PRESIDENCY UNIVERSITY

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

ITGALPURA, RAJANUKUNTE, BENGALURU - 560064

SCHOOL OF ENGINEERING

A PROJECT REPORT ON

"QR-CODE and IoT Based Electronic Passport Verification with Alert System"

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR

INNOVATIVE PROJECT-RASPBERRY-PI USING PYTHON (CSE1003)

SUBMITTED BY

NAME: S P BRAHMA CHAITANYA
ROLL No: 20211CIT0110

UNDER THE SUPERVISION OF

Guide Name: **Ms. SWEET SUBHASHREE**
Designation: **Assistant Professor**
Department of Computer Science Engineering

2022-23

ABSTRACT

An electronic passport (e-passport) is a passport that uses electronic microprocessor chips embedded in the document to store biometric and personal data. The use of e-passports has become increasingly common in recent years as a way to enhance the security and authenticity of passports.

One potential application of e-passports is the use of QR codes to facilitate the entry and exit of travelers at border crossings. This can be achieved by integrating QR code technology with the e-passport and using it in conjunction with an Internet of Things (IoT) platform, such as a Raspberry Pi Pico, to enable real-time tracking and verification of the passport holder's identity.

The proposed system would work as follows: upon arriving at a border crossing, the passport holder would present their e-passport to a border control officer, who would scan the QR code using a handheld device. The device would then connect to the IoT platform and retrieve the biometric and personal data stored on the e-passport's microprocessor chip, as well as any relevant travel information. This data would be used to verify the passport holder's identity and determine their eligibility to enter or exit the country.

The proposed system would work as follows: upon arriving at a border crossing, the passport holder would present their e-passport to a border control officer, who would scan the QR code using a handheld device. The device would then connect to the IoT platform and retrieve the biometric and personal data stored on the e-passport's microprocessor chip, as well as any relevant travel information. This data would be used to verify the passport holder's identity and determine their eligibility to enter or exit the country.

1. HARDWARE, SOFTWARE, AND TOOLS USED

1.1 **Raspberry Pi Pico** is a low-cost, high-performance microcontroller board with flexible digital interfaces, RP2040 microcontroller chip designed by Raspberry Pi in the United Kingdom, Dual-core Arm Cortex M0+ processor, flexible clock running up to 133 MHz, 264kB of SRAM, and 2MB of on-board flash memory.

1.2 **LCD display** The Liquid Crystal library allows you to control LCD displays that are compatible with the Hitachi HD44780 driver. There are many of them out there, and you can usually tell them by the 16-pin interface.

1.3 **ESP8266 Wi-Fi Module** is a self-contained SOC with an integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

1.4 **OV2640 Camera Module 2MP** This 2MP mini–Compact Camera Module is based on the 1/4″ OV2640 SOC sensor, which has an on-chip ISP, so as to do auto-exposure, auto-white balance to represent a nice image.

1.5 **BUZZER:** Apply 3V to 5V to this piezo buzzer module and you'll be rewarded with a loud 2KHz BEEP. Unlike a plain piezo, this buzzer does not need an AC signal. Inside is a piezo element plus the driver circuitry that makes it oscillate at 2.

2 BLOCK DIAGRAM & DESCRIPTION

An electronic passport, also known as an e-passport or digital passport, is a traditional passport that includes an embedded QR CODE containing biometric information about the passport holder, which can verify the authenticity of the passport and the identity of the passport holder.

A QR code-based electronic passport verification system using a Raspberry Pi might include the following components:

2.1 QR code reader: This component is used to scan and read QR codes, which are two-dimensional barcodes that can be used to store and transmit information.

2.2 2.2 Raspberry Pi: The Raspberry Pi is a small, low-cost computer that can be used to control the electronic passport verification system. It can be programmed to perform tasks such as scanning and reading QR codes, verifying the information contained in the QR code, and communicating with other devices or systems.

2.3 Display: A display, such as an LCD screen, can be used to show information to the passport holder or to display instructions for using the electronic passport verification system.

