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	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 12 **Volume:** 128

Published: 12.12.2023 **http://T-Science.org**

Issue Article

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THE DEVELOPMENT OF AN ACCESS CONTROL SYSTEM BASED ON CONTACTLESS ID CARD READING TECHNOLOGY

Abstract: *This article analyzes the directions of development of an access control system based on contactless ID card reading technology. The advantages and disadvantages of using contactless ID cards are also analyzed. In addition, our study presents conclusions and recommendations on the development of an access control system based on contactless ID card reading technology. Moreover, conclusions and recommendations are given on the development of an input control system based on contact card reading technology.*

Key words: *contactless ID card, reading technology, RFID cards, vulnerability of contactless cards.*

Language: *English*

Citation: Khaitmatov, U. T., & Gazieva, V. A. (2023). The development of an access control system based on contactless ID card reading technology. *ISJ Theoretical & Applied Science, 12 (128)*, 217-220.

Soi: http://s-o-i.org/1.1/TAS-12-128-17 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2023.12.128.17

Scopus ASCC: *1700.*

Introduction

An access card is a user ID that contains some information - a key that opens a door or access to resources. It is difficult to imagine the modern world without contactless identification technologies. The use of bank cards (magnetic stripe cards, EMV chip cards, contactless payments PayPass, payWave); RFID cards for transport, entertainment and loyalty programs: issuance of a compulsory medical insurance policy and social cards in Moscow, and, of course, cards of physical and logical access to a computer and IT resources of the company, widespread use access cards. However, the "card" is a generally accepted concept, since the identifier key can be in the form of a key fob, tag, etc. Mobile phones or other devices that support NFC technology are not slow and are used as an identifier.

For this reason, the issue of data transfer security from the identifier to the reader is more relevant than ever. The risk of copying data from cards and cloning them increases every day, which makes it necessary to take a more conscious approach to choosing technologies that ensure secure identification. This:

Firstly, vulnerability is usually assessed by the three main threats identified when working with contactless cards: data privacy, duplication of access cards and cloning.

Secondly, the unreliability of confidential information, if the identifier is stored in plain text and is not protected from any reading, makes the access card and the entire system the most vulnerable, allowing attackers to gain access not only to the object, but also to data about the cardholder. The problem is solved using DES, 3DES, and AES encryption algorithms. We have developed the following conclusions and recommendations for the development of an access control system based on contactless ID card reading technology:

Firstly, the reading range, as well as the possibility of using it in a very wide range from 0 (contact access cards) to 300 meters (active contactless cards).

Secondly, two technologies are often used as additional protection on joint access cards, and the leading technology in the ACS segment is undoubtedly the development of RIFD (Radio

Frequency Identification), a radio frequency identification system that provides quick access to the system without requiring the exact position of the tag. In addition, RIFD cards allow you to work in harsh conditions, carry out remote identification and have a long service life.

Preventing unauthorized persons from entering the restricted area by electronic means was a vital approach to securing the area. Over time, a number of access control methods have developed, each with its own advantages and disadvantages. The biometric access control method extracts the physiological and behavioral characteristics of a person to perform human recognition.

These characteristics include: fingerprint, hand geometry, handwriting, handprint, iris, palm veins, voice and retina. These characteristics have been the subject of many studies to provide human identification and access control functions. In [1], a system for identifying a person by finger veins was introduced, which can be used to control access. A simple pattern matching method has been used to reduce computation time for embedded environments, but the success rate is 97.6% and therefore not suitable for personal security.

A technique for recognizing veins and finger textures based on multiple line tracking; the Gabor filter and neural network were proposed in [2], they can be cost-effective and more accurate than some algorithms, however, long computing time limits their use. In [3], a device for palm vein authentication using blood vessel patterns as a personal identification factor was presented. Although it has a high level of accuracy, false acceptance and false rejection are still a problem.

Methods. A card reader is a data entry device that reads data from a media in the form of a card. The first were punch card readers that read paper or cardboard punch cards, which were used during the first few decades of the computer industry to store information and programs for computer systems. Modern card readers are electronic devices that can read plastic cards with a built—in barcode, magnetic stripe, computer chip or other information carrier. A smart card reader is an electronic device that reads smart cards and can be found in the following form [6]:

Some keyboards have a built-in card reader.

• For personal computers (PCs), there are external devices and card readers of the internal drive compartment.

• Some laptop models contain a built-in smart card reader and/or use an updatable firmware using flash memory.

External devices that can read a personal identification number (PIN) or other information can also be connected to a keyboard (commonly referred to as "PIN pad card readers"). This model works by supplying an integrated circuit on a smart card with electricity and exchanging data via protocols, which allows the user to read and write to a fixed address on the card [7].

