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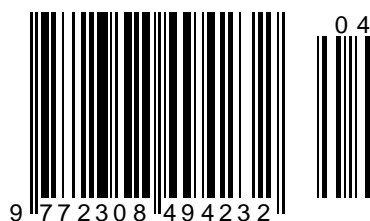
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THERMAL CONDUCTIVITY OF A POROUS MATERIAL WITH AN ORDERED STRUCTURE BASED ON A SCHWARZ P TRIPLE PERIODIC MINIMAL SURFACE, TAKING INTO ACCOUNT THERMAL CONDUCTIVITY OF AIR

Abstract: The paper studies the heat-conducting properties of a porous material with an ordered structure, based on Schwarz P TPMS, taking into account the thermal conductivity of air in the interpore space. Thermal conductivity was studied for a TPMS material made of aluminum. The problem of thermal conductivity was solved by the finite element method in the Steady-State Thermal module of the ANSYS software package. The obtained results demonstrate that the thermal conductivity of the TPMS material with air is higher by 1.1% than the thermal conductivity of the lattice without air. The dependences obtained during the study will make it possible to predict the thermal conductivity of a TPMS material for applications in a variety of engineering problems.

Key words: thermal conductivity, air, TPMS, ANSYS, finite element method.

Language: Russian

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ТЕПЛОПРОВОДНОСТЬ ПОРИСТОГО МАТЕРИАЛА С УПОРЯДОЧЕННОЙ СТРУКТУРОЙ, ОСНОВАННОЙ НА ТРИЖДЫ ПЕРИОДИЧЕСКОЙ МИНИМАЛЬНОЙ ПОВЕРХНОСТИ ШВАРЦА P, С УЧЕТОМ ТЕПЛОПРОВОДНОСТИ ВОЗДУХА

Аннотация: В работе проводится исследование теплопроводящих свойств пористого материала с упорядоченной структурой, основанной на TPMS Шварца P, с учётом теплопроводности воздуха в межпоревом пространстве. Теплопроводность изучалась для TPMS-материала из алюминия. Задача теплопроводности

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решалась методом конечных элементов в модуле *Steady-State Thermal* программного комплекса ANSYS. Полученные результаты демонстрируют, что теплопроводность TPMS-материала с учетом воздуха выше на 1,1% теплопроводности решетки без воздуха. Полученные в ходе исследования зависимости позволяют прогнозировать теплопроводность TPMS-материала для прикладного применения во множестве инженерных задач.

Ключевые слова: теплопроводность, воздух, TPMS, ANSYS, метод конечных элементов.

Введение

УДК 536.2

Разработка материалов с прогнозируемыми теплофизическими свойствами является важной задачей для многих областей науки и техники, таких как энергетика [1-3], машиностроение [4,5], электротехника [6,7], аэрокосмическая промышленность [8], строительство [9,10] и т.д.

Одним из наиболее важных теплофизических свойств материалов является теплопроводность – способность материала передавать тепло. Прогнозирование теплопроводности материала играет важную роль в решении множества инженерных задач, связанных с конструированием систем охлаждения, проектированием зданий и сооружений, разработкой теплообменных устройств и многого другого [1-3,11].

Задача разработки материалов с прогнозируемыми свойствами решается на макро- и микроуровне. На микроуровне разработка новых материалов может включать создание структурных материалов на основе наночастиц, полимерных нанокомпозитов или композитов с наночастицами металлов [12]. Эти материалы могут иметь уникальные свойства, такие как: высокая термостойкость, устойчивость к износу, высокая проводимость и т.д. На макроуровне новые материалы могут быть разработаны путем

комбинирования различных материалов [13], таких как стекловолокно, углеродное волокно или полимерные материалы, а также путем конструирования упорядоченных и неупорядоченных решеток, для получения пористых структур.

Наибольший интерес как для прикладных, так и для научных задач представляют пористые материалы с упорядоченной структурой, поскольку моделирование таких материалов значительно упрощается с использованием различных численных [14] и аналитических методов [15].

Среди упорядоченных структур особого внимания заслуживают трижды периодические минимальные поверхности (TPMS от англ. triply periodic minimal surfaces). TPMS состоят из двух отдельных непересекающихся объемов, разделенных стенкой имеющей минимально возможную площадь при заданных ограничениях. TPMS делит трехмерное (3D) пространство на два взаимопроницающих канала для создания большого отношения площади поверхности к объему. TPMS встречаются в природе, например, в биологических мембранах, горных кристаллах и сополимерных фазах в качестве межматериальных разделительных поверхностей. На рисунке 1 изображена TPMS Шварца Р, являющаяся объектом данного исследования.

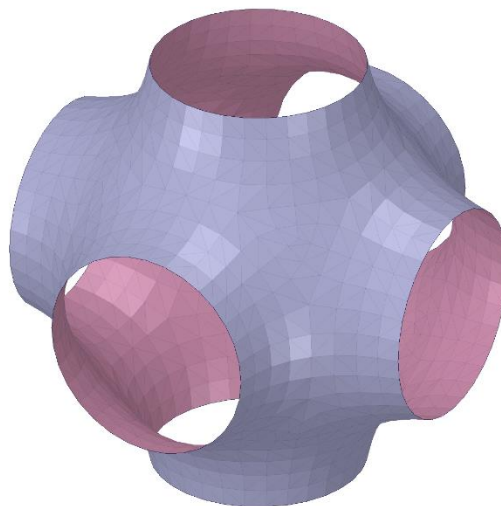


Рисунок 1. TPMS Шварца Р.

Трижды периодические минимальные поверхности можно точно описать при помощи

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тригонометрических функций вида $f(x, y, z) = c$. Для описания TPMS Шварца Р применяется следующая функция:

$$\cos(x) + \cos(y) + \cos(z) = 0. \quad (1)$$

Важно отметить, что обладающие высокой прочностью TPMS-материалы находят широкое распространение в сферах медицины [16-19], машиностроения [20], конструирования различного оборудования [21], шумоизоляции [22] аэрокосмической отрасли [23,24] и т.д. На сегодняшний день существует большое количество исследований, посвященных изучению свойств TPMS [24-31]. Однако, малоизученным является влияние воздуха, заполняющего полости внутри

TPMS решетки, на теплопроводность TPMS-материалов.

В рамках данной работы проводится исследование теплопроводности TPMS-материала, решетка которого основана на TPMS Шварца Р с учётом теплопроводности воздуха, заполняющего полости внутри TPMS решетки.

Теоретическая часть

Исследуемая TPMS Шварца Р обладает кубической симметрией [32]. В связи с этим пористый материал с TPMS топологией будет состоять из идентичных и последовательно соединенных в направлениях осей OX, OY, OZ элементарных ячеек (рис. 2).

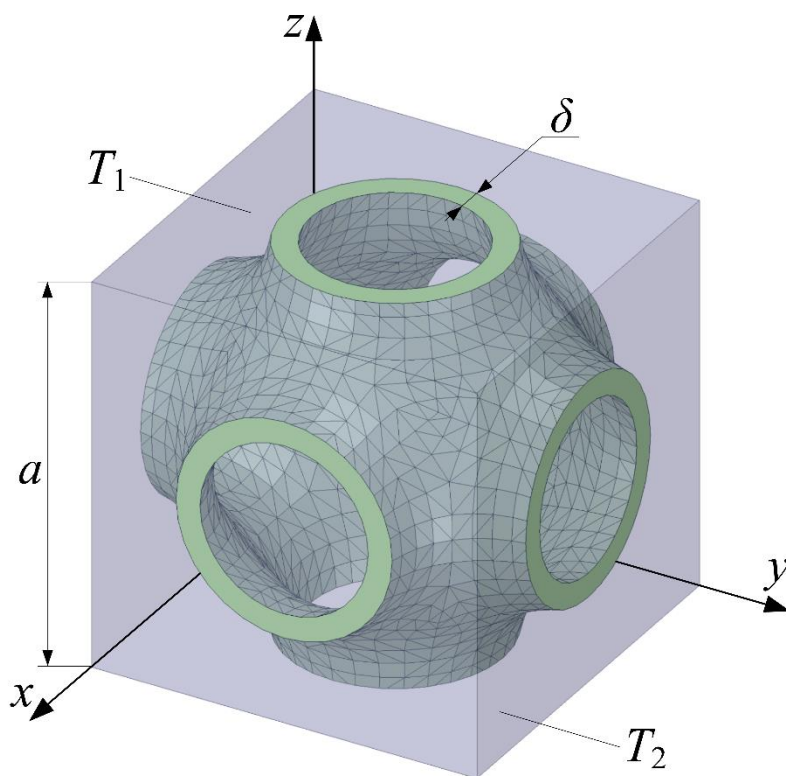


Рисунок 2. Геометрия элементарной ячейки TPMS Шварца Р

Изображенная на рисунке 2 элементарная ячейка обладает двумя характерными геометрическими параметрами: a – длина ребра куба; δ – толщина стенки TPMS.

Согласно закону Фурье, теплопроводность в рассматриваемой геометрии определяется следующим образом

$$\lambda = \frac{qa}{\Delta TS}, \quad (2)$$

На гранях куба накладываются граничные условия первого рода $T_1 = 0^\circ\text{C}$ и $T_2 = 100^\circ\text{C}$.

Учитывая граничные условия и $S = a^2$ выражения (2) примет вид:

$$\lambda = \frac{q}{(T_2 - T_1)a}. \quad (3)$$

Для определения теплопроводности ячейки по формуле (3) необходимо знать значение теплового потока q . Данное значение определялось с использованием численного решения данной задачи в модуле Steady-State Thermal программного комплекса ANSYS.

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Сетка для решения задачи методом конечных элементов изображена на рис. 3 и состоит из 1,5 млн. элементов.

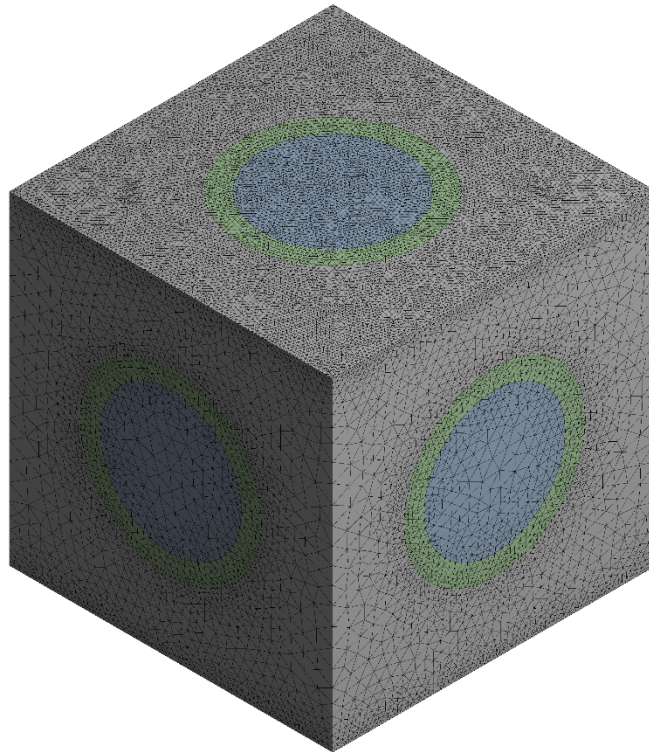


Рисунок 3. Сетка для решения задачи методом конечных элементов

В качестве исходных материалов были выбраны алюминий с теплопроводностью 202,4 $Вт/м^{\circ}С$ и воздух – 0,0242 $Вт/м^{\circ}С$.

При решении задачи теплопроводности в элементарной ячейке были приняты следующие допущения:

1. На всех гранях куба, где не действует ГУ 1 рода, теплообмен отсутствует.
2. Теплообмен конвекцией и излучением отсутствует.

Результаты

При решении задачи теплопроводности в TPMS-материале при помощи модуля Steady-State Thermal программного комплекса ANSYS были получены значения теплового потока q в сечении элементарной ячейки при различных геометрических параметрах. Результаты вычислений представлены в таблице 1.

Таблица 1.

Длина ребра куба a , м	Толщина стенки ячейки δ , м	Плотность теплового потока q , $Вт/м^2$
0,01	0,0004	137570
0,01	0,0006	212430

При помощи формулы (3) была определена теплопроводность элементарной ячейки Шварца Р при различных геометрических параметрах.

Результаты расчета изображены на графике на рис. 4.

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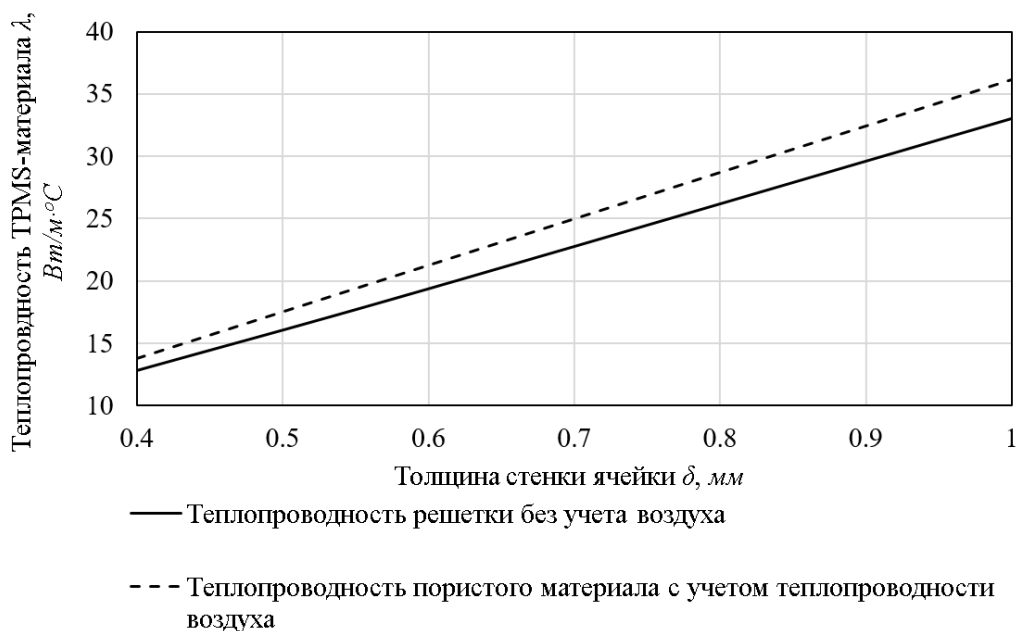


Рисунок 4. График зависимости теплопроводности TPMS-материала от толщины стенки ячейки

Из графика видно, что зависимость теплопроводности от толщины ячейки имеет линейный характер при неизменной длине ребра куба. Теплопроводность пористого материала с учетом теплопроводности воздуха приблизительно на 1,1% выше теплопроводности решетки без воздуха.

Заключение

В настоящем исследовании был изучен пористый материал с упорядоченной структурой, основанной на TPMS Шварца Р. В ходе работы оценивалось влияние воздуха на теплопроводность TPMS решетки изготовленной

из алюминия. Был получен график зависимости теплопроводности TPMS-материала от толщины стенки ячейки, которая изменялась в диапазоне $0.4 < \delta < 1$ мм при постоянной длине ребра куба $a = 10$ мм. Из анализа полученных зависимостей можно заключить, что теплопроводность оказывает незначительное влияние (приблизительно 1%) на TPMS решетку, изготовленную из алюминия. Однако очевидно, что при исследовании влияния воздуха необходимо также учитывать конвективный перенос тепла в межпоровом пространстве, что будет являться целью дальнейших исследований.

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Article



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EXHIBITION OF THE PRINCIPLES OF INTERNATIONAL HARMONY IN TASHKENT CITY MUSEUMS

Abstract: This article analyses the history, religious and artistic significance, as well as the technique of processing of icons, paintings and works of applied art of different nationalities in the exhibition halls of large and home museums in Tashkent. Also, through them, methods of spiritual influence on the audience are provided.

Key words: collection, icon, graphics, picture, artist, painting, practical art, confession, organization, excursion.

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ВЫСТАВКА ПРИНЦИПОВ МЕЖДУНАРОДНОЙ ГАРМОНИИ В МУЗЕЯХ ГОРОДА ТАШКЕНТА

Аннотация: В данной статье анализируется история, религиозное и художественное значение, а также техника обработки икон, картин и произведений прикладного искусства разных национальностей, представленных в крупных выставочных залах и домах музеев Ташкента. Также через них представлены методы духовного воздействия на аудиторию.

Ключевые слова: коллекция, икона, графика, картина, художник, живопись, практическое искусство, исповедь, организация, экскурсия.

Введение

С древних времен представители разных национальностей, народов и конфессий живут в мире друг с другом и свободно совершают свои религиозные молитвы и обряды. Сегодня в Узбекистане действуют организации, принадлежащие к 16 религиозным конфессиям. В настоящее время наше правительство проводит политику разумной религиозной терпимости. За последние годы в нашей стране принято около 100 нормативно-правовых документов и важных решений в сфере межнациональных и религиозных отношений. Если в 1991-2017 годах было принято 14 правовых документов, относящихся к данной сфере, то за истекший период после 2017 года реализовано более 40 правовых документов, указов и постановлений

Президента, постановлений Кабинета Министров. В 2021 году принята новая редакция Закона «О свободе совести и религиозных организациях» [1, с.1-15].

При подготовке этих правовых документов учитывались исторически сложившиеся в нашей стране традиции, обычаи и ценности, международные нормы и требования в этом направлении, прежде всего Всеобщая декларация прав человека, Международный пакт о гражданских и политических правах, а также Комитетом ООН по правам человека, безопасности и сотрудничеству в Европе были учтены основные правила и принципы, предложения и рекомендации, признанные в документах таких международных организаций,

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как Бюро демократических институтов и прав человека организации.

Это также находит отражение в реформах, проводимых в во всех сферах. В частности, примером большого внимания, уделяемого Президентом и правительством страны общечеловеческим задачам, определенным в международных документах [2, с.50-57].

Проделана большая работа по сохранению и изучению культурного наследия, доведению его до всеобщего сведения, повышению туристической привлекательности нашей республики. В частности, реализация плана расширения и развития международного сотрудничества в области музеев, установленного постановлением Президента Республики Узбекистан №PQ-261 от 27 мая 2022 года, и на этой основе, поднять на новый уровень сложившиеся отношения с музеями мира – требование сегодняшнего дня [3, с.1-10].

Одним из факторов, определяющих актуальность изучения роли музеев в современном обществе, является то, что, несмотря на кардинальные изменения социокультурной ситуации в начале XX и XXI веков, музей продолжает свою просветительскую деятельность. Основной темой проектов, разрабатываемых в просветительской деятельности музеев, являются проблемы социокультурной адаптации детей и подростков в современном поликультурном обществе, проблемы этнической и межкультурной толерантности. Выставочная концепция музея наводит вас на ту или иную идею, и в то же время берет на себя ответственность за уточнение идей и их согласование на основе конкретной информации.

Иван Гринько, кандидат исторических наук, культуролог, считает, что музей – это место, где формируется культурная память общества. С появлением Интернета информационная функция музея умерла. Это должно быть признано. Сегодня музеи должны выполнять социокультурную функцию: работать с населением, интерпретировать и собирать информацию, становиться местом встречи и культурного общения [7, с.1-5]. В этом направлении действуют ведущие мировые выставочные комплексы. Пока мы продолжаем относиться к музею как к старому и бесполезному, мы все еще отстаем в этом вопросе.