2.4 Communication interface: A communication interface, such as a wireless or wired network connection, can be used to allow the electronic passport verification system to communicate with other devices or systems, such as border control systems or databases.

2.5 Internet of Things (IoT) devices: These devices, such as sensors or smart devices, can be used to collect and transmit data about the passport holder or the environment in which the electronic passport verification system is

being used. For example, sensors could be used to collect biometric data from the passport holder, or smart devices could be used to collect data about the location or surroundings.

Overall, the electronic passport system using a Raspberry Pi would be used to capture and verify the biometric and personal information of the passport

A block diagram for an electronic passport system using a Raspberry Pi might include the following components:

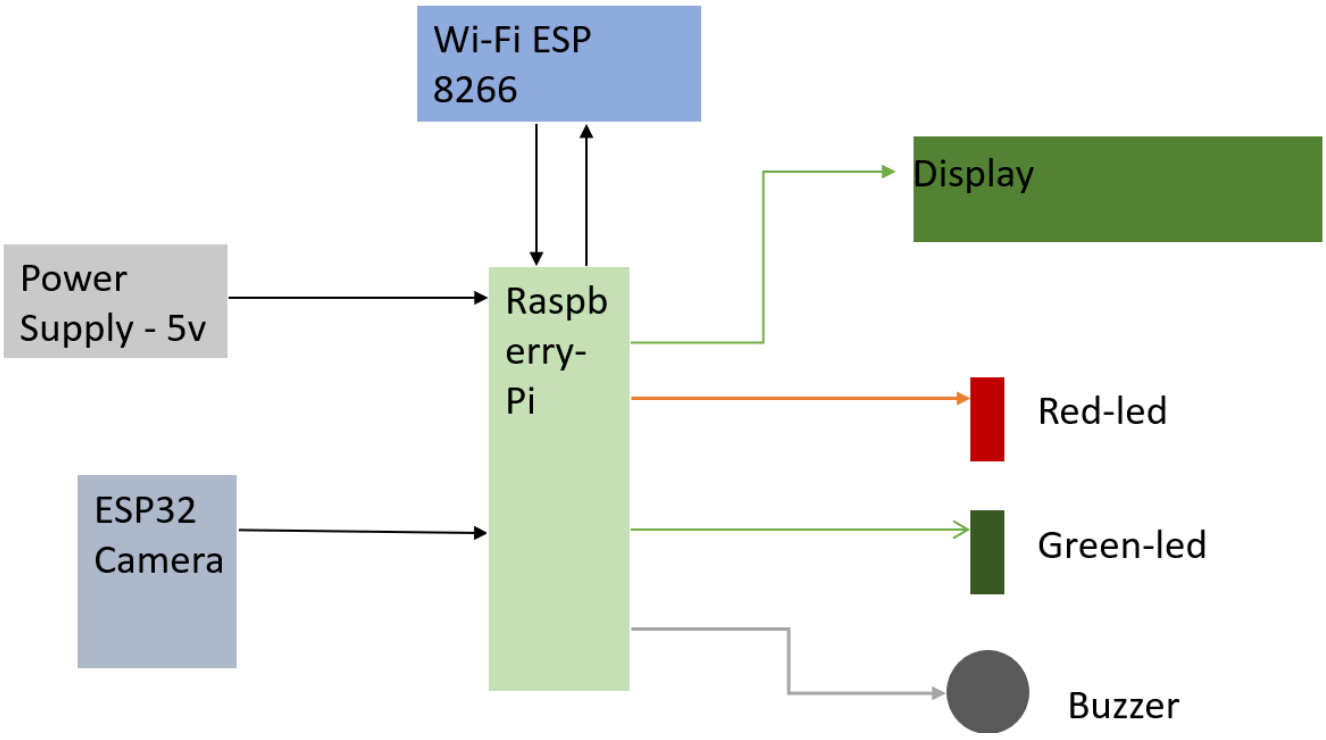

Fig 1. Flow Chart of Program Execution

2.6 THE PINS ARE TO BE CONNECTED SUCH AS:

- **POWER**-5V, GND

- **LEDs**
  RED-GP2
  GREEN-GP3

- **ALARM**-GP17

- **DISPLAY**
  RS-10, D4-12, D5-13, D6-14, D7-15

- **WIFI ESP8266**-RX1, TX0

- **ESP32 CAM**-RX2-9

3 RESULT

An electronic passport verification system using a Raspberry Pi and QR codes could involve using the Raspberry Pi to read the QR code on a passport and then verifying the information contained in the code against a database or other source of information. The Raspberry Pi could be connected to the Internet and use APIs or other methods to access the necessary data.

The Raspberry Pi Pico is a microcontroller board based on the Raspberry Pi Foundation's in-house designed RP2040 microcontroller. It can be used to develop and run programs that interact with physical devices and sensors, such as those used in an electronic passport verification system.

To implement electronic passport verification using a Raspberry Pi Pico, you would need to have a Raspberry Pi Pico and a device that can read QR codes, such as a camera module. You would also need to have access to a database or other source of information that can be used to verify the information contained in the QR code.

There are a number of ways that such a system could be implemented, depending on the specific requirements and use case. For example, the system could be used at a border control point to quickly and accurately verify the identity of travelers, or it could be used by immigration officials to verify the authenticity of passports.

To implement the system, you would need to develop a program that can read the QR code on a passport and verify the information contained in the code against the database or other source of information. You would also need to develop any necessary user interfaces and other features, such as the ability to log or record verification events.

Overall, the process of implementing an electronic passport verification system using a Raspberry Pi Pico would involve a combination of hardware setup, software development, and integration with external information sources.