Table 1. Data transfer protocols

Name Description	**Name Description**
T=0	A byte-level asynchronous half-duplex transmission protocol defined in ISO/IEC 7816-3.
T=1	Asynchronous half-duplex transmission protocol at the block level, defined in ISO/IEC 7816-3.
T=2	Reserved for future use.
T=3	Reserved for future use.
Contactless	Contactless APDU transmission via an ISO/IEC 14443 contactless interface.

Analysis of the relevant literature

Magnetic stripe. The magnetic stripe technology, commonly referred to as "mag-stripe", is so named because of the strip of magnetic oxide tape laminated onto the card. There are three data tracks on the magnetic stripe. Usually, the data on each track corresponds to a certain encoding standard, but any format can be encoded on any track. A magnetic stripe card is cheap compared to cards of other technologies and is easy to program. A magnetic stripe contains more data than a barcode in the same space. Although it is more difficult to create a magnetic stripe than a barcode, the technology of reading and encoding data on a magnetic stripe is widespread and easy to acquire. Magnetic stripe technology is also prone to incorrect reading, card wear and data corruption. These cards are also subject to some forms of skimming, when external devices are placed above the reader to intercept the data being read [8].

Wiegand Map. Wiegand Card Technology is a proprietary technology that uses embedded ferromagnetic wires strategically positioned to create a unique pattern that generates an identification number. Similar to magnetic stripe or barcode technologies, this card must be passed through a reader in order to be read. Unlike other technologies, the identification carrier is embedded in the card and is not subject to wear. This technology once gained popularity because it is difficult to reproduce, which creates a high level of security. However, this technology is being replaced by contactless cards due to a limited supply source, the relatively better

resistance of contactless readers to hacking, and the convenience of contactless functions in contactless readers.

Proximity card readers are still called "Wiegand readers", but no longer use the Wiegand effect. Proximity technology preserves Wiegand upstream data so that new readers are compatible with older systems.

Proximity Card. The reader emits an electric field around itself ranging in size from 1 to 20 inches. The cards use a simple LC scheme. When the card is brought to the reader, the electric field of the reader excites the coil in the card. The coil charges the capacitor and, in turn, powers the integrated circuit. The integrated circuit outputs the card number to the coil, which transmits it to the reader [9].

Access Control Server. Each access control system needs a server where permissions are stored in the access database. Thus, it acts as the center or "brain" of the access control system. In fact, it is the server that decides whether the door should open or not by matching the submitted credentials with the credentials authorized for that door. The server can be a dedicated Windows or Linux local computer, a cloud server, or even a decentralized server (when permissions are stored in a door reader). The server also monitors and records access-related actions and events, and allows administrators to receive reports on past events with data for a specified period of time. If a local access control server is used, there is usually a dedicated machine running the access software. It requires the presence of an administrator on site to manage it. Because there is a need to deal with multiple locks.

Discussion of the results. In the form of credit cards and SIM cards, smart cards are the most common form of IT computing power on the planet.

It is estimated that there are between 30 and 50 billion smart cards in circulation today.

The smart card has a built-in microprocessor or memory chip with the processing power needed to serve a variety of different applications in combination with a smart card reader.

Over the past three decades, these tools, more than any other technology, have quietly transported us all into the virtual world.

• Smart credit cards provide trillions of dollars worth of daily transactions.

• SIM cards facilitate billions of conversations that link together our social and economic worlds.

• As an access control device, smart cards (company badges, university IDs) make personal and business data available only to the relevant users.

• Like a national eID card, a smart health card, a residence permit or an electronic passport, smart card technology offers more reliable identification and authentication tools for the benefit of both authorities and citizens.

Confirmations

Electronic identifiers. An electronic identification card (e-ID) performs various roles: it acts as a traditional means of identification, a travel document and, finally, a key to access citizen's data.

There are many international rules and standards regarding electronic identity cards, most of which are applied by States.

The public has become accustomed to computerized smart cards due to their use in the banking system, and as a result, their reliability is no longer in doubt.

National ID cards are now also used to access a range of services that were previously difficult to synchronize.

An electronic identity card (also known as a computerized national identity card) can be used for identification, authentication and electronic signature. Thus, this system makes it possible to simplify several previously complex ways of transmitting information.

If the card is a multi-application card that supports, for example, debit and credit and stored value, the customer will not want to throw away this type of card. It would be more appropriate if the application with the saved values was reloadable. This process is sometimes referred to as "post-release".

Smart Card Alliance. The Smart Card Forum is a group of various industries and government groups, many of which seem to have competing interests.

Today, even competing organizations agree that when it comes to new technologies, industry-wide efforts are required to create a workable infrastructure and develop compatible, interoperable, multi-purpose systems. This effort cannot be carried out on any meaningful scale by individual players acting in their own interests.

To date, the Forum has made great strides in establishing links between industries and the public sector, as well as in encouraging various trials demonstrating the viability of smart card-based payment and information systems.

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