Современный потребитель культуры зачастую принимает хорошо раскрученный выбор. «Тотальная профанация – вот вполне реальный вектор развития культуры». Вместе с тем индустрия культуры с ее достижениями и издержками демонстрирует мобильный опыт активных стратегий внедрения любого продукта, а также демократизм, действенные методы

коммуникации. Музей с его ценностными ориентирами – противоположность профанности, обладает возможностями структурировать культурное пространство в пользу реальных ценностей, но не всегда эти возможности использует в полной мере, работая в традиционной методологии.

Сегодня музей фактически стал одним из средств массовой информации. Музеи имеют возможность влиять на национальную политику, становясь инструментом беспристрастной власти, то есть формируя новые культурные образы через культуру и образование.

Сегодня в Узбекистане несколько исчезло доверие к СМИ. Но музеи по-прежнему остаются одними из самых надежных учреждений. У большинства людей есть идея, что ассоциация представляет собой лучшие примеры, выдержавшие испытание временем. Это правда, что музеи обращаются к прошлому и формируют коллективную память. Иногда, даже не собираясь, они создают образы, объединяющие сообщества. В настоящее время музеи Узбекистана и города Ташкента практически не используют этот ресурс для работы по формированию национальной идентичности, но могли бы использовать его целенаправленно.

Музей должен показать внутреннюю связь всех культур. Например, так работает крупнейший музей Европы Бранли, расположенный в Париже. Этот музей посвящен истории мировой культуры. Он отображает традиционное искусство разных народов, чтобы посетитель мог увидеть, как связаны все культуры. Когда люди входят в этот музей, они понимают, что все народы имеют общие культурные и исторические корни. Так люди сближаются. Музей формирует толерантность к другим культурам и людям не непосредственно, а через художественно-эстетическое восприятие [7, с. 2-5].

Тенденция развивается, когда в англосаксонской традиции создаются крупные музейные комплексы, отражающие культуру всех народов страны. Например, в Новой Зеландии большой музейный комплекс The Pora состоит из двух частей. Первая часть посвящена английским поселенцам, а вторая - маори. Музей является символическим признанием наличия в стране двух больших этносов, совместно проживающих и имеющих общую историю.

В Канаде есть Музей цивилизаций, в котором представлены культуры коренных народов и всех поселенцев. У каждой диаспоры есть свое место в истории страны. Это хорошие примеры формирования гражданской идентичности. Отрадно, что подобные проекты реализуются в экспозициях музеев Узбекистана.

Если брать пример музеев города Ташкента, то экспозиции Государственного музея истории

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Узбекистана в основном отражают процессы национально-исторического становления. Экскурсия по музею начинается с карты Узбекистана, на которой 5 территориально граничащих стран начинаются с текстов дружественных отношений с ними [8, с.1-5]. В рамках экспозиции была организована экскурсия, пропагандирующая идею единства общих исторических корней человечества. Здесь на посетителя воздействуют не напрямую, а через экспонаты о межнациональной дружбе и религиозной толерантности.

В своих будущих исследованиях Музей также планирует изучить развитие инновационного музейного комплекса XXI века. Государственный музей истории Узбекистана служит главным источником укрепления самосознания людей, знаний, отражающих все достижения исторической цивилизации в развитии человечества на территории Узбекистана на основе материальных объектов.

С 15 октября по 15 декабря 2018 года под девизом «Одно место, одна дорога», в целях развития культурного обмена и сотрудничества между странами и регионами, в сотрудничестве с Государственным музеем истории Узбекистана и Шанхайским музеем народного Китая Республики и Шанхайского музея науки и техники, организована выставка «Синий и белый – символ величия Великого Шелкового пути». На выставке было представлено более 70 уникальных предметов китайского фарфора XII-XX веков.[14, с. 2-4].

В экспозиции Государственного музея искусств Узбекистана наиболее широко представлены идеи межнациональной дружбы и религиозной толерантности. В настоящее время коллекция музея насчитывает более 100 000 экспонатов, собранных по 5 разным направлениям: Узбекистан, Россия, Западная Европа и зарубежное восточное прикладное и декоративно-прикладное искусство - Корея, Китай, Япония, Индия, бирманское искусство [9, с. 1-3]. В музее есть отдельные залы искусства каждого государства, где у зрителей будет возможность познакомиться с традициями и ценностями народов. Также посредством выставки картин художников русской национальности, живших и работавших в Узбекистане, будут еще больше укрепляться узы общечеловеческих ценностей и дружбы. Ценности веротерпимости базируются на буддийских статуях, иконах русского искусства, изобразительно-практических произведениях искусства на религиозную тематику.

В центре Ташкента, за жилыми домами и торговыми центрами, недалеко от шумной дороги, находится музей, посвященный одной из самых известных женщин Узбекистана - Тамараханум.

Именем этого великой певицы и танцовщицы назван дом-музей, где она прожила последние годы своей жизни. В 30 лет Тамараханум является солисткой Узбекской филармонии и активно участвует в реформировании узбекского народного танца. Однако всемирную известность ее коллекции принесли танцы народов мира. Она могла выучить иностранные народные песни и танцы за несколько дней. Благодаря ее выступлениям в разных странах, сегодня в музее Тамараханум представлена коллекция народных костюмов, среди которых славянская одежда, китайские и другие азиатские костюмы и даже египетские костюмы. Эти предметы также вызывают у туристов чувство уважения и гордости за свой народ.

Дом-музей Сергея Бородина находится в Мирзо-Улугбекском районе столицы. Этот музей посвящен памяти русского писателя Сергея Бородина, жившего в середине XX века и написавшего в 1950-1974 годах ряд крупных жанров исторической прозы. Два зала литературной экспозиции музея охватывают основные этапы жизни и творчества писателя. В первом зале собраны воспоминания о детстве и юности Сергея Бородина. Из рисунков, писем и документов можно понять, что это свидетельствует о том, что интересы будущего писателя сформировались рано. Во втором зале нельзя не заметить экспозицию, рассказывающую о деятельности Сергея Бородина с 1930-х годов до последних дней его жизни. В мемориальной части музея сохранились предметы быта писателя. Библиотека, обогащенная более чем 10 000 книг, и картины, висящие на стенах, подаренные друзьями-художниками, добавляют своеобразный уют. В творческой комнате писателя лежат стопки бумаг и семейные фотографии.

Опыт работы узбекских музеев последнего десятилетия показал перспективность спонсорства и заинтересованность в нем бизнес-структур. Поддержка культуры со стороны бизнеса является полезной не только для культуры, но и для общества и для самого бизнеса, демонстрирующего таким образом свою социальную ответственность. Такая поддержка может быть бескорыстной (меценатство) или она может предполагать определенные не прямые выгоды для частных предприятий (спонсорство). К числу не прямых выгод для частного бизнеса относятся реклама предприятия спонсора, улучшение его репутации, имиджа, развитие кругозора и творческого потенциала сотрудников и т.д.

Узбекистан накопил уникальный опыт налаживания международных отношений. При этом соблюдался принцип достижения всеобщего единства всех национальностей в стране, не ограничиваясь реализацией национального

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самосознания, воспитанием национальной гордости и сохранением языка, культуры и обычаев наций. Музеям еще многое предстоит сделать.

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Article



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CONSTRUCTING OF SECOND-ORDER LINEAR DIFFERENTIAL EQUATION IN MAPLE SYSTEM

Abstract: The linear differential equation theory occupies an important place in mathematics applications to various branches of science and technology, with the fact that by means of these equations the construction and investigation of solutions is greatly facilitated. The rapid advancement of modern systems of analytical calculations creates the possibility of theoretical research and practical implementation in these systems. This is furthered by the great possibilities of computer mathematics systems, which have such advantages as the speed of computation, the efficiency of the result, the reduction of labor intensity of calculations.

Key words: linear differential equations, linearly independent functions, fundamental system of solutions, Wronskian, Lagrange method.

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Introduction

Among the most extensive ways to investigate chemical, physical, economic, biological, and social phenomena through mathematical methods is to model them with differential equations and their systems. The most ordinary models of phenomena and processes can be described by common differential equations and indeed by their more narrow class, the linear differential equations. These equations have remarkable properties that greatly simplify the process of constructing and investigating solutions [1]. At the same time, as the order of a differential equation increases, different problem solving procedure

involving these equations is accompanied by complicated mathematical calculations and computations. This process can be simplified by computer mathematical systems (CMS). Given the advantages that CMSs have, the development of mathematical products in symbolic computation systems is the most a reasonable method for the solution of linear differential equations for their consequent application.

It is well known from the differential equation theory that a linear differential equation has the following form:

$$y^n + p_1(x)y^{(n-1)} + p_2(x)y^{(n-2)} + \dots + p_{n-1}(x)y' + p_n(x)y = f(x), \quad (1.1)$$

where $p_0(x), p_1(x), \dots, p_n(x)$ are coefficients, $f(x)$ are continuous functions in the interval (a, b) has a single solution satisfying the original terms:

$$y = y_0, y' = y_0', \dots, y^{(n-1)} = y_0^{(n-1)},$$

where $x = x_0, x_0 \in (a, b), y_0, y_0', \dots, y_0^{(n-1)}$ are any given numbers. This singular solution is defined and n is differentiable in (a, b) . (1.1) has no special solutions. A partial solution is any solution to (1.1) [2].

Taking $f(x) \equiv 0$ in (a, b) the equation (1.1) is homogeneous:

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$$\begin{vmatrix} y_1^{(n)} & y_1^{(n-1)} & \dots & y_1' & y_1 \\ y_2^{(n)} & y_2^{(n-1)} & \dots & y_2' & y_2 \\ \dots & \dots & \dots & \dots & \dots \\ y_n^{(n)} & y_n^{(n-1)} & \dots & y_n' & y_n \\ y^{(n)} & y^{(n-1)} & \dots & y' & y \end{vmatrix} = 0 \quad \text{at } x \in (a, b), \quad (1.7)$$

which is necessary for the cohesion of system (1.6) and equation (1.2). Equality (1.7) can be expressed in the form:

$$\begin{vmatrix} y_1 & y_2 & \dots & y_n & y \\ y_1' & y_2' & \dots & y_n' & y' \\ \dots & \dots & \dots & \dots & \dots \\ y_1^{(n)} & y_2^{(n)} & \dots & y_n^{(n)} & y^{(n)} \end{vmatrix} = 0 \quad (1.8)$$

Using the decomposition of determinant (1.8) by column, namely by the elements of the last column, we obtain the equation. By dividing all the terms of the last equation by $W(y_1, y_2, \dots, y_n)$, we obtain the equation we are looking for [4].

There is also another way of constructing the (1.2) equation, specifically identifying the equation's coefficients using its fundamental system of solutions

[2]. For example, for a linear homogeneous equation of order 2:

$$y'' + p(x)y' + q(x)y = 0, \quad (1.9)$$

if $\{y_1, y_2\}$ is a fundamental system of solutions to the equation, the coefficients $p(x), q(x)$, are defined as follows [3]:

$$p(x) = -\frac{W'(y_1, y_2)}{W(y_1, y_2)}, \quad q(x) = -\frac{y_1''}{y_1} + \frac{y_1' W'(y_1, y_2)}{y_1 W(y_1, y_2)} \quad (1.10)$$

The equation corresponding to $\{y_1, y_2\}$ - the basic solution system of the equation has the form:

$$y'' - \frac{W'(y_1, y_2)}{W(y_1, y_2)} y' + \left(-\frac{y_1''}{y_1} + \frac{y_1' W'(y_1, y_2)}{y_1 W(y_1, y_2)} \right) y = 0 \quad (1.11)$$

Let's compose a differential equation if $\{y_1 = e^x, y_2 = e^{-x}\}$ is the fundamental system of

solutions to the equation. We equate the Wronskian of solutions to zero:

$$\begin{vmatrix} y_1 & y_2 & y \\ y_1' & y_2' & y' \\ y_1'' & y_2'' & y'' \end{vmatrix} = 0 \Rightarrow \begin{vmatrix} e^x & e^{-x} & y \\ e^x & -e^{-x} & y' \\ e^x & e^{-x} & y'' \end{vmatrix} = 0 \quad (1.2)$$

We calculate the determinant on the left side of the last equality:

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The system (1.15) is an algebraic linear inhomogeneous system with respect to the functions $C'_i(x)$. From (1.15) we find $C'_i(x)$:

$$C'_i(x) = \frac{W_{ni}(x)f(x)}{W(x)} \quad (1.16)$$

In (1.16) $W_{ni}(x)$ is the algebraic addition of the elements of the n row of the determinant $W(x)$, and the functions of the relation $\frac{W_{ni}(x)f(x)}{W(x)}$ are continuous in the interval (a, b) . [3]

Knowing $C'_i(x)$ of (1.16) has the form:

$$C_i(x) = \int_{x_0}^x \frac{W_{ni}(x)f(x)}{W(x)} dx + C_i, (i = 1, 2, \dots, n), \quad (1.17)$$

where $C_i = const$, $x_0 \in (a, b)$.

We obtain the expression for y by substituting the values of functions $C_i(x)$ in (1.14):

$$y = \sum_{i=1}^n y_i \int_{x_0}^x \frac{W_{ni}(x)f(x)}{W(x)} dx + \sum_{i=1}^n C_i y_i \quad (1.18)$$

To obtain the solution of the inhomogeneous equation (1.1), the arbitrary constants must be equal to zero: $C_1 = C_2 \dots = C_n = 0$, then:

$$y_u = \sum_{i=1}^n y_i \int_{x_0}^x \frac{W_{ni}(x)f(x)}{W(x)} dx \quad (1.19)$$

If we have an inhomogeneous linear equation of order 2:

$$y'' + p(x)y' + q(x)y = f(x), \quad (1.20)$$

the general solution by formula (1.18) will be written as [3]:

$$y = -y_1 \int_{x_0}^x \frac{y_2 f(x)}{W(x)} dx + y_2 \int_{x_0}^x \frac{y_1 f(x)}{W(x)} dx + C_1 y_1 + C_2 y_2 \quad (1.21)$$

Writing the private solution of equation (1.20) by formula (1.19) is as follows:

$$y_u = -y_1 \int_{x_0}^x \frac{y_2 f(x)}{W(x)} dx + y_2 \int_{x_0}^x \frac{y_1 f(x)}{W(x)} dx, \quad (1.22)$$

under initial conditions:

$$y_1 = 0, y_1' = 0, \text{ при } x = x_0.$$

Let us make up the Wronskian solutions [6]:

Let us consider the problem of constructing a linear homogeneous differential equation Let us implement the solution in Maple. We enter the data:

```
restart; y1 := exp(x); y2 := exp(-x);
dy1 := diff(y1, x); dy2 := diff(y2, x);
d2y1 := diff(y1, x$2); d2y2 := diff(y2, x$2);
W := Matrix(3, 3, [y1, y2, y, dy1, dy2, dy, d2y1, d2y2, d2y]);
```

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$$dy1 := e^x$$

$$dy2 := -e^{(-x)}$$

$$d2y1 := e^x$$

$$d2y2 := e^{(-x)}$$

$$W := \begin{bmatrix} e^x & e^{(-x)} & y \\ e^x & -e^{(-x)} & dy \\ e^x & e^{(-x)} & d2y \end{bmatrix}$$

Let's calculate the determinant and equate it to zero, thus obtaining an equation, denoting $d2y = y''$, $dy = y'$:

$$DW := \text{simplify}(\text{Determinant}(W)); eq1 := DW = 0;$$

$$DW := -2 d2y + 2 y$$

$$eq1 := -2 d2y + 2 y = 0$$

It is also possible to make a differential equation in another way, by calculating its coefficients using the formulas (1.10) [6]:

$$\begin{aligned} W1 &:= \text{Matrix}(2, 2, [y1, y2, dy1, dy2]); \\ DW1 &:= \text{simplify}(\text{Determinant}(W1)); \\ dDW1 &:= \text{diff}(DW1, x); \\ p &:= -dDW1/DW1; \\ q &:= -(d2y1/y1) + (dy1*dDW1)/(y1*DW1); \end{aligned}$$

$$W1 := \begin{bmatrix} e^x & e^{(-x)} \\ e^x & -e^{(-x)} \end{bmatrix}$$

$$DW1 := -2$$

$$dDW1 := 0$$

$$p := 0$$

$$q := -1$$

$$eq2 := d2y - y = 0$$

Comparing the equation in the form of $eq1$ and $eq2$ we see that it is not necessary to simplify it as in $eq1$.

Let us consider the problem of constructing a linear homogeneous differential equation and finding a general solution of the corresponding inhomogeneous differential equation by the Lagrange method. We need 1) to construct a differential

equation if $\{y_1 = x, y_2 = x^2\}$ is the fundamental system of solutions of the equation; 2) to find a general solution of the linear inhomogeneous equation, knowing that $f(x) = \frac{1}{x}$.

Let us calculate the Wronskian of solutions $W(x, x^2)$:

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$$W(x, x^2) = \begin{vmatrix} x & x^2 \\ 1 & 2x \end{vmatrix} = 2x^2 - x^2 = x^2$$

Although functions $y_1 = x, y_2 = x^2$ are linearly independent at $(-\infty, +\infty)$, $W(x, x^2)$ is zero at $x = 0$. We calculate the coefficients $p(x), q(x)$ using the formulas (1.10):

$$p(x) = -\frac{2x}{x^2} = -\frac{2}{x},$$

$$q(x) = -\frac{0}{x} + \frac{1 \cdot 2x}{x \cdot x^2} = \frac{2}{x^2}.$$

$p(x), q(x)$, have discontinuities at the point $x = 0$. This is understandable, since $W(x, x^2)$ at the same point it is equal to zero. The differential equation has the form:

$$y'' - \frac{2}{x} \cdot y' + \frac{2}{x^2} y = 0.$$

$$C_1'(x) = \frac{y_1 f(x)}{W(y_1, y_2)} = \frac{x \cdot \frac{1}{x}}{x^2} = \frac{1}{x^2}, C_1(x) = \int \frac{dx}{x^2} = -\frac{1}{x} + C_1;$$

$$C_2'(x) = \frac{y_2 f(x)}{W(y_1, y_2)} = \frac{x^2 \cdot \frac{1}{x}}{x^2} = \frac{1}{x}, C_2(x) = \int \frac{dx}{x} = \ln x + C_2.$$

The general solution is:

$$y = \left(-\frac{1}{x} + C_1\right)x + (\ln x + C_2)x^2,$$

$$y = -1 + xC_1 + x^2 \ln x + x^2 C_2.$$

$$eq1 := -\frac{2 dy}{x} + \frac{2y}{x^2} + d2y = 0$$

Now compare with the result of manual calculations: the equation is correct. For the second part of the example, enter the formulas for finding $C_1(x)$ and $C_2(x)$ [9],[10]:

```
cc1 := y1*f/DW1; cc2 := y2*f/DW1;
C11 := Int(cc1, x) = int(cc1, x);
C22 := Int(cc2, x) = int(cc2, x);
```

Let us proceed to the general solution of the inhomogeneous linear differential equation:

$$y'' - \frac{2}{x} \cdot y' + \frac{2}{x^2} y = \frac{1}{x}.$$

Let us apply the Lagrange method and write a general solution to the equation:

$$y = C_1(x)y_1 + C_2(x)y_2,$$

where $C_1(x), C_2(x)$ can be found by solving the system [4]:

$$\begin{cases} y_1 C_1(x) + y_2 C_2(x) = 0 \\ y_1 C_1'(x) + y_2 C_2'(x) = f(x) \end{cases}$$

also by formulas:

$$C_1'(x) = \frac{y_1 f(x)}{W(y_1, y_2)}, C_2'(x) = \frac{y_2 f(x)}{W(y_1, y_2)}$$

Let's calculate $C_1(x)$ and $C_2(x)$ by formulas:

Now let's look at the solution of this example in Maple. For the first part of the problem, we use the program we made earlier and obtain the equation [7], [8]

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$$cc1 := \frac{1}{x^2}$$

$$cc2 := \frac{1}{x}$$

$$C11 := \int \frac{1}{x^2} dx = -\frac{1}{x}$$

$$C22 := \int \frac{1}{x} dx = \ln(x)$$

Here we find a fundamental equation solution

$$y'' - \frac{2}{x} \cdot y' + \frac{2}{x^2} y = \frac{1}{x}:$$

$$Y := (C11 + C1) * y1 + (C22 + C2) * y2;$$

$$Y := x \left(\int \frac{1}{x^2} dx + C1 \right) + x^2 \left(\int \frac{1}{x} dx + C2 \right) = x \left(-\frac{1}{x} + C1 \right) + x^2 (\ln(x) + C2)$$

Conclusion

As can be seen, finding the analytical solving a non-homogeneous linear differential equation by the Lagrange method is successfully implemented in

MAPLE. Initial entry of the problem data and further calculations involving them indicate that the program is automated.

