

# СЕКЦИЯ VII ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ И МОДЕЛИРОВАНИЕ

## PASSPORT VERIFICATION SYSTEM DEVELOPMENT VIA IOT EQUIPMENT

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Biometrics is a key fundamental security mechanism, which include fingerprints for personal information verification in passport document. Biometrics can be used as an accurate electronic identifier making it a powerful tool for contemporary authentication processes. The number of biometrical applications [1] is fast growing, with a major part of the biometrical systems being governmental applications seeking for higher accuracy and security in the verification.

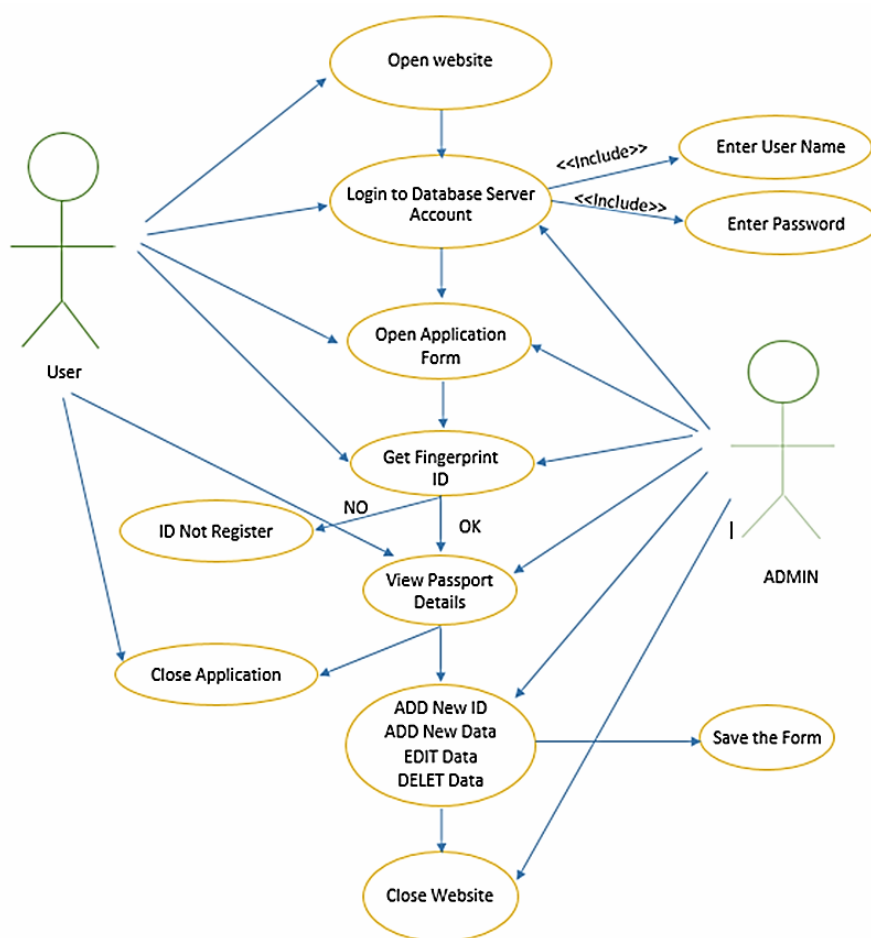


Figure 1. Use-Case diagram for the verification system

The objective of this work is the developing of the verification system by using internet of things (IoT) components [2], [3]. In the proposed verification system, fingerprints will be used as biometric data. Note that this choice is fairly common [4], [5]. At this time, the most developed technology is fingerprint recognition by using fingerprint sensor. Fingerprint sensor is a sensor used to detect fingerprint using optical system, where the detection is done by reading the contours (high level of the surface) fingerprint and static electricity body.

The verification system consists of three parts:

- hardware equipment;
- central database with server;
- custom application.

For the correct and efficient operation of the developed system, two types of users were identified: the manager (*administrator*) and the regular the passport officer (*user*). The functionality of the administrator and the user is shown in figure 1.

All system information is stored in a database consisting of three tables:

- Person.
- User.
- Sensor data.

The table *Person* is designed to store passport data such as First Name, Last Name, Date of Birth and so on. The table *User* contains information about login and password of the verification system user. Table *Sensor data* contains the data accumulated by the fingerprint sensor.

The system was designed using the IoT controller's technology. The equipment connection diagram is shown in the figure 2.

The system user works directly with only two parts of the system: with the hardware module (contains the fingerprint reader) or the custom application. The custom application and the hardware part of the system communicate with one another using a database server and a local network or the Internet.

The system therefore requires network connection. The microcontroller board Arduino Uno as a system base is used. Arduino UNO is a flexible and programmable open-source microcontroller board that can be integrated into a variety of electronic projects.

This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

For verification of user based on the biometrics fingerprint, the fingerprint reader with a mark R305 was selected. This module realizes the processing of fingerprint, image processing of fingerprint, searching and assigning of fingerprint and saving of the pattern of the fingerprint.

For communication with Arduino it uses an UART protocol and can communicate with the speed from 9600 to 115200bps. Module of the fingerprint reader uses the graphical memory and two others 512 bytes' memories (short memory term and permanent for saving of the pattern of the fingerprint and various settings).

