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SMART DOOR LOCK SYSTEM USING QR CODE

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Abstract *- The rise of modern technology has led to a surge in wirelessly based security applications. These applications often utilize various wireless communication technologies to build and implement security access control systems. Among these technologies, Quick Response (QR) codes have gained widespread use in contactless applications across sectors like access control, library book tracking, supply chains, and tollgate systems. This paper explores the integration of QR code technology with Arduino and Python to develop an automated QR code-based access management system. When a QR code is detected, the entry's QR scanner collects and compares the user's Unique Identifier (UID) with the system's stored UID. The results demonstrate that this system effectively grants or denies access to secure environments in a timely and reliable manner. Such security systems play a crucial role in safeguarding physical and intellectual property by preventing unauthorized access. While traditional door locks, including mechanical and electrical locks, address basic security needs, advanced systems like the one described here contribute to creating structured data files for authorized individuals, enhancing overall security measures.*

INTRODUCTION

Numerous organizations have found that automated forced assimilation and accessing control systems are critical in combating the security threats they encounter. This is a period when everything is connected to the system, and everyone can access data from anywhere on the entire planet. As a result, information hacking is a serious problem. Because of these risks, having some kind of personal identification (ID) to have access to one's own personal information is essential. At various points within the guarded space, various methods are introduced to track the individual's activity and limit their access to privatezone. ID card and password techniques are the most regularly used standard individual ID systems.

An electric lock is a safe device that operates on electricity supply. Keyless entry electronic door locks have lately become the most popular security options, with keyless electronic door locks being installed in many households, workplaces, and academic institutions. The reliability with which authorized users may get authorization to access the doors inside a secure system that incorporates an interactive interface, like using a fingerprint or even a predefined passcode to enter it, is the system's key characteristic work by U. Farooq[1].

LITERATURE REVIEW

Securing the keyless door system is very important in order to avoid any intruder accessed the room without being monitored by the authorized person. Furthermore, it is also to avoid any unwanted cases such as equipment being stolen in the laboratory or classroom. According to previous work by S. Morsalin[2].

A asecure access control system based on RFID has been developed that use the RFID tag as the access system. To complete the required task, the system needed to combine RFID technology and biometrics. When the RFID reader installed at the entrance of hostel detected the RFID tag, the system captured the user image and scanned the database for a match. If both the card and captured image belong to the registered user, entrance door will be opened; otherwise the system turned on the alarm and alerted the security via emergency call through GSM modem in order to address the situation. The downside of this project is that if the person lost the RFID tag, the cost to create another RFID tag was more expensive and it was less financial friendly work by J. Boschen[3].

Furthermore, the RFID system usually involves an expensive piece of scanning equipment that is designed to do one task only – scan and decode RFID tags. Compared to the proposed project that implemented QR code, it is much more accessible and affordable compared to RFID and it can print on any surface while RFID need specialized code to generate code in tag. QR system is easy to generate, hence the system has been used in various applications. In related work in the author has developed a QR based attendance management system for recording the students' attendance daily. The author claimed that the QR implementation was user friendly and cost of effective because of no use of paperwork. In other related work by K. Rajesh et. al[4].

A unique QR code was allotted at the parking slot for the purpose of tracing the vehicle location efficiently by using quick sort algorithm. The author has also said that most companies prefer to provide higher, more cost- effective service, hence QR system is considered as one of the best solutions. Apart from tracking the presence of people and objects, QR system has also been used for sharing personal confidential information work by X.Wei[5].

METHODOLOGY

Block Representation:

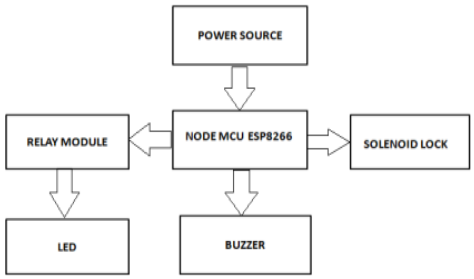

Fig. 1.1 Block Diagram

Functions of the Components:

Node MCU ESP8266 :

The below fig 1.2 Node MCU ESP8266 used in smart door lock system using QR code. The Node MCU (Node Micro-Controller Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SOC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

Fig. 1.2 Node MCU ESP8266

Buzzer:

Buzzer meaning electronic component that generates sound through the transmission of electrical signals. Its primary function is to provide an audible alert or notification and typically operates within a voltage range of 5V to 12V. The below fig 1.3 shows the buzzer used in smart door lock system using QR code.

Fig. 1.3 Buzzer

Solenoid Lock :

The solenoid lock denotes a latch for electrical locking & unlocking. It is available in unlocking in the power-on mode type and locking and keeping in the power-on mode type, which can be used selectively for situations. The below fig.1.4 shows the Solenoid lock used in smart door lock system using QR code.

Fig. 1.4 Solenoid Lock

Light Emittion Diode:

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with holes emitting light in the process. Thebelow fig 1.5 shows the buzzer used in smart door lock system using QR code.

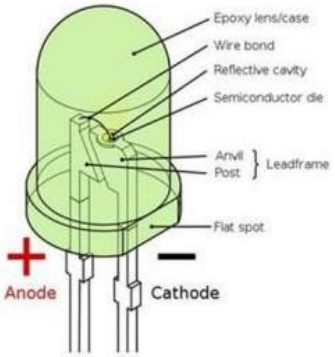

Fig. 1.5 LED

Relay Module:

A power relay module is an electrical switch that is operated by electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit. The below fig 1.6 shows the Relay Module used in smart door lock system using QR code.

Fig. 1.6 Relay Module

QR Code:

Fig. 1.7 QR Code

Final Result:

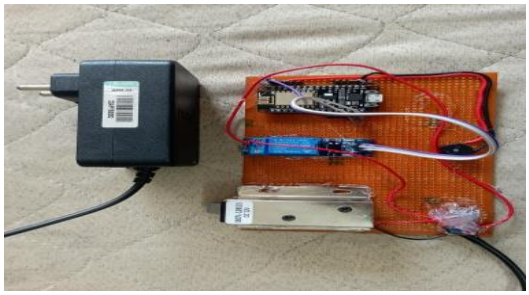

Fig. 1.8 Final Result

The system operates cohesively to create an automated access control mechanism. Beginning with the power supply, it ensures a stable and continuous flow of electricity to sustain the system's functionality. The Node MCU ESP8266 assumes the role of the central nervous system, processing data, executing programmed commands, and coordinating communication between components. Through the relay module, the Node MCU sends signals to the solenoid lock, effectively managing its state of engagement or disengagement. This seamless integration allows the solenoid lock to secure or release access points as directed by the Node MCU. Concurrently, the buzzer, also under the Node MCU's control via the relay module, delivers audible cues or alarms, enhancing user feedback and system responsiveness. Together, these elements form an efficient and reliable automated access control system capable of securing environments while providing informative auditory feedback.

CONCLUSION:

The QR code door lock system is like having a digital key on your phone. It's super safe because it uses strong security measures to keep unwanted people out. Plus, it's really easy to use – just scan the QR code with your phone then a page open in our smartphone and we have to just enter the user passward then door unlocks. It works for homes, offices, schools, hospitals, basically anywhere you need to control who can come in. You can even give temporary access to people if needed. So, it's all about safety, ease, and flexibility.

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