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where $A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{pmatrix}$ - system matrix,

$B = \begin{pmatrix} b_1 \\ b_2 \\ \dots \\ b_n \end{pmatrix}$ - matrix of free terms, $X = \begin{pmatrix} x_1 \\ x_2 \\ \dots \\ x_n \end{pmatrix}$ - matrix

of unknowns.

$$L = \begin{pmatrix} l_{11} & 0 & 0 & \dots & 0 \\ l_{21} & l_{22} & 0 & \dots & 0 \\ l_{31} & l_{32} & l_{33} & \dots & 0 \\ \dots & \dots & \dots & l_{n-1n-1} & 0 \\ l_{n1} & l_{n2} & \dots & l_{nn-1} & l_{nn} \end{pmatrix}, \quad U = \begin{pmatrix} 1 & u_{12} & u_{13} & \dots & u_{1n} \\ 0 & 1 & u_{23} & \dots & u_{2n} \\ 0 & 0 & 1 & \dots & u_{3n} \\ 0 & 0 & 0 & 1 & u_{n-1n} \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}.$$

Moreover, if the elements of L diagonal matrix are non-zero, such decomposition is the only one. The A matrix decomposition is performed in n stages [1]. At each j stage, the l_{ij} elements of the subsequent j column of the matrix L are recalculated sequentially according to the formulas [3]:

$$l_{ij} = a_{ij} - \sum_{k=1}^{j-1} l_{ik} u_{kj}, \quad i = \overline{j, n}. \quad (4)$$

For the elements of the u_{ji} j -th row of the matrix U the formulas [3] are used

$$u_{ji} = \frac{a_{ji} - \sum_{k=1}^{j-1} l_{jk} u_{ki}}{l_{jj}}, \quad i = \overline{j+1, n} \quad (5)$$

Having the representation in the form (3), the matrix equation (2) is written as follows:

$$L \cdot U \cdot X = B. \quad (6)$$

Denoting the vector of auxiliary variables by Y , the matrix equation (6) has the form of the following system:

$$\begin{cases} L \cdot Y = B \\ U \cdot X = Y \end{cases} \quad (7)$$

The following statement is true for A matrix: if the principal minors of A square matrix are nonzero, then this matrix has a LU -decomposition representation:

$$A = L \cdot U, \quad (8)$$

where L - lower triangular matrix, U - upper triangular matrix with unit diagonal

Solving the first equation of the system (7), we calculate the values of the variables at $i = \overline{1, n}$ by the forward formula:

$$y_i = b_i - \sum_{k=1}^{i-1} l_{ik} y_k. \quad (8)$$

When solving the second equation of the system (7), the unknowns X at $i = \overline{n, 1}$ are found with the backward formula

$$x_i = \frac{1}{u_{ii}} \left(y_i - \sum_{k=i-1}^n u_{ik} x_k \right). \quad (9)$$

The described LU -decomposition system can be implemented only if the elements $l_{jj} \neq 0$. In addition, the proximity of these elements to zero can lead to a large loss of accuracy of the calculations. To avoid this, the solution of the system of equations by the method LU -decomposition must be implemented with the choice of the largest element l_{jj} modulo .

Therefore, in addition to matrices L and U it is necessary to store the matrix of permutations P . The permutation matrix P is obtained from the unit matrix E by permutation of rows and columns. Then the matrix A in this case has the form[4]:

$$A = P \cdot L \cdot U \quad (10)$$

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Among matrix decompositions, orthogonal ones that preserve the norm of the vector play a special role. One of the most important variants of orthogonal decompositions of A matrix is QR a decomposition of the form[1]

$$A = Q \cdot R, \tag{11}$$

where Q - orthogonal matrix, R - upper triangular matrix.

By orthogonalizing the matrix columns and then orthonormalizing them, we construct a QR - decomposition of the matrix. In the same way, applying orthogonal transformations, it is possible to come to this decomposition [1].

Let the columns a_1, a_2, \dots, a_n of the matrix $A = (a_1, a_2, \dots, a_n)$ be linearly independent.

$$U = \begin{pmatrix} u_{11} & u_{12} & \dots & u_{1,n-1} & u_{1n} \\ 0 & u_{22} & \dots & u_{2,n-1} & u_{2n} \\ \dots & \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & 0 & u_{nn} \end{pmatrix} \tag{14}$$

From here we obtain QR -decomposition $A = Q \cdot R$ with orthogonal matrix Q and upper triangular matrix $R = U^{-1}$ [3].

The QR -decomposition of the matrix can be constructed by means of rotations and by means of reflections [1].

Knowing the QR -decomposition of the matrix of the system, the matrix equation (2) can be written in the form:

$$Q \cdot R \cdot X = B, \tag{15}$$

multiplying equation (15) from the right by Q^T , we have:

$$\underbrace{Q^T \cdot Q}_{=I} \cdot R \cdot X = Q^T \cdot B, \tag{16}$$

where follows the solution of the system:

$$R \cdot X = Q^T \cdot B. \tag{17}$$

We orthogonalize the system of vectors a_1, a_2, \dots, a_n . Then normalize each vector of the obtained vector system. As a result, we come to an orthonormalized system of vectors:

$$\begin{aligned} q_1 &= u_{11} a \\ q_2 &= u_{12} a_1 + u_{22} a_2 \\ &\dots \dots \dots \\ q_n &= u_{1n} a_1 + u_{2n} a_2 + \dots + u_{nn} a_n \end{aligned} \tag{12}$$

In matrix notation this gives the equality:

$$Q = A \cdot U \tag{13}$$

where $Q = (q_1, q_2, \dots, q_n)$ - orthogonal matrix, U - upper triangular matrix:

Since the matrix R is triangular, the solution is obtained by the forward formulas[4].

The solution of systems of linear algebraic equations using matrix expansions of the system is greatly simplified in systems of computer mathematics. These systems have built-in functions that perform matrix expansions[5].

So let's need to find a solution to a system of linear equations

$$\begin{cases} 10x_1 + 6x_2 + 2x_3 = 8, \\ 6x_2 - 2x_3 + 2x_4 = 2, \\ 3x_1 + 5x_2 - x_3 - x_4 = 2, \\ 5x_1 + x_2 - 2x_3 + 4x_4 = 7. \end{cases}$$

We solve the system by the LU -decomposition method in the Maple system of computer mathematics. At the first stage of solving the system we perform LU -decomposition for the matrix of the system A [5]:

$$P, L, U := \text{LUdecomposition}(A);$$

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$$P, L, U := \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 & 0 & 0 \\ \frac{1}{2} & 1 & 0 & 0 \\ \frac{3}{10} & -\frac{8}{5} & 1 & 0 \\ 0 & -3 & \frac{55}{32} & 1 \end{bmatrix}, \begin{bmatrix} 10 & 6 & 2 & 0 \\ 0 & -2 & -3 & 4 \\ 0 & 0 & -\frac{32}{5} & \frac{27}{5} \\ 0 & 0 & 0 & \frac{151}{32} \end{bmatrix}.$$

Let us distinguish the matrices of this decomposition:

$P := LUdecomposition(A, output='P');$
 $L := LUdecomposition(A, output='L');$
 $U := LUdecomposition(A, output='U');$

$$P := \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$L := \begin{bmatrix} 1 & 0 & 0 & 0 \\ \frac{1}{2} & 1 & 0 & 0 \\ \frac{3}{10} & -\frac{8}{5} & 1 & 0 \\ 0 & -3 & \frac{55}{32} & 1 \end{bmatrix}$$

$$U := \begin{bmatrix} 10 & 6 & 2 & 0 \\ 0 & -2 & -3 & 4 \\ 0 & 0 & -\frac{32}{5} & \frac{27}{5} \\ 0 & 0 & 0 & \frac{151}{32} \end{bmatrix}$$

Let us make sure that the LU -decomposition of the matrix A is correct[6]:

$PLU := P.L.U; Equal(A, P.L.U);$

$$PLU := \begin{bmatrix} 10 & 6 & 2 & 0 \\ 5 & 1 & -2 & 4 \\ 3 & 5 & -1 & -1 \\ 0 & 6 & -2 & 2 \end{bmatrix}$$

true

In the second step, we directly solve the system, the matrix equation of which now has the form:

$$P \cdot L \cdot U \cdot x = B. \quad (18)$$

Multiply (18) by the transpose matrix P :

$$P^T \cdot P \cdot L \cdot U \cdot x = P^T \cdot B. \quad (19)$$

Then we have:

$$L \cdot U \cdot x = P_r, \quad (20)$$

Since L is a lower triangular matrix it is necessary to find P_l , such that $U \cdot x = P_l$ and:

$$L \cdot P_l = P_r. \quad (21)$$

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Since (20), (21) is satisfied, and considering that U - the upper triangular matrix, the solution of the original system X is found from the equation

$$U \cdot x = P_r \quad (22)$$

In Maple the described step is performed by the following sequence of operations[7]:

```
PtB := Multiply(Transpose(P), B);
LPtB := ForwardSubstitute(L, PtB);
x := BackwardSubstitute(U, LPtB);
```

$$PtB := \begin{bmatrix} 8 \\ 7 \\ 2 \\ 2 \end{bmatrix}$$

$$LPtB := \begin{bmatrix} 8 \\ 3 \\ \frac{22}{5} \\ \frac{55}{16} \end{bmatrix}$$

$$x := \begin{bmatrix} \frac{117}{151} \\ \frac{10}{151} \\ -\frac{11}{151} \\ \frac{110}{151} \end{bmatrix}$$

In order to verify the accuracy of the solution, let us calculate the remainder[7],[8]:

$O_s := A \cdot x - B;$

$$O_s := \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

The solution of the system by QR -decomposition is carried out in the computer mathematics system Maple similarly to the above mentioned LU -decomposition. At the first stage the system matrix is QR decomposed [5]:

```
Q, R := QRDecomposition(A);
Q := QRDecomposition(A, output='Q');
R := QRDecomposition(A, output='R');
QR := Q.R;
Equal(A, Q.R);
```

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$Q, R :=$

$$Q := \begin{bmatrix} \frac{5}{67} \sqrt{134} & \frac{1}{37587} \sqrt{25058} & \frac{2498}{9580197} \sqrt{3193399} & \frac{25}{2578627} \sqrt{389372677} \\ \frac{5}{134} \sqrt{134} & -\frac{133}{75174} \sqrt{25058} & -\frac{4549}{9580197} \sqrt{3193399} & \frac{16}{2578627} \sqrt{389372677} \\ \frac{3}{134} \sqrt{134} & \frac{215}{75174} \sqrt{25058} & -\frac{745}{9580197} \sqrt{3193399} & -\frac{110}{2578627} \sqrt{389372677} \\ 0 & \frac{1}{187} \sqrt{25058} & -\frac{373}{3193399} \sqrt{3193399} & \frac{64}{2578627} \sqrt{389372677} \\ \sqrt{134} & \frac{40}{67} \sqrt{134} & \frac{7}{134} \sqrt{134} & \frac{17}{134} \sqrt{134} \\ 0 & \frac{3}{67} \sqrt{25058} & -\frac{749}{75174} \sqrt{25058} & \frac{19}{25058} \sqrt{25058} \\ 0 & 0 & \frac{1}{561} \sqrt{3193399} & -\frac{6563}{3193399} \sqrt{3193399} \\ 0 & 0 & 0 & \frac{2}{17077} \sqrt{389372677} \end{bmatrix}$$

$$Q := \begin{bmatrix} \frac{5}{67} \sqrt{134} & \frac{1}{37587} \sqrt{25058} & \frac{2498}{9580197} \sqrt{3193399} & \frac{25}{2578627} \sqrt{389372677} \\ \frac{5}{134} \sqrt{134} & -\frac{133}{75174} \sqrt{25058} & -\frac{4549}{9580197} \sqrt{3193399} & \frac{16}{2578627} \sqrt{389372677} \\ \frac{3}{134} \sqrt{134} & \frac{215}{75174} \sqrt{25058} & -\frac{745}{9580197} \sqrt{3193399} & -\frac{110}{2578627} \sqrt{389372677} \\ 0 & \frac{1}{187} \sqrt{25058} & -\frac{373}{3193399} \sqrt{3193399} & \frac{64}{2578627} \sqrt{389372677} \\ \sqrt{134} & \frac{40}{67} \sqrt{134} & \frac{7}{134} \sqrt{134} & \frac{17}{134} \sqrt{134} \\ 0 & \frac{3}{67} \sqrt{25058} & -\frac{749}{75174} \sqrt{25058} & \frac{19}{25058} \sqrt{25058} \\ 0 & 0 & \frac{1}{561} \sqrt{3193399} & -\frac{6563}{3193399} \sqrt{3193399} \\ 0 & 0 & 0 & \frac{2}{17077} \sqrt{389372677} \end{bmatrix}$$

$$R := \begin{bmatrix} \sqrt{134} & \frac{40}{67} \sqrt{134} & \frac{7}{134} \sqrt{134} & \frac{17}{134} \sqrt{134} \\ 0 & \frac{3}{67} \sqrt{25058} & -\frac{749}{75174} \sqrt{25058} & \frac{19}{25058} \sqrt{25058} \\ 0 & 0 & \frac{1}{561} \sqrt{3193399} & -\frac{6563}{3193399} \sqrt{3193399} \\ 0 & 0 & 0 & \frac{2}{17077} \sqrt{389372677} \end{bmatrix}$$

$$QR := \begin{bmatrix} 10 & 6 & 2 & 0 \\ 5 & 1 & -2 & 4 \\ 3 & 5 & -1 & -1 \\ 0 & 6 & -2 & 2 \end{bmatrix}$$

true

At the stage of solving the system, operations are performed, according to (16), (17), which in Maple is carried out by a sequence of actions[9],[10]:

$QtB := \text{Multiply}(\text{Transpose}(Q), B); X := \text{BackwardSubstitute}(R, QtB);$

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$$Q_t B := \begin{bmatrix} \frac{121}{134} \sqrt{134} \\ \frac{29}{6834} \sqrt{25058} \\ -\frac{1417}{870927} \sqrt{3193399} \\ \frac{220}{2578627} \sqrt{389372677} \end{bmatrix}$$

$$X := \begin{bmatrix} \frac{117}{151} \\ \frac{10}{151} \\ -\frac{11}{151} \\ \frac{110}{151} \end{bmatrix}$$

As we see, the solution of the system by LU decomposition and by QR -decomposition coincide. Noting the advantage of the solution of SLAE LU -decomposition and QR -decomposition, which is expressed only in the use of the matrix of B free terms at the final stage, it is possible to solve SLAE with the

same system matrix, but with different matrices of free terms. To this advantage should be added the accuracy of calculations in systems of computer mathematics, which is clearly confirmed for the solution of systems with coefficients in the form of decimal numbers (in Maple floating point numbers), which takes place during the experiments.

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Article



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DISTINCTIVE FEATURES OF RADIO JOURNALISM (ON THE EXAMPLE OF UZBEK RADIO BROADCASTS)

Abstract: This article describes radio journalism and its specific characteristics. Basically, these features were considered on the example of radio journalism in Uzbekistan. Some radio broadcasts were also analyzed.

Key words: Journalism, radio, broadcasting, programs, genre, type, sound.

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ОТЛИЧИТЕЛЬНЫЕ ОСОБЕННОСТИ РАДИОЖУРНАЛИСТИКИ (НА ПРИМЕРЕ УЗБЕКСКИХ РАДИОПЕРЕДАЧ)

Аннотация: В данной статье описывается радиожурналистика и ее специфические характеристики. В основном, эти особенности были рассмотрены на примере радиожурналистики в Узбекистане. Также были проанализированы некоторые радиопередачи.

Ключевые слова: журналистика, радио, вещание, программы, жанр, тип, звук.

Введение

Радиожурналистика относится к числу сложных социальных явлений, которые опираются на экстраординарные технические возможности радио, средства создания и распространения средств массовой информации. Радиожурналистика всегда воздействует на разум, сознание.

Основная часть

Организационная задача радио изначально предусматривает пропаганду, воспитание и другие цели, и оно выполняет эту задачу совместно с другими средствами массовой информации. Выражение и формирование общественного мнения - главная, предполагаемая задача журналистики в целом. В самом начале формирования общественного мнения важную роль играют дебаты, полемика. Роль радио в этом тоже велика.

Радио - один из самых мощных инструментов распространения знаний. В эфире известные

ученые, специалисты и другие читают интересные лекции из разных областей науки, ведут интересные беседы. Радио также выполняет эстетическую функцию, и это происходит в нескольких направлениях. Большинство радиопередач в целом выполняют определенный уровень эстетической функции. Страстная, образная, умная речь пленяет нас; живое острое общение (диалог) может вызвать большой интерес. Умелый радиожурналист думает о том, чтобы придать слушателю эстетический колорит, в каком бы жанре он ни выступал, какой бы метод ни использовал.

Транслитерация произведений искусства обычно доставляет большое эстетическое удовольствие. Именно поэтому музыка, литература, театральные постановки получают постоянное место в репертуаре радио. Давайте вспомним, что произведения Навои были очень хорошо прочитаны на радио покойным ведущим Кадыром Махсумовым.

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Задачи радио с точки зрения развлечения - снять усталость, поднять настроение и придать бодрости. Развлекательные радио программы намеренно создаются с расчетом на то, что они будут более легкими, легче усваиваемыми. Особенно для детей, подростков.

