified very inconsistently in grammars.

The name of any of the twelve English “tenses” begins with one of three words: Present, Past, Future. There are four types of present, four types of past, and four types of future, which are known as Simple,

Progressive, Perfect, and Perfect Progressive. The term “simple tense” (in the American grammatical tradition) indicates the formal principle of classification: the form is simple, because it consists of an infinitive, to which a suffix can be added. We are describing the morphological forms of the present and past tense. Although in theoretical grammars, *will + Infinitive* is not considered as a tense forms of the verb, functionally this construction is nevertheless included in the system of expression of tense forms relations, so it can be considered as a conditionally simple form-especially in cases of neutralization of the modal shade in the meaning of the verbs will and shall in the clitic 'll. However, grammarians say “A”, they don't say “B”, and they don't call the other forms complex, even though they consist of two or more words. Similarly, in the British tradition, simple forms are called “indefinite tense”, but the concept of uncertainty in relation to these forms is not disclosed, just as there is no opposite concept, and the corresponding term “definite tense”. The statement often found in grammars that an indefinite form is used when the time of an action or event is not defined or specified does not correspond to reality, as the following example well shows: He arrived in Samarkand at exactly 11 a.m. on the 28th of March, 2020.

Table 1. Simple and complex forms of the English verb in the active voice

TENSE	Simple / Indefinite	[Complex?]/ [Definite?]		
		PROGRESSIVE be + Ving	PERFECT have + Ven	Character of interaction
Present	I fly	I am flying	I have flown	I have been flying
Past	I flew	I was flying	I had flown	I had been flying
Future	I'll fly	I'll be flying	I'll have flown	I'll have been flying

Strange as it may seem, the main real difficulty in mastering English “tenses” is not so much the peculiarities of the functioning of English verb forms as such, but rather the metalanguage knowledge that students have acquired in Uzbek lessons in secondary schools. Orthodox grammatical theory in Uzbek studies imposes on students knowledge about the forms and functions of the Uzbek verb (such as temporal and pledge forms), which has a very remote relationship to the understanding of the cognitive mechanisms underlying their system, that is, determining the features of the functioning of grammatical meaning.

A cognitive approach to time and species

Without dwelling in detail on the criticism of orthodox grammatical theory, we will briefly outline the approach to the categories of verbal tense and type within the framework of the cognitive theory developed by the author and the method of teaching English based on it. With the help of the category of time a person divides the entire world around him into three spheres of experience:

1) experience, directly entering into the sphere of perceived by the senses and perceived reality, or the present (present, from Latin praesens ‘that which is before the senses’);

2) an experience that persists as a memory of what passed “by” our feelings, or the past;

3) an experience that is predicted based on existing knowledge, or the future.

It is very important to understand that, unlike English, Uzbek does not have an unambiguous correspondence between these concepts and the so-called verb forms.

Thus, every time we talk, we talk either about what we know (without specifying the source of information by grammatical means), or about what we observe (choosing the form in which the reference to the observer is grammaticalized). The “DEFINITE-INDEFINITE (source of information)” juxtaposition forms the basis of species juxtaposition as a grammatical category of a verb word, but this is not the whole story: situations when we talk about what we directly observe can differ significantly depending on what we see (hear, etc.). to express this cognitive meaning, the English language has its own special form of the verb - Perfect. This form is used when we compare what we see with what was before, and based on this comparison we draw a certain conclusion based on background knowledge. Finally, there may be cases where we are talking about a directly observed action, and at the same time we are comparing what we see now with what we saw at some point (or moments) before. Perfect Progressive can be used even when the action itself is not observed at the moment of utterance – if there are observable signs that are closely related to it in time.

The proposed cognitive approach to teaching English grammar allows us to see that there are no fundamental differences in functional nature between the modern forms of English. In other words, the systems of verb forms in the two languages (Uzbek and English) are arranged and function in a similar way. To understand how English verb forms function, just need to understand – at the level of rational understanding-what determines the features of the functioning of verb forms in the Uzbek language. This is the understanding given by the cognitive theory of time and type, which allows us to formulate a simple

algorithm for choosing a particular verb form in discourse, which, unfortunately, traditional grammars are not able to do.

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