The connection between system hardware and the central database is performed by wireless Esp32-module. For taking pictures of travelers a wireless Esp32-camera is utilized. To enter and view passport information for travelers, a smart touch screen Nextion is used.

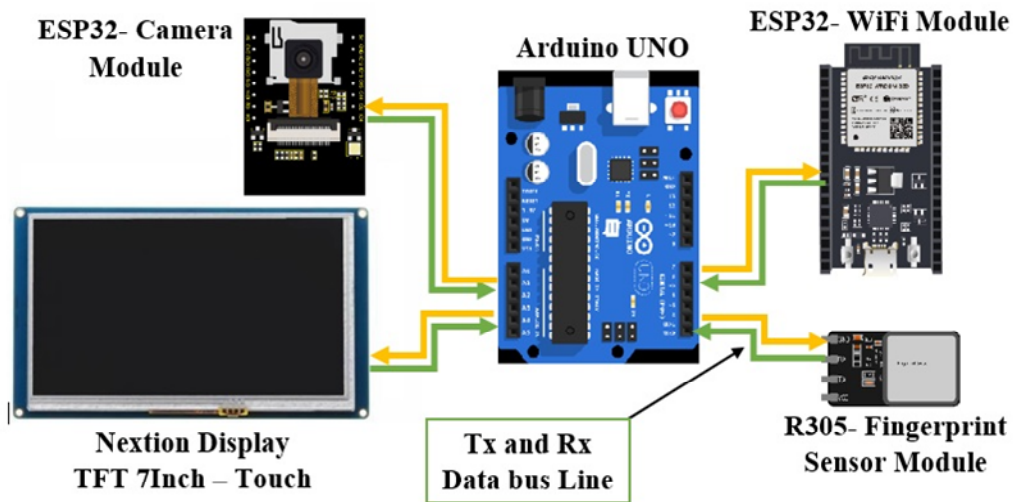


Figure 2. Equipment component diagram

For programming implementation VisualBasic.NET, XAMPP, .NET framework MySQL are used.

The following main *functionalities* have been implemented in the custom application:

- connection with Database and Hardware of the system;
- traveler verification;
- adding and modifying Database.

Our real time fingerprint verification system is a system designed with facilities for registration, verification and viewing travelers' details.

The registration feature collects the travelers' data and also stores this data in an online database. The data required include passport details: passport serial number, full name, family name, country, gender, date of birth, mother's name, expire date, date of issue and the captured fingerprint image with ID which is given automatically via fingerprint sensor. To add person's photo, the specific camera connected to the system can be used.

To validate the traveler's data, the system compares the traveler's fingerprint with templates stored in the system. If the sample matches the template, the traveler's data stored in the database is displayed. In the event of a mismatch, an alert message will be displayed with intermittent beeps.

Also it's possible to search, view, edit and delete data. To search for the traveler's data there several options: by typing the fingerprint ID or Full name or re-scanning the fingerprint.

In developed system, the fingerprint template is stored in the memory of the fingerprint sensor. Note that the memory size of the fingerprint sensor allows to store up to 3000 templates. Storing samples in the sensor memory is the main disadvantage of the implemented verification system. In the future, it is planned to organize the storage of samples using a central server. In this case, it will be possible to provide for the possibility of using several sensors at different workplaces.

In present paper, biometric fingerprint and Internet of things (IOT) technologies were applied for the development of the passport verification system. This avoids forgery and manual work associated with traditional passport verification system. The developed system allows you to store passport data in electronic form, thereby reducing the risk of forgery, duplication of personal data or theft of personal data. It also allows to constantly up-

date information about travelers in the system. Thus, the verification system saves time and provides advanced passport control information.

#### Reference

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## WEB-ПРИЛОЖЕНИЕ ДЛЯ ОРГАНИЗАЦИИ РАБОТЫ ШАХМАТНОГО ПОРТАЛА

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Практически все, что окружает нас в повседневной жизни, так или иначе связано с использованием последних достижений в науке и технике. С каждым днем появляется все больше различных приложений и программ, призванных ускорить работу в различных областях жизни человека.

В частности, данный процесс происходит в сфере спорта, а конкретнее, в тех дисциплинах, где требуется проявить свои интеллектуальные способности.

Основными дисциплинами подобного рода являются: шашки; шахматы; покер; бридж; го; маджонг.

Одна из наиболее распространенных дисциплин – шахматы. Они представляют собой организованный вид спорта с иерархией званий, большим количеством разнообразных регулярных турниров, национальными и международными лигами, шахматными конгрессами.

Возникновение дисциплины привело к появлению спортсменов, тренеров, журналистов, комментаторов.

До недавнего времени все турниры и встречи по шахматам проводились очно. Данный формат проведения мероприятий позволял игрокам путешествовать по различным странам и встречаться с известными шахматистами.

Из-за эпидемиологической ситуации в стране и в мире проведение очных турниров становится все более затруднительным. Здесь и возникает необходимость создать приложение, которое бы позволяло проводить турниры заочно через сеть Интернет, используя технологии *ASP .NET Core* и *Blazor*.

Использование данных технологий позволит использовать приложение в любом браузере, а следовательно, практически на любой операционной системе.