Конечно, образовательная задача присуща любому радиовещанию. На данный момент существует специальная программа. Например, программа "Человек и закон", программа "Этика" и т.д.

Общение - одна из важнейших форм человеческого образа жизни. В радиовещании осуществляется социальная речевая коммуникация.

На радио, момент общения, все внимание человека сосредоточено на слове, голосе собеседника. Основное внимание уделяется теме, ее важным моментам, здесь нет места второстепенным вещам.

По своей природе радио является акустическим инструментом, то есть предназначено для одновременного прослушивания и понимания информации. Трансляция осуществляется с помощью звука.

Телевидение в полной мере использует как изображение, так и звук, но при этом использование звука происходит за счет ограничения некоторых возможностей, на экране звук часто вторичен, выполняя вспомогательную функцию. Однако на радио звук является важнейшим художественным средством, звук делает слово живым, привлекательным, заметным, воздействуя на слушателя.

Оказалось, что телевидение не может заменить вещание, какими бы богатыми ни были его возможности. Автор "Звуковых книг" И. Андроников предсказал, что повествование вскоре станет жанром, общим для многих.

Выразительными средствами радио являются: устная речь, шум, музыка и монтаж. Выступление по радио является устным и отличается от письменной речи, газетной речи. Устная речь уникальна для телевидения, но там она усиливается изображением, благодаря которому приобретает особый характер. На радио слово должно оказывать эмоциональное воздействие, и делать невидимое видимым. Хотя слово включает в себя части устной речи в составе (персонажи документальных передач, персонажи радиотеатра и т.д.), в целом оно не является устным.

Слово - это своего рода уникальная вещь, по своей природе. Его сила оказывает огромное влияние на аудиторию. В этом аспекте его часто также называют "социальным диалогом". Еще одно качество вещания связано с психологией, то есть с настроением говорящего, его психическим состоянием.

Духовные медиумы также включают в себя шум, который некоторые также называют "сценическим шумом". Иногда шум - это долговременный образ, заменяющий язык, сохраняющий ценные моменты, выполняющий информационные, эмоциональные задачи. Давайте вспомним репортажи с запуска ГЭС, начала масштабного строительства, празднования митинга и т.д.

Музыка также относится к выразительным средствам, в сотрудничестве с текстом она усиливает шипящие аспекты, является элементом монтажа, позволяет хорошо усвоить трансляцию. Д. Скорость и широкий охват считаются специфическими возможностями радио. Оперативность, или маневренность является наиболее важной характеристикой радио.

"Оперативность, маневренность и еще раз маневренность - важный девиз радио". Скорость не типична для передач "Сунги ахборот", "Машгал". Спортивное вещание, наука, искусство и т.д. .

Программы вещания делятся на два больших круга, когда они принимаются в самом общем виде: общественно-политическое вещание и художественно-публицистическое вещание. В то время как первый круг принимает информационные и пропагандистские передачи, а также передачи для детей и подростков, второй круг включает литературно-драматические, публицистические и музыкальные программы, частично передачи для детей и подростков.

Допустимо предположить, что это разделение в некоторой степени условно, основанное в основном на предметном принципе поля. Внутри кружков тоже будут разделения, только в нем, в соответствии с заданием, задаются вопросы "с какой целью" (информирование, пропаганда), "для кого" (для взрослых, детей, подростков). При разделении второго круга на произведения - литературные, драматические, публицистические, музыкальные - в основном учитывается содержание и суть программ.

Любое вещание, независимо от того, к какой сфере оно относится, по своей сути является социальным, политическим. Давайте посмотрим, что охватывает в нем каждая из этих областей.

Общественно-политические передачи - это серия передач, освещающих деятельность государственных органов, госорганов, общественных организаций, отражающих актуальные проблемы внутренней и внешней политики, различные аспекты жизни. Важнейшей особенностью такого типа трансляций является их документирование.

Содержание общественно-политических передач:

Информационные радиопередачи. При этом общественно-политическая жизнь быстро и

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лаконично доносится до аудитории через новые факты, события, кратко разъясняется, комментируется.

Пропагандистское вещание - обширные, подробные рассказы о важных, насущных проблемах, приоритетных законах, научно-популярной тематике, значимых дискуссиях, размышлениях о событиях, процессах, принципах, описание-описания людей, прямо или косвенно вовлеченных в этот процесс.

Пропагандистские радиопередачи отличаются от информационных (информативных) передач своим более широким охватом и более глубоким освещением явлений действительности, воздействующих на умы, сознание людей. Самое главное в этом - не скорость, а актуальность, то есть релевантность.

Пропагандистские передачи спокойной рассказывают о процессах, принципах, законах, когда поток событий прерывается и достигается определенная пауза. Делает выводы, обобщения и таким образом воздействует на общественное сознание.

Художественно-публицистические передачи занимают большой раздел радиопрограмм. Они состоят из трех основных типов: художественно-драматические, художественно-публицистические, музыкальные. На них приходится более половины общего объема вещания.

Мы уже упоминали, что художественно-публицистические передачи опираются на литературно-художественный стиль, косвенное отражение действительности, общественно-политические передачи - на жизненность, документированность.

Художественные драматические передачи отражают реальность через образы, логотипы, характеристики персонажей (радиопостановки, радиополфильмы, романы, короткие рассказы, радиостанции, основанные на стихах, радиопрограммы и т.д.).

Правда, художественно-публицистические передачи, особенно очерк, эссе, заметки, характерны для документации, но они допускают использование художественной фактуры, плода воображения, будь то фактура, которая не портит только основную идею, не вымысел.

Информационное вещание. Рубриками этой программы являются: "Сунгги ахборот", "Машгал" янгиликлари", "Дустлик" канали ахбороти", "Республика газеталари шархи", "Халқаро кундалик", "Халқаро шархловчилар давра столи", "Халқаро мавзу: савол ва жавоблар",

"Узбекистон мустақиллик йилларида", "Хамдустлик сархадлари", "Дунё воқеалари", "Аср ахборот мусиқий дастури", "Етти иқлим садоси", "Машгал"нинг муҳим воқеалари", "Замин ва замон" и т.д.

Формы передачи информации, способы. Информационные передачи обычно транслируются по радио регулярно и в определенное время. Наиболее заметным является "Сунгги ахборот".

В "Машгал"е программа часто прерывается. В "Машгал"е информация обычно дается в течение короткого промежутка времени, обычно 2-3 минуты, в течение которого событие, за исключением доказательств, транслируется в неубедительной манере.

Немного больше времени уделяется утренней информации, краткая детализация некоторых событий, также дается комментарий, те, кто ходит на работу, учебу, утренние завтраки, в курсе новостей, знают погоду, время.

Заклучение

В практике радиовещания обычно используется 5-10 минут информации. Информацию следует отличать как от содержания, так и от формы. Существует несколько принципов вещания, передачи информации. Решающим в вещании является уделение особого внимания общественно-политической значимости событий, которые упоминаются в информации.

Первое сообщение может обеспечить успешный вывод всей широкоэмитальной передачи. Событие, с которого начинается трансляция, должно быть самым важным, политически значимым и сразу же привлекать внимание аудитории. Второе сообщение может быть не более важным, чем первое, хотя новизна также важна.

Вторым важным принципом является соблюдение тематической целостности. Если событий одной и той же темы, подлежащих передаче, довольно много, редактору лучше представлять их по группам, то есть сначала события из жизни страны, затем из жизни стран Содружества, за которыми следуют события мирового уровня.

Третий важный принцип - обращать внимание на географию воздействия информации (например, сначала важные новости в масштабе страны в целом, затем новости по регионам, а затем по округам).

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Article



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ASSESSMENT OF THE ECOLOGICAL STATE OF THE NURA RIVER DEPENDING ON TECHNOGENIC IMPACT OF TEMIRTAU

Abstract: Hydrochemical indicators were analyzed on the Nura River section from 2009 to 2018. The relevance of the study was determined by the important recreational, economic and environmental significance of the Nura River. The watercourse crosses areas of intense technogenic impact from the industrial complex of the city of Temirtau, where 6 sampling points were selected for analysis. We studied the change in river pollution as the selected enterprises crossed, and the dynamics of pollution over the years was observed. It was found that in the Nura River there is an excess of the MPC for copper and oil products that are not associated with emissions from the Temirtau industrial complex. But enterprises pollute the river with mercury, zinc, sulfates, nitrite nitrogen. The Nura River maintains a relatively normal dissolved oxygen content in the water, but 1 km higher than the combined wastewater discharge of Arcelor Mittal Temirtau JSC and CMF TEMK LLP there is a sharp decrease in BOD₃. (*translated article [13]*)

Key words: monitoring, Nura river, Temirtau, hydrochemistry, pollutants, technogenic impact, nitrite nitrogen, mercury, pollution dynamics, maximum permissible concentration.

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Introduction

The problem of preservation of ecological well-being and rational use of water bodies is very urgent today both in Kazakhstan and in the world. Monitoring of water bodies, especially those located in the industrial impact zone, is a mandatory component of national environmental programmes and scientific projects [11, 12]. Industry specializing in energy and materials-intensive steel and non-ferrous metallurgy can directly or indirectly degrade the quality of adjacent water bodies and streams [8]. In this connection, in the central regions of the Republic of Kazakhstan, particular attention is paid to the monitoring of the hydrochemical regime of r. Nura. The Nura River is the main water artery of the huge Teniz-Kurgalzhyn Depression. It originates from the western spurs of Kyzyltas Karkaral-Aktau

low mountain range at an altitude of 1000...1200 m. The total length of 978 km, catchment area is 55100 km². The source of the river is the confluence of several small springs. The importance of the river is determined by its recreational, national significance. The Nura River is also the main source of food for the lakes of the Korgalzhinsky Reserve [1, 6, 8].

The purpose of this work was: To estimate the technogenic influence on the hydrochemical parameters of r. Nura in the zone of technogenic impact.

Materials and Methods.

The Nura River flows through two regions: Karaganda and Akmola. The Territory is characterized by a harsh continental and arid climate, with harsh winters, hot summers and low rainfall [4,

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5, 8]. The industrial potential of the regions continues to grow, exerting man-made and man-made effects on the surface waters of the Nura river [2, 3, 6].

In this work the section of the river passing through the city of Temirtau is considered. The section of the river passes through the city. In this territory, an industry for the production of energy- and material-intensive steel and non-ferrous metallurgy products has been formed. In connection with the historical development, industrial enterprises of LLP «TEMK» - branch of chemical industry and LLS «Bassel Group» - are located in the western part of the city. In 1000 m in the east of the city there is a large industrial enterprise with a full metallurgical cycle - JSC «Arcelor Mittal Temirtau», LLP «Trek», JSC «Central Azia Cement», LLP «Kazakhmys Corporation» LLP «ZPH Techol», Mirtauryg», LLP «Temirtau Color Met».

The main water source, possible for use by economic objects of the city, is r. Nura. Its water resources are used in the production activities of SD JSC «Arcelor Mittal Temirtau», LLP «TEMK», LLP «Kazakhmys Energy» etc. Once used for production purposes, water is discharged back into the water body.

We analyzed the annual averages for the period 2009... 2018. Samples for hydrochemical analysis were taken from 6 sampling points in r. Nura (Table. 1): Samarkand reservoir, point above the combined discharge of wastewater of JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMK", sewage discharge channel of JSC "Arselor Mit Tal Tem and TAHMR" "TEMC", point below the combined discharge of wastewater of JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMK", Mill Dam, 5.7 km below the combined discharge of wastewater of JSC "Arselor Mittal Temirtau" and HMZ LLP "TEM" (1).



Figure 1. Map of sampling scheme

Table 1. Sampling points for hydrochemical analysis of the Nura River

Selection point	Item number	Co-ordinates
Samarkand podhr, 0.5 km above the dam	I	N 50.106525° E 72.921584°
p. Nura 1 km above the combined discharge of wastewater of JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMC"	II	N 50.103950° E 72.869329°
Channel of joint discharge of wastewater of JSC "Erselor Mittal Temirtau" and CMF LLP "TEMK"	III	N 50.122285° E 72.826040°
p. Nura, 1 km below the combined discharge of wastewater 4 JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMC"	IV	N 50.118453° E 72.744570°
r. Nura, Mill Dam	V	N 50.044638° E 72.693821°
p. Nura, 5.7 km below the combined discharge of wastewater of JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMC"	VI	N 49.975874° E 72.608488°

In aqueous samples, copper, mercury, zinc, manganese, sulphates, petroleum products, dissolved oxygen, nitrite nitrogen, BOD3 were determined and analysed.

Discharges from industrial and utilities treatment plants and accidental discharges are sources of river pollution. Unfortunately, the amount of contaminants increases from year to year, as the treatment plants of the plants that discharge treated

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wastewater into the river need to be modernized. This is confirmed by long-term data where the exceedance of MACs of pollutants increases at the joint effluent discharge points of enterprises and downstream [10, 11].

Results and discussion.

In the water of r. Nur in the zone of influence of Temirtau industrial complex the content of copper from 2009 to 2016. Consistently exceeded maximum permissible concentrations at all observation points, reaching a maximum in 2012 and 2014: 5 MACs and 6.5 MACs respectively (fig. 2). Even at the points above the combined wastewater discharge, the copper content remained high. Only in 2017 on the II point 1 km above the combined discharge of wastewater JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMK", as well as in 2018 at Point V Mill Dam the level of copper fell below the maximum permissible level. In 2018, the level of the mill dam fell below the maximum permissible level. Such a picture shows that

r. Nura is polluted by oil regardless of the Temirtau industrial complex. The high oil content is determined by the natural xenobiotic profile along the river bed itself.

Zinc content in r. Nura showed (Fig. 3) dependence on the sampling point: lower values or within the MPC the zinc content in water was observed on I (Samarkand podhr, 0.5 km above the dam) and on IV paragraphs (r. Nura, 1 km below the combined discharge of wastewater of JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMK"). That is, the zinc in the water is less up to the Temirtau industrial complex, as well as downstream. Moreover, the discharge of zinc into the water occurs immediately after the Samarkand reservoir, even without reaching the combined discharge of wastewater by enterprises. Dynamics of zinc content by years showed its high content in 2009 (up to 2.5 MAC), 2014 (up to 3.7 MAC), 2017 (2.4 MAC), 2018 (2.2 MAC) years.

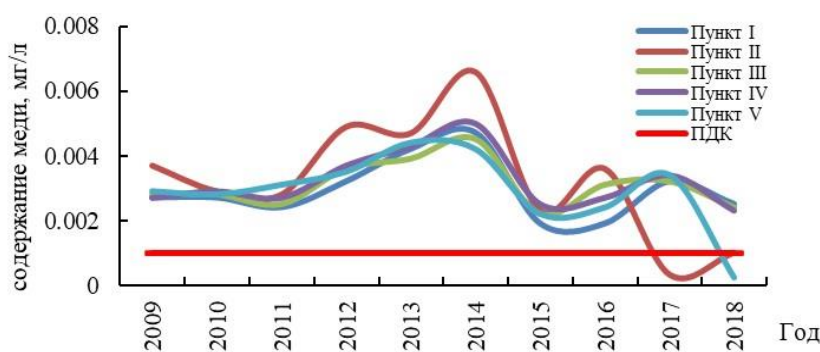


Figure 2. Copper content in the water of the Nura River in the zone of influence of the Temirtau industrial complex

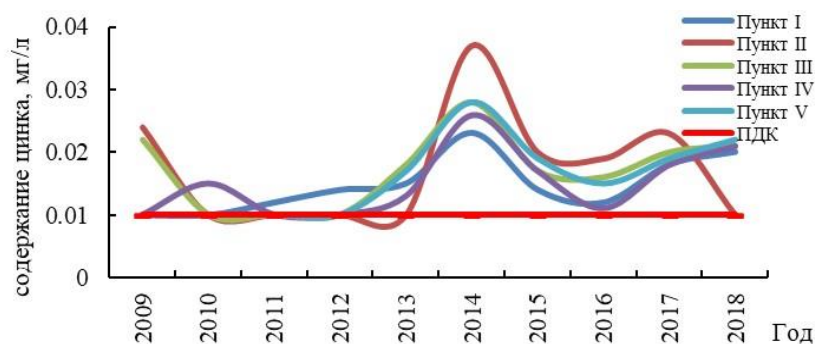


Figure 3. Zinc content in Nura River water in the Temirtau industrial zone

During the period under review from 2009 to 2018. The manganese content in the water r. Nura was reduced smoothly and gradually from a maximum of 2.6 MPC (2) to 0.7 MPC (5) (Fig. 4).

The sulphate distribution showed a complex picture both on the target and over time (Fig. 5): the

highest sulphate contamination occurred in 2009 (3.4 MAC), 2012 (3.7 MAC), 2007 (3.5 MAC). The ratios of contamination over the sections are mostly traceable: water contains fewer sulphates at 1 and 5 sections.

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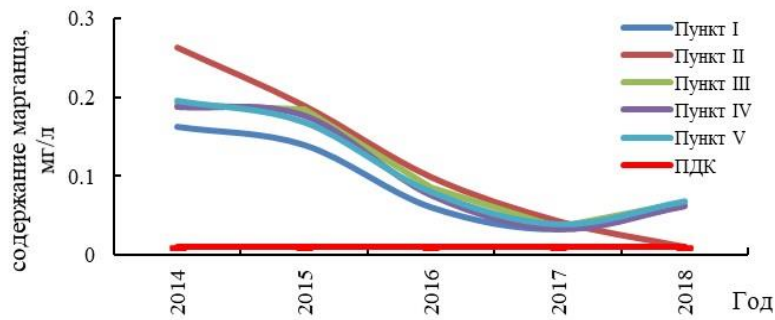


Figure 4. Manganese content in the water of the Nura River in the zone of influence of the Temirtau industrial complex

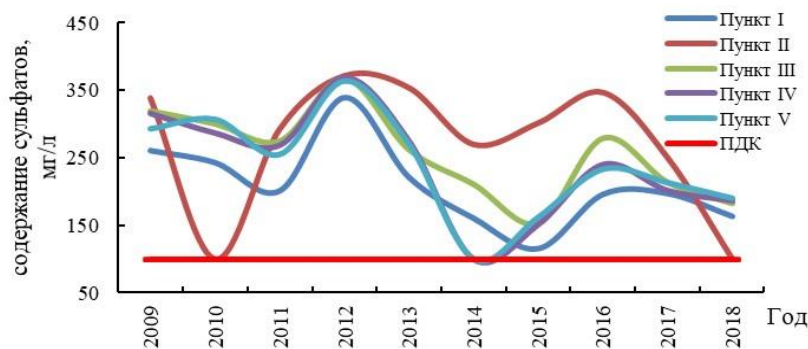


Figure 5. Sulphate content in Nura River water in the zone of influence of Temirtau industrial complex

The content of oil products in the studied sections of the river is chaotic and does not depend on the sampling points (fig. 6), but practically does not fall below the values of the maximum permissible concentration from 2009 to 2012.

Dissolved oxygen content in water is generally in accordance with the norm (fig. 7), but in all analysed years shows a fall on 2 alignment (1 km

above the combined discharge of wastewater of JSC "Arcelor Mittal Temirtau" and CMF LLP "TEMK"), which is gradually leveled by 5 plots (r. Nura, Mill Dam). Similarly, the biological oxygen consumption of BOD3 in 2018 is drastically reduced by 2 cycles, which is evidence of the discharge of organic pollutants into water (Fig. 8).