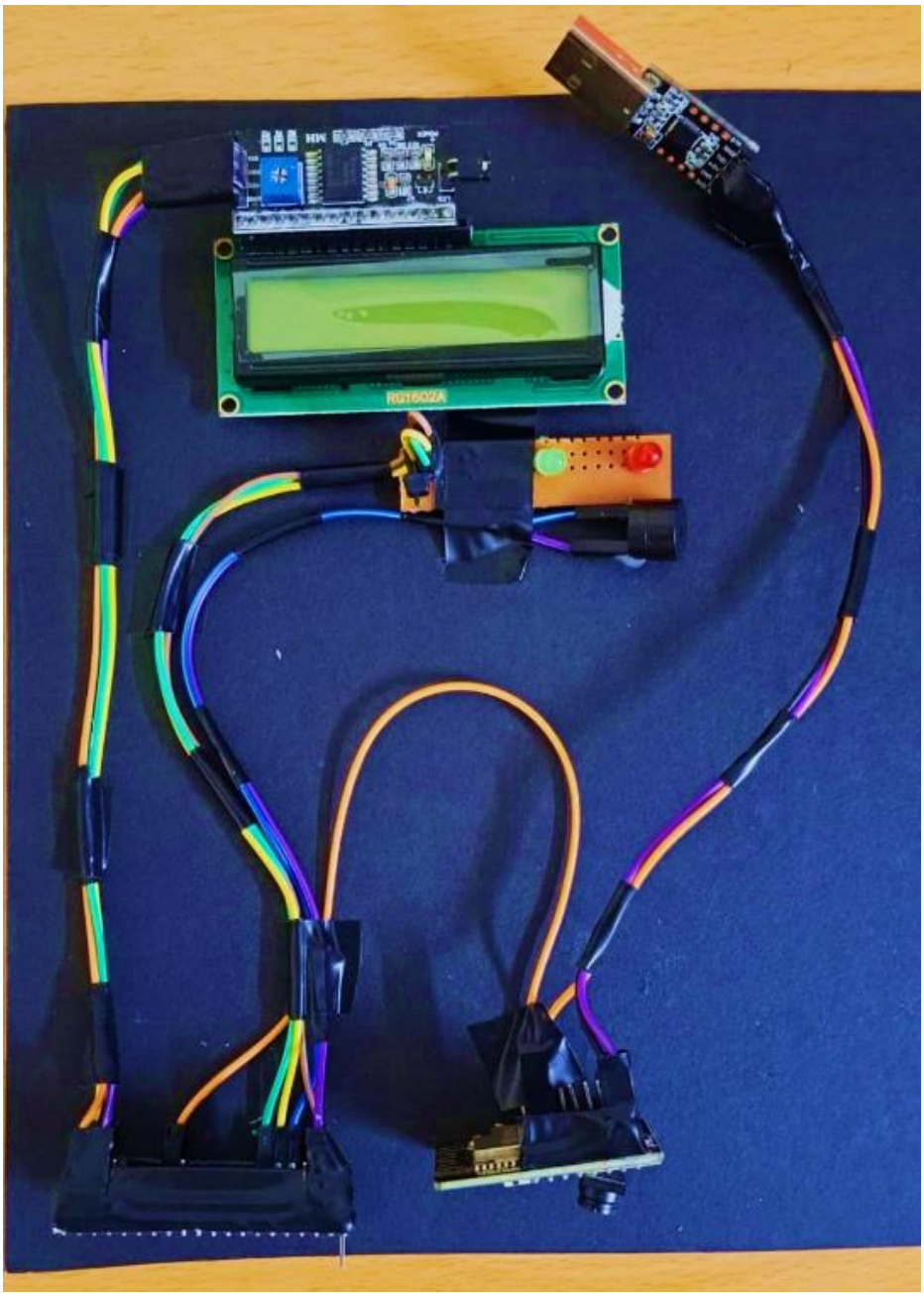

Fig 3. Circuit Design

4 CHALLENGES FACE

There are several challenges that you might face when using a Raspberry Pi Pico for electronic passport verification:

4.1 Limited processing power: The Raspberry Pi Pico is a low-power device with limited processing power, which might not be sufficient for running complex passport verification algorithms or handling large amounts of data.

4.2 Lack of built-in connectivity: The Raspberry Pi Pico does not have built-in connectivity options like Wi-Fi or Bluetooth, which means you will need to use additional hardware to connect it to the internet or other devices.

4.3 Security concerns: When handling sensitive information like passport data, security is a major concern. The Raspberry Pi Pico might not have the necessary security measures in place to protect against data breaches or hacking attempts.

4.4 Integration with existing systems: If you are integrating the Raspberry Pi Pico into an existing passport verification system, you might face challenges in getting it to work seamlessly with the existing hardware and software.

4.5 Limited storage: The Raspberry Pi Pico has limited storage capacity, which might not be sufficient for storing large amounts of passport data or other required documents.

Overall, using a Raspberry Pi Pico for electronic passport verification can be a challenging task, and it may require significant resources and effort to ensure that it is done securely and efficiently.

5 CONCLUSION

The Raspberry Pi Pico is a low-cost, low-power microcontroller that can be used for electronic passport verification, but it may not be the most suitable option in all situations. While it has limited processing power and lacks built-in connectivity, it can be a cost-effective solution for simple or small-scale passport verification applications.

To ensure successful and secure electronic passport verification using a Raspberry Pi Pico, it is important to carefully consider the specific requirements of your application and evaluate whether the Pico is capable of meeting those needs. It may also be necessary to incorporate additional hardware and software to supplement the capabilities of the Pico and ensure that the system is able to function effectively.

In conclusion, the Raspberry Pi Pico can be used for electronic passport verification, but it may not be the best choice for all situations due to its limited processing power, lack of built-in connectivity, and security concerns. While it can be a cost-effective solution for simple or small-scale passport verification applications, it may not be suitable for more complex or high-volume systems.

To ensure successful and secure electronic passport verification using a Raspberry Pi Pico, it is important to carefully consider the specific requirements of your application and evaluate whether the Pico is capable of meeting those needs. It may also be necessary to incorporate additional hardware and software to supplement the capabilities of the Pico and ensure that the system is able to function effectively.