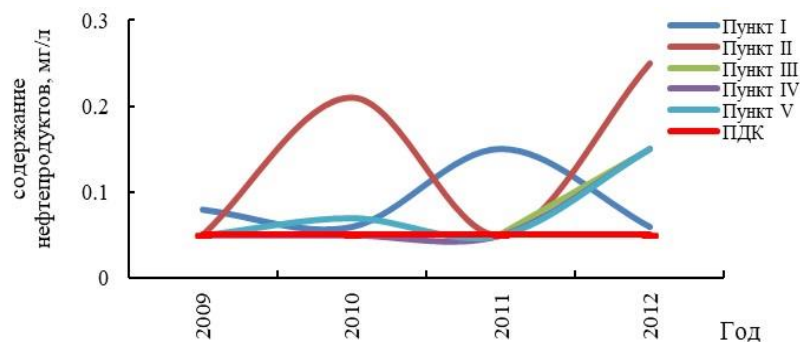


Figure 6. Content of petroleum products in water of p. Nur in the zone of influence of Temirtau industrial complex

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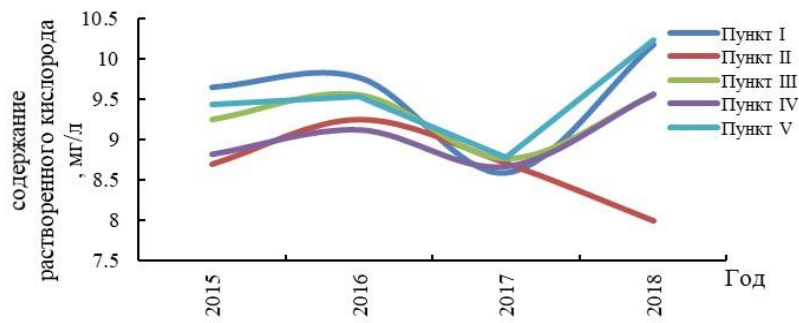


Figure 7. Dissolved oxygen content in water of p. Nur in the zone of influence of Temirtau industrial complex

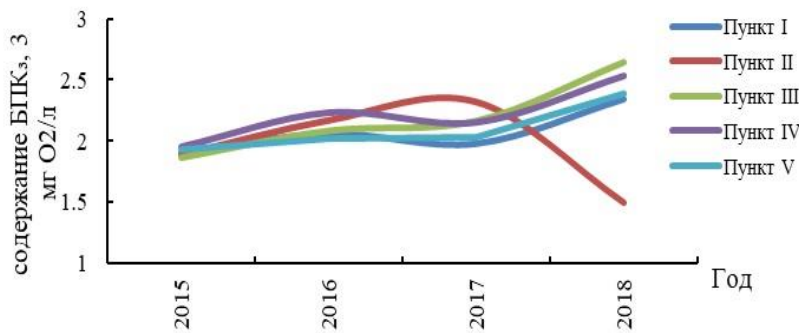


Figure 8. BOD3 content in water of p. Nur in the zone of influence of Temirtau industrial complex

In particular, the nitrogen content of nitrite was almost always higher at the 2nd point in all monitored points from 2009 to 2018 (fig. 9). Control 1 point

(Samarkand reservoir) remained within the norm in all cases.

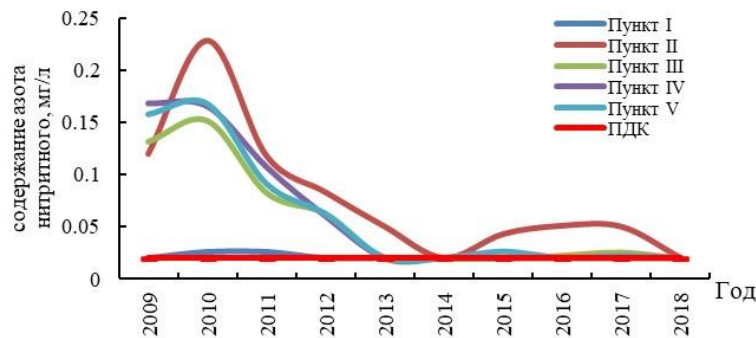


Figure 9. Nitrite content in water of p. Nur in the zone of influence of Temirtau industrial complex.

The mercury dissolved in water over 10 years is shown in Figure 10. The graphs leave no doubt that it is the Temirtau facilities that pollute the river with mercury, as the upstream and upstream River I and River I contain mercury within the allowable limit for

all the years studied. While at the remaining water sampling points, the mercury concentration increased many times over the years. The highest rates of mercury pollution were observed in 2010.2011 (up to 0.003 mg/dm³) and 2014 (up to 0.0025 mg/dm³).

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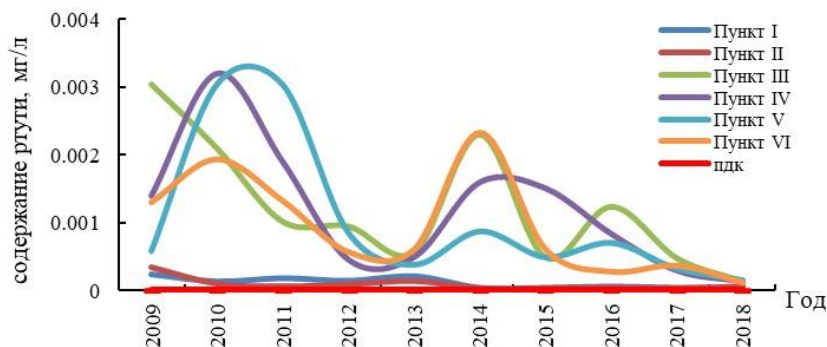


Figure 10. Mercury content in water of p. Nur in the zone of influence of Temirtau industrial complex.

There are large polluting plants ISPAT-KARMET and chemical plant «Carbide», which for most of its 30-th operation discharged mercury into water uncontrolled.

The main concentrates and carriers of mercury in r. Nura are technogenic silts. The total volume of technogenic silt in the Nura basin, located 25 km downstream of Temirtau, is estimated by tens of mln. tons [3, 4, 5].

Findings.

The natural regime of the Nura river has now been replaced by man-made water for a considerable length of the course, due to both the influence of the incoming wastewater and the intensive use of the river water for irrigation of agricultural land.

In r. Nura there is an excess of MAC of copper and oil products unrelated to emissions of Temirtau industrial complex.

B r. Nura maintains a relatively normal dissolved oxygen content in water, but 1 km above the combined discharge of wastewater JSC "Arcelor Mittal Temirtau" and CMF "TEMC" LLP emit organic pollutants, which reduces the BOD3 indicator. Technogenic effects on the Nur of the Temirtau industrial complex led to an increased content of pollutants in the water: mercury, zinc, sulphates, nitrogen nitrite, organic compounds. Of particular concern is the critical issue of mercury removal in r. Nura.

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Issue

Article



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THEORETICAL FOUNDATIONS OF THE NEED TO ENSURE THE SOCIAL SECURITY OF THE TERRITORIES

Abstract: Today, provision of social security is one of the urgent issues for every country. Public safety is also important because it is directly related to the population, its social groups, people's lives, standard of living, employment, etc. In this article, the results of many studies conducted by scientists of Europe, the CIS and our country are cited. In this regard, the results of the scientific work done by the scientists of the Garb country on the development of the social sphere were highlighted. In addition, the term social security was also emphasized. Also, the concept of social security and its types, factors affecting the provision of security, and at the same time distribution relations were also brought up with scientific grounds.

Key words: social security, national security, public security, poverty, poverty, ecological situation, real and potential, social stability, population income, criminalization.

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Introduction

Ensuring national security is an important issue of life and death for every country. National security represents the state of protection of the country's national interests from internal and external threats in all spheres and aspects of public life. National security represents the state of protection of the country's national interests from internal and external threats in all spheres and aspects of public life. The forms of its manifestation are diverse, and security in the state defense, economic, energetic, ecological, ideological, cultural, informational, and social spheres are its important forms. Because security in the social sphere is directly related to the population, its social groups, the life of each person, the living conditions and the level, quality, employment, education and health services and the provision of housing is also important. Problems in the social sphere, conflicts related to the deterioration of people's lives, social threats will increase as a result of their not being resolved in time, socio-political instability and shocks will arise in the country. Problems in the social sphere, conflicts related to the deterioration of people's lives,

social threats will increase as a result of their not being resolved in time, socio-political instability and shocks will arise in the country. We have huge tasks ahead of us in this direction. He emphasized that the development of our country and the well-being of our people are first of all closely related to the results of our reforms in the social sphere. This indicates the urgency of researching the problems of the development of the social sphere and the provision of social security.

The issue of social security of society has been widely studied by many foreign, Commonwealth of Independent States and local scientists. Some elements of the social environment and views on building a just society were initially reflected in the studies of the Greek philosophers Plato, Aristotle and the ancient Roman thinker Cicero. Thoughts on social security, social justice and human well-being in society were reflected in the views of medieval Central Asian thinkers and politicians Farabi, Ibn Sina, Nizamulmulk, Abu Rayhan Beruni, Yusuf Khos Hajib, Amir Temur, Alisher Navoi, Babur.

English scientists Thomas Hobbes, John Locke,

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German scientists Immanuel Kant and Georg Hegel stand out among the scientists who contributed to the development of the theory of social security of territories in the West.

The problem of social development has been studied in several works of foreign scientists. Among their representatives are J. Schumpeter, F. Malerba, M. Crocco, R. Delbridge, J. Bessant, J. Zaltman, P. Drucker, B. Santo, K. Freeman, L. Perre, R. Greminger can pass.

Russian scientists such as M. Bagomedov, A. Musaeva, I. Vodyanenko, L. Galaktionova, N. Zarubina, N. Emirov, I. Krasnopolskaya, I. Marsiyanova, Ye. Lugovaya, I. Garafiev in various areas of development of the social sphere who conducted research.

In recent years, a number of studies have been conducted in our country, which include the problems of social security and the establishment of the foundations of a safe civil society. J. Tukhtabaev, H. Adulqasimov, S. Shermuhammedov, A. Saidov, B. Toraev, J. Yakhshilikov, N. Joraev, R. Jumaev, B. Karimov, I. Ergashev, M. Kyrgyzboev, M. Our scientists, such as Bekmurodov, R. Ubaydullaeva, Kh. Abdusattorova, conducted various researches on the development of the social sphere in the society.

Ensuring and strengthening social security in our country is considered as a component of civil society and legal state building reforms. Ensuring human rights, increasing the economic potential of the country, increasing the well-being of the population, providing every person with a decent standard of living, and achieving universal values such as the formation of a perfect generation are important factors in ensuring social and political security of the society.

These factors will emerge and have their practical character when security in the social sphere is fully realized. Social security is an important part of society, and in revealing its content and essence, it is important to correctly define its concept, functions and structure.. is interpreted as an inter-sectoral direction. Although the relevance of social security is more evident in the development trends of all areas of society, in some scientific data it is considered as a branch of the economy not related to production or to the population service related. When the concept of "social security" is analyzed in depth, we see that it does not have a narrow meaning as stated above, but has a relatively more complex structure according to its character.

When we study the category of "social security" sociologically, including at the meso level, it becomes clear that it embodies the laws that are reflected in the interactions of social institutions with a certain systematization and structure of the society. This category realizes continuous and developing relationships of members of social groups or small communities at the micro level.

Social security in the regions represents a set of measures to protect the interests of the country and population in social security, social structures and relations in society, life support systems and socialization of people, development of lifestyle in accordance with the development of the needs of current and future generations. Social security as a part of national security is a state of protection against threats of violation of vital interests, rights and freedoms of individuals, social groups and communities of the population.

This term entered international and national scientific circulation recently. The term social security was used in the Universal Social Declaration adopted at the World Conference on Social Development held in 1995. In particular, it is said that "We propose to build such a society in which the right to food is as sacred as the right to vote, in which the right to primary education is as worthy of respect as the right to freedom of price, in which the right to development is considered one of the main fundamental human rights." The declaration defines the minimum tasks of ensuring social security:

- general primary education for boys and girls;
- halving illiteracy among the elderly population, and female illiteracy should not exceed the level of male illiteracy;
- providing elementary medical care for all, priority of vaccination of children;
- elimination of cases of acute malnutrition (semi-starvation)
- self-employment opportunities for everyone
- providing family planning services for those who wish;
- safe drinking water and sanitation for all;
- loan for security

Based on these, in our opinion, the main task of the regions to ensure social security is social protection of the disadvantaged sections of the population through complex economic, legal and organizational measures aimed at specific goals, ensuring the personal security of every citizen, his rights and will consist of protecting their freedoms, health and property. Social protection is the implementation of the priority task of the social policy of the region in terms of economic, legal and social guarantees, which are strengthened in the legislation that ensures the realization of the most important social rights of every member of the society. In our opinion, the concept of social security is comprehensive and includes:

- prevention and reduction of poverty and poverty;
- unemployment protection;
- raising the income and standard of living of the population;
- preventing the widening of differences between income and property classes of the population;

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- ensuring production and labor safety at each workplace;
- service and consumer safety;
- environmental safety;
- establishing public order and preventing crime;
- ensuring the safety of women and girls.
- When providing social security, it is necessary to take into account the following factors affecting the development of social security and ensuring security:
 - the economic country, the level of socio-economic development of the region, the characteristics of social infrastructure development, the type and description of property in enterprises, factors related to distribution relations;
 - the impact of the state social policy on increasing the potential of political social security, the implementation of legal guarantees in the field of social reproduction of the population, support and assistance to disadvantaged groups of the population, as well as factors related to the socio-political situation;
 - legislative norms and legal relations in the field of regulation of legal social relations, factors related to the level of legal consciousness of the population;
 - the prevailing moral, cultural and spiritual values, norms and traditions in the cultural society, factors related to the influence of their regional characteristics on social relations;
 - factors related to the natural environment and ecological situation affecting the lifestyle and standards of the natural climate population;
 - socio-demographic factors related to the number and composition of social groups and gender of the population, birth, death, migration, employment, professional qualifications;
 - factors determining the impact of national mentality, interests, traditions and customs on social processes;
 - the mood, expectation, aspirations of the population manifested in socio-psychological social relations, views of individuals and groups

Changes in these factors affect not only social security, but also labor force reproduction. The deterioration of these factors or their negative impact on the development of social security are threats to social security. A threat to social security is defined as a potential reality, action, process or event that is occurring or may occur that harms someone's interests.. In general, a threat is understood as a reason that violates security.

The main types of social security are the following groups:

- external (caused by one country's desire to weaken, subjugate, and destroy the competitiveness of another) and internal (depends on the state of society and the state itself);

- real and potential;
- global, national, regional and local.
- In our view, the threats to social security in the country are as follows
 - an increase in the share of the poor and impoverished population in the total population to the extent that it violates social stability in society, social harmony and agreement between population groups;
 - increasing stratification of the population by income and property;
 - increase in unemployment;
 - low level of housing provision;
 - stratification of society according to the level of access to social services
 - expansion of illegal migration
 - These threats can have the following negative consequences:
 - emergence of large social conflicts;
 - depopulation of the population;
 - criminalization of society;
 - drug addiction;
 - increase in prostitution, etc

Social security of society includes, first of all, a person and his micro and macro units. There is a microcosm in it, specifically a family. It has demographic, socio-class and cultural structures and infrastructures. We are talking about the role and characteristics of innovations in the development of these infrastructures. Innovation, in turn, leads to series and successive changes in these infrastructures. It includes systems that serve the population: health care, transport, communication, trade, public catering, housing, communal and household services, sports and wellness, protection and public peace. These services ensure the existence and well-being of people. Among the noted approaches to social security, this category was analyzed somewhat more widely by V.N. Kovalyov. Relevant systems and functional aspects of this category are highlighted in his research. In particular, according to the scientist, social security is "a system of mutual safe communication and relations between subjects and other elements that form a whole society, formed during historical development." In our opinion, if there is a comprehensive approach to social security from the point of view of management, it is based on the priority of the full human interests of the society, embodies the principles that serve to increase its material support and life well-being, to the individual and civil society. It is a social space that reflects social, cultural and ideological values and has sectoral directions and infrastructure that fully serve human interests.

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society. It is a social space that reflects social, cultural and ideological values and has sectoral directions and infrastructure that fully serve human interests.

The social factor plays the role of a unique balance in the sustainable development of all spheres of society. This is an important basis for ensuring social stability and people's well-being in the society. All spheres of society experience life-death aspects, conflicts and crises in the process of performing their functions. The social factor plays an important role in the elimination of these conflict situations, because at the center of this process is the person and his interest, and only when the goals of achieving human well-being are ensured, all areas of society develop stably. If we continue the theoretical analysis of the concept of social security, this concept, according to T.I. Zaslavskaya, "has two main approaches:

1) Social security is a component of society that ensures reproduction, improves spiritual and intellectual development of people, and improves their quality of life. It includes the institution of family, work, education, sports, healthcare, embodies the fields of horse and science;

2) Social security includes social networks and various social relations of society and unites various social groups, as well as regional, gender, migrant, network-related, sectoral and other social units in the center of scientific concepts.

3) According to the first sociological approach, more attention is paid to the institutional and structural areas and processes of social security, as well as the fact that the structures have the nature of dynamic development and, taking them into account, measures aimed at the innovative development of social security are determined. is held in, and together with this, it is assumed that each of the structures has its own functions

4) In the second approach, social security is the provision of social justice in society, social protection of low-income, disabled and needy categories of the population, the participation of various social groups in these processes, the provision of civil liberties, rights and duties, the implementation of social policy in the country it is emphasized that it is in the main place in its implementation.

5) Despite these different approaches to social security, they are complementary aspects of each field, and they are one of the main factors for the analysis of social security, the study and elimination of social problems in social life. serves. At the same time, the subjects of social security participating in innovative processes are clearly shown, and the exact scope and solutions of the issues related to them are found.S. Nazarqasimov emphasized that social security is an important system that has a somewhat universal approach related to both institutional and values, that incorporates norms, criteria and features that trace

human life, "social security is showing a complex structure, it encompasses the social structure, social interests, values and norms, as well as social infrastructure, social management institutions and the way of life of people. It should be noted that in the proposed concepts of social security, in addition to household services, utilities, transport and communication services, which are part of it and provide its material basis, moral support education, it should be noted that there are also fields such as science, sports and art. These areas create important moral values in the process of ensuring social security and serve as an important tool for social development. Therefore, it is more correct to consider social security as a system aimed at forming the spiritual image of a person from a philosophical point of view. In this regard, it is appropriate to cite the following opinion of J. Yakhshilikov: "Scientific social ideas aimed at raising the social security of society to a high level include: comprehensive provision and protection of human rights; conducting an innovative policy in the comprehensive development of the economy; implementation of free democratic elections; creation of a new legal doctrine of the state adapted to humanity; formation of spiritual and ideological immunity; includes a number of ideas aimed at maintaining human health"

6) The main goal of social security reforms is to improve people's lives and enrich their lives. In the social policy of our country, since 1997, the tradition of naming years according to a certain direction has been established. Every year, in one way or another, a social issue is brought to the fore. In particular, 2019 was announced as the "Year of Active Investments and Social Development". The adopted State program for the year includes "reducing unemployment among the population, increasing people's incomes, developing science and continuous education, medical improving the quality of services and expanding their coverage of the population, strengthening social support for women and young people, improving people's living conditions, providing them with decent accommodation and increasing their well-being, establishing a healthy lifestyle in society, further popularization of physical education and sports, tourism development was envisaged.

7) In our society today, many laws and regulatory legal documents have been adopted to ensure social security and are aimed at ensuring human well-being. This process, scientists say, "Our legislation aimed at guaranteeing the inviolability of human dignity, honor, rights and freedoms was developed on the basis of universal principles and national values. And this was the main factor of achievements in all areas"

8) Social protection is one of the main branches of social security, which is aimed at social, material and moral support of various needy, low-

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income, disabled and lonely categories of the population in the society. Social policy plays an important role in the development of social protection and coordinates it and adapts it to the scope of reforms. Today, social protection mainly includes such directions as social security, social assistance and social service, and has its own various infrastructures. Each branch has its own structure, management system, legal and financial basis. Education in social security is a system that connects all sectors with each other, is the basis for innovation and creativity. It plays an important role in ensuring the specific relevance of social security laws and creates important values through new knowledge and discoveries. Education shows important features such as innovative change of society by bringing a person to spiritual improvement, as a result of achieving social progress. Nowadays, the need for new knowledge is increasing in all areas of society, in every part of human activity, because the competition and struggle for existence is increasing in nature and society. This process is connected with the shortage of resources in nature, and the growing global problems. In the conditions of such competition and problems, education and innovation are the best choice for the development of society.

9) Another important aspect of social security is maintaining the health of the population, protecting motherhood and childhood, and ensuring sanitary peace of the population. At the same time, housing and communal economy, nature protection, employment provision, youth and women's policy, social protection, and all areas of ensuring population well-being are important sectors of social security. At the same time, other structures of social security are

related to population science, demographic situation and improvement of the level of migration.

10) Based on the analysis of the concept, structure and content of social security, we put forward the following social criteria:

- social security is a human factor manifested in the relations between individuals and groups, it shows features related to its high status in society and life well-being;

- harmony of the interests of man and society in the society, constitutes a whole set of elements manifested in social protection, assistance and services, affects the internal state of the individual and further raises his social status;

- serves to improve people's life, secure and free living of citizens, development, active engagement in creative work, productive life, enrichment of life;

- social security emerges as a component of society that ensures reproduction, improves the spiritual and intellectual development of people, and improves their quality of life;

- its basis is the activity of individuals, the sum of their mutual relations, and the set of their various relations constitutes social relations;

- it is manifested in the form of conditions, obligations and opportunities related to meeting the needs of society and its members;

- social security is a factor that strengthens, supports and balances all social processes and relations;

It is a complex system that includes social infrastructure, social interests, values, standards, social management, social stability, people's lifestyle, human development in society.

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Article



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PRACTICAL IMPLEMENTATION OF THE CALCULATION OF CURVILINEAR INTEGRALS IN MAPLE

Abstract: Extensive practical applications of the theory of curved integrals and the development of the modern direction of mathematics - computer mathematics create prerequisites for expanding the possibilities of their implementation in modern computing systems. The article deals with the issues of solving problems of the theory of curved integrals in the Maple computer mathematics system.

Key words: curvilinear integral of the 1st kind, substitution of variables, limits of integration, curvilinear integral of the 2nd kind, contour.

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ПРАКТИЧЕСКАЯ РЕАЛИЗАЦИЯ ВЫЧИСЛЕНИЯ КРИВОЛИНЕЙНЫХ ИНТЕГРАЛОВ В MAPLE

Аннотация: Обширные практические приложения теории криволинейных интегралов и развитие современного направления математики - компьютерной математики создают предпосылки для расширения возможностей их реализации в современных системах вычислений. В статье рассматриваются вопросы решения задач теории криволинейных интегралов в системе компьютерной математики Maple.

Ключевые слова: криволинейный интеграл 1-го рода, замена переменных, пределы интегрирования, криволинейный интеграл 2-го рода, контур.

Введение

Как известно, областью интегрирования определённого интеграла является отрезок на прямой; двойного интеграла - некоторая область в плоскости; тройного - некоторая область в пространстве. Вместе с тем существуют интегралы, областью интегрирования которых является кривая, которая имеет свое расположение в плоскости или в пространстве. Такие интегралы называются криволинейными интегралами [1]. Аппарат криволинейных интегралов значительно расширяет возможности приложений математического анализа к решению задач из механики и физики. В связи с чем, рассматривается вопрос их практической

реализации в современных вычислительных системах.

Рассмотрим вычисление криволинейного интеграла 1-го рода в системе компьютерной математики Maple. Нужно иметь в виду, что с каждой новой версией программы существенно расширяются возможности вычислений над пространственными объектами и поверхностями. С версии Maple 8 введен пакет *VectorCalculus*, который при вызове, открывает доступ к практической реализации вычисления криволинейных интегралов. Данный пакет после загрузки может видоизменить многие операторы, команды и функции, встроенные в ядро системы. При этом происходит и изменения математического и физического смысла. Потому

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пользоваться пакетом нужно весьма осторожно[2].

Для вычисления криволинейных интегралов необходимо подключить пакет *VectorCalculus*:

```
restart;  
with(VectorCalculus);
```

$$\int_L (x+y)dl = \int_{OB} (x+y)dl + \int_{OA} (x+y)dl + \int_{BA} (x+y)dl,$$

и вычисляя каждый интеграл на конкретной прямой, получим значение:

$$J = \int_L (x+y)dl = \int_{OB} (x+y)dl + \int_{OA} (x+y)dl + \int_{BA} (x+y)dl = 1 + \sqrt{2}.$$

С помощью команды *PathInt* () задаем криволинейный интеграл с опцией 'inert', для того, чтобы автоматически интеграл не вычислялся, как выполняет система, а увидеть его

Пусть нужно вычислить $J = \int_L (x+y)dl$,

где L – контур треугольника с вершинами $O(0,0), A(1,0), B(0,1)$ [3]. При непосредственном решении используя свойство аддитивности интеграла:

вывод на рабочем листе. Для каждого отрезка используем опцию *Line* в которой указываем точки отрезка[1]:

```
I1:=PathInt( x+y, [x,y] = Line( <0,0>, <1,0> ), 'inert' );  
I2:=PathInt( x+y, [x,y] = Line( <0,0>, <0,1> ), 'inert' );  
I3:=PathInt( x+y, [x,y] = Line( <1,0>, <0,1> ), 'inert' );
```

$$I1 := \int_0^1 t dt$$

$$I2 := \int_0^1 t dt$$

$$I3 := \int_0^1 \sqrt{2} dt.$$

Вычислим каждый интеграл без опции 'inert':

```
zI1:=PathInt( x+y, [x,y] = Line( <0,0>, <1,0> ));  
zI2:=PathInt( x+y, [x,y] = Line( <0,0>, <0,1> ));  
zI3:=PathInt( x+y, [x,y] = Line( <1,0>, <0,1> ));
```

$$zI1 := \frac{1}{2}$$

$$zI2 := \frac{1}{2}$$

$$zI3 := \sqrt{2}$$

Суммируем полученные значения:

```
zI := zI1+zI2+zI3;
```

$$zI := 1 + \sqrt{2}$$

Используя команду *LineSegments*, можно без использования свойства аддитивности интеграла, получить решение[1]:

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I:=PathInt(x+y, [x,y] = LineSegments(<0,0>, <1,0>,<0,1>), 'inert');
ZI:=PathInt(x+y, [x,y] = LineSegments(<0,0>, <1,0>,<0,1>));

$$ZI := 1 + \sqrt{2}$$

Рассмотрим вычисление криволинейного интеграла 1-го рода, используя замену переменных. Например, вычислим

$$J = \int_L \sqrt{x^2 + y^2} dl \quad \text{по окружности}$$

$L: x^2 + y^2 = ax$. При введении полярной

замены: $x = \rho \cos \varphi$, $y = \rho \sin \varphi$, имеем

$$\rho(\varphi) = a \cos \varphi \quad \text{для } \varphi \in \left[-\frac{\pi}{2}, \frac{\pi}{2} \right] [3].$$

При практической реализации в системе Maple в этом случае используем команду *PathInt* () с заменой переменных: $x = \rho \cos \varphi$, $y = \rho \sin \varphi$ с учетом $\rho(\varphi) = a \cos \varphi$ [1]:

C:=PathInt(sqrt(x^2+y^2), [x,y] = Path(<a*(cos(phi))^2,a*sin(phi)*cos(phi)>, phi=-Pi/2..Pi/2), 'inert');
zO:=PathInt(sqrt(x^2+y^2), [x,y] = Path(<a*(cos(phi))^2,a*sin(phi)*cos(phi)>, phi=-Pi/2..Pi/2));

$$C := \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sqrt{\cos(\phi)^4 a^2 + a^2 \sin(\phi)^2 \cos(\phi)^2} \sqrt{4 a^2 \sin(\phi)^2 \cos(\phi)^2 + a^2 (2 \cos(\phi)^2 - 1)^2} d\phi$$

$$zO := 2 a^2$$

Как видно, в этом примере нужно было предварительно выполнить вычисления, связанные по замене и пределам интегрирования.

Вычисление криволинейных интегралов 2-го рода осуществляется, как и криволинейных интегралов 1-го рода в специализированном пакете *VectorCalculus* системе компьютерной математики Maple. При этом следует обратить внимание на то, что при введении криволинейного интеграла по координатам используется команда *LineInt*. Для введения подынтегральной функции

вводится команда *VectorField*, которая подчеркивает, что функция относится к вектор-функции[1].

Пусть требуется вычислить $J = \int_L (x^2 - 2xy)dx + (y^2 - 2xy)dy$, где L -

парабола $y = x^2$ при $-1 \leq x \leq 1$ [4]. В системе Maple для решения вводятся команды:

restart;
with(Student[VectorCalculus]);
VectorCalculus[LineInt](VectorField(<x^2-2*x*y,y^2-2*x*y>),
Path(<x,x^2>,x=-1..1),'inert')=
LineInt(VectorField(<x^2-2*x*y,y^2-2*x*y>),
Path(<x,x^2>,x=-1..1));

$$\int_{-1}^1 -2x^3 + x^2 + 2(x^4 - 2x^3)x dx = \frac{-14}{15}$$

Как видно, система уже при выводе на рабочий лист произвела вычисления: значения y

заменяла на x^2 , использовала формулу:

$$\int_L P(x, y)dx + Q(x, y)dy = \int_a^b (P(x, f(x)) + Q(x, f(x))f'(x))dx$$

и записала подынтегральное выражение с их учетом.

Рассмотрим решение вычисления криволинейного интеграла 2-го рода в системе

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Maple с графической визуализацией исходных данных: пусть нужно вычислить

$$\oint_L 2(x^2 + y^2)dx + (x + y)^2 dy,$$

где L - контур треугольника с вершинами в точках $A(1,1)$, $B(2,2)$, $C(1,3)$. [5]

Подключим пакет `plots`. Составим графические объекты G - векторное поле с фиксацией области интегрирования: треугольник ABC , стороны которого являются границами области;

PA - пропись на графике точки $A(1,1)$ с помощью команды `textplot`;

TA -фиксация точки $A(1,1)$ на графике в виде круга;

PB - пропись на графике точки $B(2,2)$ с помощью команды `textplot`;

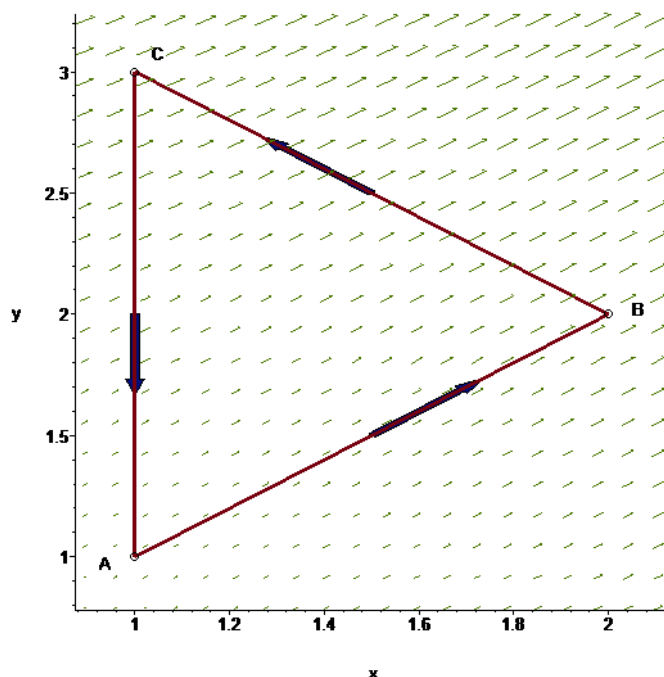
TB -фиксация точки $B(2,2)$ на графике в виде круга;

PC - пропись на графике точки $C(1,3)$ с помощью команды `textplot`;

TC -фиксация точки $C(1,3)$ на графике в виде круга.

Прописываем эти объекты в команде `display` для графической визуализации:

```
restart;  
with(Student[VectorCalculus]);  
with(plots):  
G:=LineInt(VectorField(<2*(x^2+y^2),(x+y)^2> ),  
LineSegments(<1,1>,<2,2>,<1,3>,<1,1> ), output=plot );  
PA:=textplot([1-0.05,1-0.05,A],align={ABOVE,LEFT}):  
TA:=pointplot([1,1],symbol=circle,symbolsize=14):  
PB:=textplot([2+0.05,2+0.05,B],align={BELOW,RIGHT}):  
TB:=pointplot([2,2],symbol=circle,symbolsize=14):  
TC:=textplot([1+0.05,3+0.05,C],align={ABOVE}):  
PC:=pointplot([1,3],symbol=circle,symbolsize=14):  
display(G,PA,TA,PB,TB,PC,TC,PC);
```



Вводим команду вычисления криволинейного интеграла 2-го рода:

```
VectorCalculus[LineInt]( VectorField(<2*(x^2+y^2),(x+y)^2> ),  
LineSegments(<1,1>,<2,2>,<1,3>,<1,1> ), inert )=  
LineInt(VectorField(<2*(x^2+y^2),(x+y)^2> ),
```

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LineSegments(<1,1>,<2,2>,<1,3>,<1,1>);

$$\int_0^1 4(1+t)^2 + (2+2t)^2 dt + \int_0^1 16 - 2(2-t)^2 - 2(2+t)^2 dt + \int_0^1 -2(4-2t)^2 dt = -\frac{4}{3}$$

Создадим картинку векторного поля для вычисления $J = \int_L xydx + yzdy + zxdz$, где L - четверть окружности $x = a \cos t$, $y = b \sin t$,

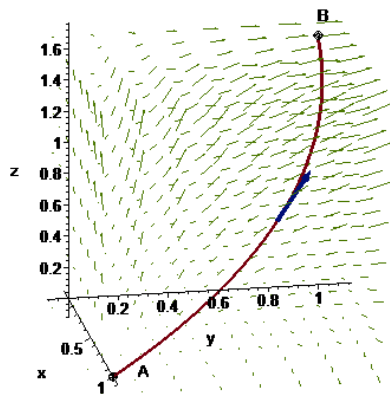
$z = t$ пробегаемая в направлении возрастания t [6]. Подключим пакет графически построений *plots*. Составляем графические объекты и прописываем с помощью команды *display* вывод графиков в одно изображение[1]:

```

restart;
with(Student[VectorCalculus]);
with(plots):
P1:=LineInt(VectorField( <x*y,y*z,z*x> ),Path( <cos(t),sin(t),t>,t=0..Pi/2 ), output=plot );
P2:=textplot3d([1,0+0.1,0,A],align={BELOW,RIGHT},color=black);
T1:=pointplot3d([1,0,0],symbol=circle,symbolsize=14,color=black);
P3:=textplot3d([0,1,1.7,B],align={BELOW,RIGHT},color=black);
T2:=pointplot3d([0,1,1.6],symbol=circle,symbolsize=14,color=black);
display(P1,P2,T1,P3,T2,axes=normal,orientation=[-5, 65]);

```

В результате получилось такое изображение:



Вводим команду вычисления криволинейного интеграла при помощи параметрических уравнений:

```

VectorCalculus[LineInt]( VectorField( <x*y,y*z,z*x> ),
Path( <cos(t),sin(t),t>,t=0..Pi/2 ),'inert')=
LineInt(VectorField( <x*y,y*z,z*x> ),
Path(<cos(t),sin(t),t>,t=0..Pi/2 ));

```

$$\int_0^{\frac{\pi}{2}} -\cos(t) \sin(t)^2 + \sin(t) t \cos(t) + t \cos(t) dt = -\frac{4}{3} + \frac{5\pi}{8}$$

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Как видим, возможности современных математических пакетов позволяют проводить вычисления криволинейных интегралов,

создавать графическую визуализацию решения задач, что сокращает временные затраты процесса вычисления, его трудоемкость.

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Article



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INTERPRETATION OF KINDNESS IN «AVESTA»

Abstract: Analysis of unity of good thought, good word and good deed glorified by our ancestors in ancient spiritual heritage "Avesta" is given in the article. The special attention directed to problems of kindness in "Avesta", the se immortal ideas have even nowadays a bid impor tance at ensuring the stability in our society.

Key words: Zoroastrianizm, Avesta, kindness, creativity, Ahura Mazda, Mitra, goths, Yasna, Vendidad.

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Introduction

Goodness has long been said to be the true goal of humanity, pure desire, good, noble, generally good deeds, and people always strive for it. From noble deeds, a person's tongue grows, his passion for living increases. In the "Avesta"[1], this human quality is revered and glorified.

"In the "Avesta", which is said with a noble mind, a noble word and a noble deed, I applaud a noble deed and a noble word. I am happy with the good deeds of all to noble thoughts, noble words, noble words(to say). I turn away from all bad thoughts, bad words, bad deeds"[2] the proverbial words are of great educational importance in the understanding of the national self today.

The First President of our Republic I.A.Karimov wrote in his book "High spirituality - invincible power",- taking the principle of "noble thought, noble word, noble deed", which defines the fundamental meaning and essence of "Avesta", it can be seen that there are lessons that are immodest even for the present. Such thoughts, that is, the interpretation of good intentions, words and unity of work as a priority idea of the life of society, are inextricably linked with nakadar with our spiritual ideals today, it is especially noteworthy that has a solid life basis"[3].

Indeed, such issues as the integrity and integrity of being, the close connection of human life with nature with the spiritual world of man, have formed the meaning of human life at all times. For this reason, people have come to try to do good to each other.

The founder of the Zoroastrian religion, Zoroastrianism, developed the doctrine that the fate of people in the other world will be decided in accordance with the life of today's world. Including academic S.F. Ol'denburg correctly wrote that "Zoroastrianism is the most rational religion aimed at facilitating a person's life on earth, making him happy"[4].

Zoroastrians in their practical activities tried to do only good deeds, leaving a good name for themselves. They tried to live a peaceful life, to work honestly, condemning useless bloodshed sacrifices, military conflicts, invasion attacks. In general, the attempt to improve material life was judged as a struggle against evil, and good deed was preferred over absolute observance of various religious creeds. It is said that the creator man meets the mercy of God, and the mother nature, which gave life to man, is kept sacred.

The "Avesta" argues that there is a constant counter - struggle between the forces of goodness and evil in the expression of moral standards, values. The

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genesis of goodness, the founder, creator Ahura Mazda, the result of the struggle between the genesis of evil and the creator Ahriman depends on the fact that a person consciously stands on the side of goodness. It is correct to say that the idea of "Avesta", in which a good thought, a good word, a good deed should be common, close and holistic in a person, and then goodness will prevail over evil, is one of the upheavals of our national spirituality.

The "Avesta" notes that the universe is built on contradictions: in physical things - darkness with light, in living nature - death with life, in the spiritual world-evil with goodness, in social affairs - there are constant contradictions between lawlessness with just laws. In the religious sphere, there is a sharp struggle between the spirit of Virtue and the spirit of goodness. Ahura Mazda will continue to bring goodness, Ahriman, the spirit of evil, will fight against him and start people to evil, to evil.

Revered is called to unite people against evil in Yasna, 28 of the source:

"O Mazda Ahura!

Come unto us with good will and truth, and give good living to zoroastrians and righteous people through the true words.

Give us joy and the power of the universe, so that we may unite in exchange for enemy oppression and evil."

"O Mazda!

Ashah-become a will upon the aim of the pharisees, a clear view that you are rightly worthy of truth and good intentions. I know in truth that the applause of the noble cause and the heart of the tongue will not be left ungrateful to you."

("Avesta". Goths, Yasna, Hot 28, pp. 8-9).

The 30th prophecy of the "Avesta" states that there is no intermediate in the eternal struggle between goodness and evil, every person is forced to participate in one side or another of this process. Therefore, faith in religiosity occupies an important place as a target of perfection. Faith allows people to distinguish goodness from evil. A believer - a believer, of course, strives for goodness, for good. Evil spirits - giant, fairy, devil and others - are depicted as the personification of sins, mistakes, lies, diseases. Ahura Mazda challenges people to avoid them, to withdraw.

Revered we read the following about this in the source:

"...There is no doubt that Ahura giants and infamous people know better than anyone what they have done in the past and what they will do in the future.

Ahura is the only justice judge of this universe who will be what he wants".

"In reality, we two-I and the spirit of the universe-applaud Ahura with miserable hands. That is our only desire from him: that in this world the wicked

and their leaders may not be harmed and humiliated by the wicked!..".

("Avesta". Goths, Yasna, Hot 29, p. 9)

The holy source notes that a good idea is primarily understood as the ideas of being kind to a loved one, in the spirit of the divine law, of being kind to a loved one, of being able to help when in need and danger, against evil, of being able to actively fight for the happiness of people, living in harmony with everyone, of a person should not be jealous of others in his thoughts, a well-meaning person cannot dargish and not be given ignorance, because in such a state he loses his goodwill, forgets duty and justice, and makes inappropriate actions.

As written in the "Avesta", the bad tutor inverts the divine words with his education and spoils the perception of the living.

"In reality, it makes people bear fruit without the priceless investment of honesty and noble intention.

They forbid people from their righteous deeds with these teachings.

They are wronged by their misguided judgment that the people of the worlds are alive".

("Avesto". Goths, Yasna, Hot 32, pp. 14-15).

In Yosin's 14th prophecy, God said, "I like noble thoughts(intentions), noble words, and noble deeds. I glorify the arrangements based on the laws of mazdayosin".

From these thoughts, it can be seen that the Zoroastrian faith is based on three supports: purity of thoughts, constancy of the word, humanity of deeds. Ahura Mazda called the people"...unbiased in their desires, their habit of living in harmony with each other, calls for self-restraint from greed, envy, seniority(inferiority), ambition, lawless deeds".

It is said that overcoming a promise made, staying true to it, strictly following contracts in trade, paying off debt on time, being free from deception and betrayal are signs of faithfulness. M.Boyce noted that in "Avesta", faith is glorified, that is, "a believer is a perfect man who knows how to keep himself from theft and robbery, from courting the goods of strangers, from self - betrayal, that is, from mistrustful deeds" [5]. "Take more care of your soul in relation to your bodies," that is, if your spiritual world is at first clear, your material life will also continue to be perfect, says Ahura Mazda. The "Avesta" glorifies the moral qualities of the individual, truthfulness, fairness. While such qualities are possessed by Ahura Mazda himself, he is at the same time an uncompromising enemy of evil, which is contrary to goodness.

In the laws of Ahura Mazda, the appropriation of dry and gray land, its fair distribution among the community, was calculated from the most noble works. The next lucrative business consisted of preparing food, raising pets and livestock. Zoroastrian says in the name of God to the rulers: "a poorly fed people will have neither good, strong workers nor

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healthy, energetic children. Decency from eating badly also gets worse. If the bread is plentiful, the holy words will also be well received". Although at first glance these words seem simple, it is necessary to note that there are a huge number of philosophical meanings, educational oars in it.

Ahura Mazda reveals about the two supreme primitives of all existence - goodness and evil. These primal powers, facing each other, always exist together, meaning life and death, heaven and hell. Hell is embodied in the vision of Ahura Mazda as the worst moments of life, the highest state of heaven and spirit.

As Revered notes in the source:

"Those who chose the lie of the two worlds were given the worst deeds, and those who turned their backs on the truth, which was built for the righteous worlds that covered the eternal sky, flattered Ahura Mazda because of their noble deeds and love for freedom.

The city of the universe, the noble intention, and the truth came to those who had chosen the good, giving them a mighty life."

("Avesta". Goth's, Yasna, Hot 30, p. 10

Evil and imperfect phenomena in a person come from their essence. And overcoming them is a work of perspective, and believers are encouraged to be the most active in the process. If they follow the laws and admonitions sent by Ahura Mazda, goodness will continue to stand up to evil.

The "Avesta" on goodness further states: "to create good and goodness, "the divine book says, "one must work, and create material pleasures with one's own hands". Indeed, as noted in the "Avesta", labor is the foundation of all goodness, the foundation of good. "The father of pleasure is often labor," says one of the sages, another, "labor is the padar of happiness." If we remember the proverbs of the ancient world thinker Aesop, "labor is a pleasure for people," the true essence of labor will seem to open up.

One of the edges of goodness is loyalty, at the same time its result is tranquility. A devoted person will have a wide bosom, a clean tongue, dedication. Loyalty, brings prestige to a person.

The "Avesta" places special emphasis on loyalty. "Whoever is faithful to me, in the Bible it is said, will be a polytheist to the best, and whoever is not faithful will be given the worst. Such is my reason and the covenant of my opinion."

Professor G.Mahmudova correctly wrote that "the humanistic vision of Zoroastrianism is based, above all, on the protection of the interests of those engaged in high - ranking works aimed at deciding piety, moral dignity, hard work, justice, pure intentions and deeds, justice, goodness, truth and piety" [6].

In "Avesta", a struggle between good and evil goes from beginning to end. Faith, faith are the veins of goodness. A person of faith, people of faith will be

above all dishonest, compassion, tolerance, open kungillilik are also their companions and companions.

"He said," I am the one who fulfills the omens. I dedicate to those who are faithful and confident joy tolerance!". According to "Avesta": "we honor Mithras... I honor Mitra, " says Revered Ahura Mazda:

Жумла эзгуликлар соҳибии...

Эъозлаймиз ёв қир Митрани

Фараҳмандлик ҳаққи-хурмати

Бор овозда дуо қиламан

Ва ҳудудсиз яйловлар шоҳи

Митра ҳаққи келтирадирман

Мен қурбонликлар.

Биз эҳтиром қиламиз Уни ,

Яйловлари поянсиздир хўп,

Яхшиликлар яратадир Ул,

Келсин бизга мадад бермоққа,

Келсин бизга кенг даштлар учун,

Келсин бизни қўлламоқ учун,

Келсин бизга мурувват учун,

Келсин бизни қутқармоқ учун,

Келсин бизга ғолиблик учун,

Келсин бизга бахт- шодлик учун,

Келсин бизга яхшилик учун,

Келсин ғолиб, келсин забардаст,

Ёлғонларга бўйинсинмас Ул".

("Avesta". Yachts, Mitra Qasida, - p. 184)

The holy scripture praises Mithras, the embodiment of goodness. One who cannot see goodness, evil and risk-corruption, blackness inside, are brought under criticism. One of the sages says about this: do not get out of the noble virgo, regret that the evil will be from his own character. Indeed, goodness has always given light to mankind. All aspects of it have served humanity. Proverbs chanting goodness in avesto still serve humanity today.

"Avesta" contains such phrases about good and goodness. Ahura Mazda, who took the affairs of the world to his sleep, says:

"Only those who lead others to good will receive good".

We want power and share, in truth, from you!

- O Ormaithius!

Grant us the living, which is shrouded in the light of good intentions and is the reward of the struggles for truth."

("Avesta". Goth's, Yasna, Hot 43, - p. 18

Also, Ahura Mazda believes that others are given light to those who want light.

"Under the light of truth, donate to us from your enlightenment, where noble intentions are created, so that we may enjoy joy every moment, every hour, every day of our existence.

In truth, the highest good will be given to those who guided us to the right path of bliss - the world of truth, which is the abode of Ahura - when we are living in the land and heaven.

- O Mazda!

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Those who indulge and believe in you will have chastity and under the light of goodness, they shall be plowed.

- When the noble intention came to me, and for the first time it came to you I heard your word, I confess that I took it between people to go is heavy. However, I am the most noble of you I will keep your word, whatever it is, until the end. After that, I considered you pure.

- O Mazda Ahura!

The noble intention visited me with the intention of my longing:

- Give you a lasting life that no one except you can give. This was a prophecy from the prince of the universe about the Armenian living.

After that, I saw you as pure.

- O Mazda!

When the noble intention came to me and taught me that rest is the best way to gain knowledge, and the leader said that it should never be a reason for the sympathy of the devotional people, for they are deserving of the righteous ashavans.

After that, I found you pure".

("Avesta". Goths, song two, Yasna, Hot 43, -p. 19)

Goodness is again interpreted as follows:

"- Whoever believes in my religion, who - who is mine, who is grafted on to my doctrine, who is-who listens to my calling, she is my closest companion, and I have a noble intention for her in his urine, the most beautiful miracles are deliverables.

However, whoever is obsessed with our path, religion, raftoru kirdor, we are the alternative to him. We are present opposite him to muhoraba.

- O Mazda!

I will bring out your muhibs to ruyab in the urine of truth, and I will please you. It is my suicide. The muqtazah of my intention and my fiction".

("Avesta". Yasna, Hot 46, -p. 24).

The ideas presented in the "Avesta" on goodness, creation above served to make our ancestors do only good, to leave themselves good deeds, so that the ideas of goodness, creativity were characterized by noble goals, such as making the land prosperous, the people's life prosperous. These ideas have lived, since ancient times, as the most noble ideas of the life of society. The words of our President Shavkat Mirziyoyev "to study our rich heritage, which represents the invaluable values of our people and the experience of rich statehood"[7] are a requirement of today. Such noble ideas, patriotism and creativity are a legacy to our people from their ancestors. In the history of mankind, he who sowed seeds of such high ideas as justice, truth, goodness, hard work, creativity in the minds and minds of people, the high ideas in the book "Avesta", created by the Prophet Zoroaster, were the immortal ideology of our great compatriot Zoroaster.

Almost three thousand years ago - during the period when the enlightenment was overshadowed by clouds of ignorance, our great compatriot Zoroaster began to promote the ideas of solitude and goodness. In Zoroastrian doctrine, ideas calling for human goodness occupy a central place.

The ideological struggle between the forces of goodness and evil is described in detail in the Zoroastrian bible, the "Avesta". In it, the ideas of military conflicts, wars of invasions, tormenting animals, injustice to people, falsehood, covenant fidelity, betrayal are condemned, and ideas that call for a more fiery, peaceful life, hard work, farming, animal husbandry are glorified. In Zoroastrianism, land, water, clear air, mother - nature are revered, a person who opens up a Kuruk land and turns it into a garden and a garden is subject to theological mercy, but those who destroy gardens, crops, irrigation structures, on the contrary, fall into great sin. Zoroastrian ingenious ideas encourage people to live in peace, to make the motherland prosperous by working honestly.

The "Avesta" glorified the idea of patriotism and urged people to be perfect" [8]. "Give me children, perfect and religious, love homeland and anjumoro, stable, noble, saving me from darkness, hassle. So that they may raise the address, the city, the country and its name and sound." The work also promotes the ideas of honoring the Mother earth, its improvement. In particular, according to the "Avesta", it is he who planted the ground with more than one blessed person and more wheat, cocaine and fruit trees than anyone else! It is said that he released water into dry land and plowed water lands.

"The ground, which has not been planted in a long time and has not touched the spine, is unfortunate... Whoever plows the floor with the left and right hand, the right hand and the left hand, the floor will give him prosperity... The ground also gifts abundant fruit".

("Avesta". Vandidod, 3rd fargard, 3rd division, - p.114)

The plowing of the Earth and the sowing of Sarah seeds the germination of wheat grass the evil forces there, the idea that the giants will leave these lands is given in the section dedicated to the Vandidod part of Avesta as follows:

"When a seed is produced in the egats, the giants will die out of their seats.

When the wheat gurgles, the giants begin to tremble in horror.

When wheat is flour, the giants smoke moans.

When the wheat is eaten by the threshing floor, the giants die.

Whichever household produces a head of wheat, the giants move away from that household.

As if there was a storehouse of wheat in an apartment, as if heated iron giants would scratch the neck".

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("Avesta". Vandidod, 3rd fargard, 3rd division, - p. 115)

Zarathustra, featured in "Avesta", says, " I applaud the noble intention, the noble word, and the noble deed! From the inside of intentions, words and deeds, I choose a noble intention, a noble word and a noble deed. The wise words" I turn away from all evil and evil words and evil deeds" are still of great educational value today. These immortal ideas came later in religions, including, it was also adopted by Christianity and Islam. So this book was an ideology of society, consisting of a system of ideas formed in its time.

In our ancient historical - literary monument "Avesta" there are many instructive points honoring, glorifying goodness, and this immortal heritage still retains its significance today in ensuring the stability of society in our country, in raising a harmonious generation. In order for our priceless monument to serve as an important resource in the education of the harmonious young generation in the spirit of patriotism, the immortal ideas that glorify the unity of noble thought, good word, good deed, in the context of today's globalization, to carry out reforms carried out in our country more effectively, it is advisable to use them more widely in spirituality.

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ABU RAYHAN BIRUNI A GREAT SCHOLAR WHO CONTRIBUTED TO THE FIRST RENAISSANCE OF CENTRAL ASIA AND HIS CONTRIBUTIONS TO THE DEVELOPMENT OF GEOLOGY AND MINERALOGY

Abstract: This article briefly discusses the great polymath Islamic Scholar Abu Rayhan Biruni's works on mineralogy and geology and his achievements in these fields. Here the role of the scholar's heritage in today's era also discussed. Article finds that his great mind helped to establish scientific disciplines such as geodesy and helped to shape science of geology.

Key words: Al Biruni, Polymath scholars, Geology, Mineralogy, Khwarazm.

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Introduction

Al-Biruni, Abu Ar-Rayhan Mohammad Bin Ahmad (440AH/1048CE) is in the authors view the leading mineralogist throughout Islamic history. His monograph "Treatises on how to recognize gems" (*Al-Jamhir fi Ma'rifatil Al-Jawahir*) is most probably the best contribution on mineralogy in the Muslim civilization. Throughout this manuscript, Al-Biruni did not translate or copy the science of other civilizations but Instead, he recorded his own experience. Abu Rayhan Mohammed ibn Ahmad al-Biruni, a prominent polymath scholar from Khwarazm, city of Kyat great representative of Mamun Academy in Khwarazm, he has written about 150 works in astronomy, mathematics, mining, geography, history, pharmacology and others, 31 of which have reached us. Among them are the following fundamental works of the scholar.

There is information that Biruni wrote 154 works of different sizes, correspondence, but 30 of them have come down to us. In his works, on the one hand, he creatively developed the advanced traditions of

Central Asian, ancient Greek and Indian thinkers, and on the other hand, his maturity testifies to the breadth of his scope of thinking. It is noteworthy that Biruni raised the question of the "cause of causes" - the emergence of man and human society. In this regard, he writes, "it is the oldest and most famous of all ancient histories, the beginning of humanity." Hence, the Scholar was in a position of rationalism on this issue, acknowledging the differences between people, thinking only of external differences, and concluding that the internal structure and organization of people are common to all. Biruni's great works such as "India", "Monuments of Ancient Peoples", "Mineralogy", "Geodesy" brought him worldwide fame [2, p. 12].

Main part

Biruni defined the concepts of arithmetic, algebra, geometry and number theory in a certain order, raised trigonometry to the level of an independent science. In his studies on geography, he showed the exact coordinates of countries, seas and

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islands located in seven climates, developed the most perfect map of the world. With the help of the astronomical instruments he created, he discovered the unique shape of the Earth - a globe, which was one of the greatest inventions in the history of mankind. Unlike the Greek scientists [5, p.68], he proved in an original way that the Indian and Atlantic oceans are connected, and discovered the unknown continent unknown assembly behind the ocean five hundred years before Christopher Columbus. did Biruni is one of the encyclopedic scholars who left a rich legacy in the fields of history, ethnography, language, literature and medicine.

Mineralogy. In mineralogy, Beruni first measured the specific gravity of solids and liquids using his own instrument and proposed the classification of minerals. He developed the theory of origins of minerals and cited paragenetic data. When he was already eighty years old, Biruni devoted a book entitled *Ketāb al-jamāher fī maʿrefat al-jawāher* (The sum of knowledge about precious stones) to mineralogy. It is the most comprehensive book on this subject in medieval Arabic literature. In it Biruni describes the minerals and metals of Europe, Asia, and Africa, drawing upon earlier sources and his own vast experience.

The work consists of three parts, beginning with an introduction composed of a *dībāja* (preamble) devoted to praise of the wisdom possessed by created beings and fifteen *tarwīḥa* (sections) describing the situation of man in nature and how he came to use gold and silver and to make use of jewels for his adornment (32 pages of the printed text).

The second part (200 pages) is devoted to precious stones (*al-jawāher*), as well as to other minerals. The principal stones described are the following: *yāqūt* (hyacinth, sapphire), *yāqūt aḥmar* (ruby), *yāqūt aḳẓar* (green corundum), *yāqūt jamrī* (carbuncle), *laʿl* (spinel), *bijādī* (garnet), *almās* (diamond), *sanbādeĵ* (emery), *loʿloʿ* (pearl), *zomorrod* (emerald), *fayrūzaj* (turquoise), *ʿaqīq* (agate), *jazʿ* (onyx), *ballūr* (rock crystal), *jamast* (amethyst), *lazaward* (lapis lazuli), *dahanĵ* (malachite), *yašm* (jade), *yašb* (jasper), *sabaj* (obsidian), *bādzahr* (bezoar), *kahrobā* (amber), *maġnaṭīs* (magnetite), *šaḍenj* (hematite), *zoĵāj* (glass), *mīnā* (enamel), *qīsaʿ šīnīya* (porcelain). Metals (*felezzāt*) include *zeʿbaq* (mercury), *ḍahab* (gold), *feẓẓa* (silver), *noḥās* (copper), *ḥadīd* (iron), *asrob* (lead), and *kār šīnī* (Chinese iron, i.e., zinc).

Biruni makes use of numerous ancient Greek and Arab authors and cites many verses from Arab or Persian poets. He carefully analyzes the names of minerals from the philological point of view, citing authors like *Ḳalīl b. Aḥmad*, *Ašmaʿī*, *Farrāʿ*, *Abū Ḥanīfa*, and *Dīnavarī*.

Biruni accepts the vapor theory, more specifically *Jāber b. Ḥayyān*'s sulphur-mercury theory, of the origins of the minerals and metals. He

rejects the notion of transmutation, though he admits the growth and gradual transformation of metals into gold in nature.

Finally, thanks to an apparatus he constructed himself, he succeeded in determining the specific gravity of a certain number of metals and minerals with remarkable precision [6, p.561].

Geology. Biruni's results in determining the geographical width and distance of different places amaze even modern scientists. The great scientist notes that each part of the Earth's surface has its own long historical development. Biruni was the first to seriously study the geological development of some regions of Central Asia, including the Amudarya Valley. His conclusions about the geological past of the Amudarya valley and the formation of the Aral Sea are considered to be one of the most successful geological analyzes of that time. The scientist relies on the theory that "Seas turn into land, and lands turn into seas." Biruni's conclusions about the formation of mineral deposits, the importance of rock erosion, and weathering of rocks are of great scientific importance. He puts forward a theory that interprets the appearance and disappearance of mountains based on natural factors.

He criticized the theory of the transmutation of simple metals into precious metals - a utopian idea that was firmly established in the chemistry of that time. In geography, he suggests the theory of the seas and the idea to create the world's first spherical globe of the Earth and the continent's existence behind the Pacific and Atlantic oceans.

Biruni also made great discoveries in the field of geology. They took a scientific approach to the study of the earth. He writes that each part of the earth's surface has its own long historical development. Biruni was the first to seriously study the geological development of some parts of Turkestan, including the Amudarya valley. His conclusions about the geological past of the Amudarya valley [4, p.883] and the formation [9, p. 206] of the Aral Sea are considered to be one of the most successful geological analyzes of that time. The scientist [10, p.128] relies on the theory that "Seas turn into land, and lands turn into seas." Biruni's conclusions about the formation of layers of minerals, erosion of rocks, etc. are of great importance. Assumptions about the location of terrestrial bodies for the balance of gravity in the earth's crust are also very important.

In his work "Geodesy" for the first time, he introduced a method of finding the distance between cities by triangulation (measuring distance through the solution of triangles) and using it to determine the distance between the Ghazna and Mecca through Khorezm [3, p.4541]. In this work [1, p.1052], he proved [7, p.524: 8, p.4] that the African continent was washed by the ocean waters from the south using the original logical way.

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Conclusion

This article briefly discusses the great polymath Islamic Scholar Abu Rayhan Biruni's works on mineralogy and geology and his achievements in these fields. Here the role of the scholar's heritage in today's era also discussed. Article finds that his great

mind helped to establish scientific disciplines such as geodesy and helped to shape science of geology.

Nowadays, his great heritage can be widely used to promote tourism and his scientific discoveries such as measurements of earth circumference and devices used to measure it can be showed as a expositions in the museums.

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SOCIAL AND CULTURAL LIFE OF THE SHIITE COMMUNITIES OF CENTRAL ASIA IN THE XX-EARLY XXI CENTURIES

Abstract: *The article is devoted to a review of the history and culture of the Shiite communities of Central Asia, in particular Uzbekistan, which profess Shiism, from the Isnaasharid (Ismamite) and Ismaili interpretations. The historically proven centuries-old contradictions of Shiites and Sunnis sometimes took the form of not only confessional, political or diplomatic conflicts. They seriously influenced the mutual perceptions of Muslims of two confessional directions within Islam, which sometimes resulted in an almost physical hostility to Sunnis and Shiites. The hostility of these two confessional areas of Islam prompted their bearers to apply the label "wrong" in relation to each other. And sometimes it was difficult to separate simple confessional rejection from political confrontations, which, in turn, often became an occasion for mutual military expansion, bloody clashes, etc. Now, despite the prevailing predominantly Sunni-Hanafi religious environment, Shiites from time immemorial keep the features of religious ritual and their confessional self-identification. The article also discusses some historical data on the resettlement and penetration of Shiite currents in Central Asia.*

Key words: Irani, Persian, Marvi, Mavri, Samarkand, Bukhara, Sunnits, Shiites, Imamites, Ismailites, Pandjab.

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Introduction

From the 16th century to the 20s of the 20th century, in particular, due to the wars and invasions caused by the religious and ideological rivalry between the Sunni rulers of Movarounnahr and the Iranian Shiites, and the political, religious, economic and social situations in Iran and its neighboring countries, the arrival of Shiite representatives to Central Asia was observed. Since these Shiite representatives mainly come from Iran, in Central Asia, especially in the territory of the present Republic of Uzbekistan (except for Iranian Jews), they are called by the ethnographic term Irani (Pers. Iranian).

But Irani is a generic ethnic term that does not mean that all Shiites belong to a single "sub-ethnic" group¹. Among the Shias we know as Iranian (depending on the city of origin) we can also find those who call themselves Marvi/Mavri (from Marv), Sabzbori (vegetable), Mashhadi (from Mashhad), Giloni (from Gilon), Mozandaroni (from Mozandaron), Niso (from Niso)[4, p. 385-413].

Iranians are divided into Tajik and Turkic speakers according to language signs. For example, O.A. Sukhareva, who conducted research on the history of the cities of the Bukhara Khanate, writes that according to the Tajik-speaking Persian language and anthropological type of the city of Bukhara, it is

¹ The term "Subethnik" ("Subethnos") is used here to refer to a group separated from a particular nation or ethnos for geographical or political reasons [13, p. 197-199].

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different from the descendants of the red-headed people of Samarkand, who speak the Turkic language and are considered to have been transferred to the emir Shahmurad (1785-1800). We conducted research in Samarkand in January 2007 and witnessed this in the speech of the Iranian population living and working in and around the Panjab Mosque.

In relation to the ethnic (or "sub-ethnic") group that we know as Iranians, O.A. Sukhareva used the words "Persian" and "Persian" in her published work on the history of the cities of the Bukhara Khanate and proposed to include the term "Persian" in the literature as the official name of this group [14, p. 365]. O.A. Sukhareva expresses her opinion that after the "massacre of Shias" in 1910, that is, when relations between Sunnis and Shias in Bukhara became tense, the Shias adopted the name Persian because the words "Iran" and "Marvi" were used in a derogatory and hostile spirit [14, p. 82-83].

Professor I.I. Zarubin commented that, regarding the division of Shias into *Persians* or *Iranians*, the district civil commissioner in the Pamirs used the word *Iranian* in reference to people who were deported from Marv. I.I. Zarubin writes that they, those deported from Merv (all Shias enslaved and sold in the slave markets of the Bukhara Khanate) call themselves *Iranians*, do not mix with the Tajiks, but despite their language and religion differences, their dress and lifestyle are similar to the Tajiks [15, p. 8].

In addition to the *Iranians*, I.I. Zarubin speaks about the *Persians* living in the cities of the Trans-Caspian region. For example, in the 1926 census, I.I. Zarubin puts the number of *Iranians* in Samarkand region at 11,282 and the number of *Persians* at 654 [16, p. 24]. That is, here referred Shia representatives are called by two – *Iranian* and *Persian* – ethnic names.

Information about this can be found in other literature as well. For example, in the book "Multinational Uzbekistan: historical and demographic aspect" in the census, which began in 1926, we can see that the ethnic composition of Uzbekistan was 9.2 thousand *Iranians* and 9.8 thousand *Persians*. Subsequent calculations, in 1939 and 1959, show that neither the *Iranians* nor the *Persians* are a separate ethnic group, and therefore it is difficult to know their number. However, among those registered in 1970 and in 1979 and 1989, only the name of the *Persians* occurs, and we see that their number has doubled compared to the previous registered periods. For example, in 1970, 15.5 thousand *Persians* were registered [17, p. 448-452], meanwhile between 1979 and 1989, 20.0 thousand *Persians* were registered in Uzbekistan [3, p. 54-68, 144-151].

F.D. Lyushkevich, who conducted a study on the ethnic group of *Iranians* (as cited in the 1926 census), does not specify to whom he referred to the *Persians* cited by I.I. Zarubin [9, p. 39]. However, both I.I.

Zarubin and those who registered in 1926 used the word *персы* / *Persians* in the early twentieth century to refer to Iranians seeking asylum and lucrative employment in Central Asia, particularly in Uzbekistan [10, p. 76; 2]. The word *Iranian* was widespread among the local Shias at that time. Although only the word *Persian* was used in the 1970, 1979, and 1989 censuses, many Shias who have lived in present-day Uzbekistan for centuries call themselves *Iranians*. Even we may find the word *Iranian* can be found next to the word "Nationality" in their passports. However, in the documents of the younger generation, we can see that according to their wishes, the word *Uzbek* is indicated in the "Nationality" aspect. This process is a natural phenomenon (not organized on the "initiative" of government agencies). At the same time, *Iranians* do not evaluate their "ethnic conversion" negatively. Therefore, such a process of "ethnic assimilation" is natural. However, the *Iranians* have preserved their traditions and even restored all their customs during independence, and there is no evidence of interference or obstruction in this process by the relevant institutions of the state.

In the survey of *Iranians* in the "Panjob" and "Khoja Soat" neighborhoods in Samarkand that was conducted in 2007, Ishakov Yusuf (was born in 1953, nationality is Iranian), deputy imam of the Panjob mosque, and Gulyamov Ravshan (Ravshan strongman, born in 1960), chairman of the Iranian-Uzbek Friendship Society and Cultural Center, said that as well as Iranian Shias, Russian-speaking Azerbaijani Shias also lived in Samarkand. Moreover, they were called as *мурсиён* (*Persian*), and that some of them had *Persian* in their passports instead of Azerbaijani. According to 1995 data, 93% of the population of Azerbaijan believe in Shi'ism [5, p. 13]. Currently, considering Central Asia there are about 60,000 Azerbaijanis in Uzbekistan, about 78,000 in Kazakhstan [6, p. 175], and about 20,000 in Turkmenistan, Kyrgyzstan and Tajikistan [7; 12; 11]. Due to the regime of the Soviet Union and the Stalinist policy pursued, people of this Azerbaijani nationality moved to other socialist republics located in the Central Asian region as representatives of the nation, such as: *Russians*, *Armenians*, *Chechens*, etc. The politics and situation of the Soviet era was not left unnoticed by the worldview, beliefs and traditions of the Azerbaijanis who came to Central Asia. For example, in 2007-2011 Gadjeva Sakina Fikretovna, a bachelor's degree student in international relations at the Tashkent State Institute of Oriental Studies said that when her uncle died, her family, along with her neighbors, who were Armenians and Russians, performed Christian rites, and buried his body under the sounds of music. "Now we, the Azerbaijanis, understand that we are Muslims"- Sakina Gadjeva added. Obviously, the cultural and enlightenment centers established in the countries where Shias live

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are of great importance for the Shias of Azerbaijan to understand themselves as Muslims. Consequently, such centers are located in Turkmenbashi (formerly Krasnovodsk) in Turkmenistan, Almaty in Kazakhstan, Bishkek in Kyrgyzstan, Dushanbe in Tajikistan, Navoi, Samarkand, Tashkent, and Fergana Valley in Uzbekistan. The first cultural center of Azerbaijanis in Uzbekistan was opened in 1989 in "Gardashlyk" ("Brotherhood") in Tashkent and then another in Samarkand region [8].

The life of the Iranian-Shias of Central Asia, especially Uzbekistan, during the Soviet Union was distinguished by its uniqueness. First of all, there are Shias, along with representatives of other religions and nationalities, as a result of the process of Sovietization, their knowledge about Shiism has been preserved in a vague form, or rather, in the form of certain (apparently simplified) religious rituals. Many researchers have met them in this form. For example, according to B. Bobojonov and A. Mominov during the scientific research in Samarkand, even the "new" religious leaders of Samarkand in the early 1990s did not have extensive knowledge about Shi'ism, moreover, about its internal currents and factions. Although, according to other historical sources, Shiites may have heard of the religious leader in Iran – Ayatollah², marja al-taqlid Ruhullo Mousavi Khomeini (1979-1889) and his follower Sayyid Ali Khomani (1989-present).

Therefore, at that time, when the Soviet era was coming to an end, it was appropriate to talk about the historical-ethnic self-awareness as an Iranian, and the religious awareness (as a result of the atheistic policy) was so forgotten that it is correct to talk about the Iranians as a separate religious and even ethnic group. would not come. In the period of the Soviet Union, the group self-consciousness of Iranians was preserved in the standards raised by the reality of the Soviet era, and in ethnic mutual feelings through certain rituals and ceremonial gatherings. But Iranians, at any level, joined the local population – Uzbeks, Tajiks and other national and ethnic groups, and worked side by side with them.

In Central Asia, especially in Uzbekistan, the majority of Iranians live in Samarkand. Samarkand became a major refuge for Iranians after the bloody clashes between Shias and Sunnis in Bukhara in 1910. Many Iranians at the time, according to the information given by the original Iranians, ran away from Bukhara and took refuge in colonized Samarkand. They were accustomed to the situation here and were able to survive with their hard work and ingenuity. As a result, the "Dargam" Canal in Samarkand was built by the Iranians. The people of Samarkand remembered this channel as "Iranian

stream". Later, around this canal, the neighborhoods of Iranians such as Punjab (Five Streams, River), Khoja Soat, Lolazor, Topkhana, Mingtut, Bogishamol, Slave Garden (now Flower Garden), Bekmahallya were formed. From 1928 to 1930, in this place of Samarkand there was the district of "Eron bogishamoli" (Iranian garden) [2].

The common occupations of Iranians living in Central Asia, especially in the territory of present-day Uzbekistan, were weaving silk (shoibofi), making confectionery products (kannodi), selling medicinal spices (attori) and jewelry making (zargari). By now, we can find Iranians working in different areas of the country [1, p. 123-125; 2].

In 2007, when we went to Samarkand to conduct research on the history, lifestyle and culture of the Iranian population of the city, we stayed at the "Tomaris" hotel located in the Iranian district of Samarvand, and we were the first to witness the use of Turkish words by Iranians in their daily conversations. In an interview with Alieva Fatima Sattorovna, assistant professor of the Department of History of Uzbekistan, Ph.D., who is from Iran, she said that representatives of different nationalities live in Iran - Persians, Azerbaijanis, Kurds, Iranians from Samarkand are from Iranian Azerbaijan, i.e. that they come from the region of Azerbaijan (Oston-e Azarbaydjon) of Iran and that they use Turkic words because the Azerbaijani language is close to the Uzbek language, as well as in the process of the all-Union census held in 1970, 15,457 Iranians were registered in Uzbekistan, of which 12,202 spoke Uzbek as their mother tongue said that his speech was recorded [2]. It is also interesting that some Iranians consider themselves to be representatives of the Imamite movement based on the Jafari school of Shiism. That is, the cases of linguistic assimilation did not turn into religious conversion of Iranians. Ethnographically, this process is particularly noteworthy.

In her research, Fatima Alieva writes that many scientific and cultural figures from Iran have appeared in Uzbekistan. For example, poet and prose writer Abulqasim Lohuti, lithographer Ibrahim Sultan from Khiva, a participant in the revolutionary movement in the Bukhara Emirate, later historian Professor Aliev (may be the father of the author), orientalist-pedagogues K. Shitfar, A. Tabataboi, D. Eftekor, M. Tageev, Iranian scholars Latif Halilov and A. Patsun, director Syed Ali Okhunzoda, artist Rashid Fayzi, former consul of the Republic of Uzbekistan in Thailand Parviz Aliev. We can add the People's Artist of Uzbekistan Mrs. Nasiba Abdullaeva among them. Among the Azerbaijanis, it is worth mentioning Alisher Navoi state academician and ballet theater

² Ayatullah ("Miracle of Allah") and Marja al-Taqlid ("Object of Imitation") are titles given to prominent and high-ranking clerics in the Shia world.

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director, People's Artist of Uzbekistan and Azerbaijan F. Safarov, writer A. Najafov, artist of the Academy of Arts of Uzbekistan Yu. Husaynov[2].

Currently, while talking about the main architectural heritage of the Iranians of Uzbekistan, it is impossible not to mention the Punjab mosque and madrasa in Samarkand during the Soviet Union, which was called "Punjab Mosque of the Religious Society of Samarkand, UzSSR, Ogyi Mirhasan". The madrasa was built in the 19th century with a mosque and its minaret, which have not survived to us, and the architect was Khwaja Abduraim. This complex was built on the waqf land of a person named Hajibobo Abduokhunbek. The Punjab Madrasah was established in 1908, where students studied religious and secular sciences. Until 1924, the building was kept in good condition and used for its intended purpose. Since 1924, the madrasa (like many religious institutions of the Soviet Union) has been adapted for various organizations and offices, and since then the building has been reworked. In 1939-1943, the madrasa housed a vocational school. Later, the building was used for various offices - construction, trade, warehouse, post office. By 1990, the Panjab Madrasah, together with the Murad Awliya Memorial Complex, built by the ancestors of the Iranians in Samarkand, passed into the hands of its real owners, the Shia Muslims. From March 10 of this year, the "Cultural Center of Iranians" was established in the Punjab Madrasah. In 1997, instead of the mosque adjacent to the madrasa, a new mosque was built and opened in 1999. In addition, the control of the Punjab

tomb, 50 meters away from the Punjab mosque and madrasa, was also handed over to the Iranians. It is said that it is a cemetery of brothers, in addition to Iranians, Arabs, Jews and Kurds are buried. According to information given to us by Iranians from Samarkand, there are 9 Iranian mosques in the city, of which only two are open because they are registered. In Bukhara, only one such mosque (the mosque located on Samarkand Street, Bukhara) is open[1, p. 126; 2].

So, Iranians living in the territory of Uzbekistan were kept here as one of the peoples. Iranians have managed to maintain their religious and ethnic identity while becoming much closer to the local peoples. This situation is more common in Uzbekistan than in the countries of Central Asia. In addition, due to the existing conditions, the contribution of Iranians to the culture and science of Uzbekistan is indisputable. These processes are interesting from an ideological (ethnological or historical) point of view, as well as from an ideological point of view. That is, ethnic groups such as Iranians were able to adapt to local conditions and even show their respective effects on these conditions. So, while we observe a limited process of assimilation of Iranians (especially from the aspects of language and culture), this ethnic group has preserved its own characteristics (identity). In the future, ethnologists must study such factors more widely and more deeply. In particular, we think that it is an urgent issue to determine the reasons and types of adaptation of Iranians to different conditions.

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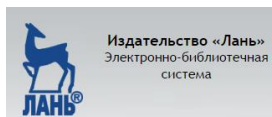
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