A Survey on Door Lock Security System using IoT

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Abstract: While we are in the 21st century with a lot of technical advancement and enhanced stages of using applications within the scope of our hands, the search for a novel and better technology for a life of ease never comes to an end. The Internet of Things is one such emerging technology. The internet provides a remote access control system to control the computers and equipment at home or the office with the person who manages them from anywhere in the world. As the interface for monitoring and regulating the door lock, a Raspberry Pi board is used in our proposed framework. This study focuses entirely on the safety aspects by broadly listing the typical safety challenges in IOT systems and summarizing these challenges in order to develop a practical and secure product from Just scratch. For this project, a microcontroller is selected and a test environment is developed to experiment and establish breaches of security.

Keywords: Internet of things (IoT); Face Detection; Raspberry Pi; Mobile Application

I. INTRODUCTION

The **Internet of Things (IoT)** defines the network of physical objects equipped with sensors, software, and other technologies in order to communicate and share information over the internet with other devices and systems.

In general, all the devices connected through the internet operate and can be controlled from anywhere. There are billions of physical devices that are now connected to the web across the world, all gathering and exchanging knowledge.

IoT is a series of sensor and actuator-enabled internet-connected physical devices that can exchange data without the intervention of the user.

IoT can be a complex network of nodes with the unique ability to wirelessly share data and information that allows communication between two objects, making them smart and reducing the need for machine-to-machine communication for humans.

The aim of the system is to make users have a simple and easy-to-use system. By using certain innovations that allow for real-time face adjustment, the Smart Home Automation System plays a serious role in helping to minimize work.

By using a wireless system, the proposed job is to give a sign to doors from a computer or tablet or mobile device. This helps the user to lock a door inside or outside a house and unlock it.

The Raspberry Pi Development Board, Wi-Fi Module, Camera, Solenoid Lock, Sensors are the main components of the device used for building the smart door security system. Other sensors can also be added to improve the quality of protection (like motion sensors etc.)

II. LITERATURE SURVEY

The below paragraphs outlines a survey of papers related to the topic in brief with possible gaps/limitations within the proposed system.

[1] The objective of this project is to create an economical and low-budget biometric lock using the fingerprint sensor of a smartphone. The first step to develop in this scenario is an Arduino Nano is a software that uses and uploads Arduino IDE to a microcontroller. Through Bluetooth, this software establishes a

communication link between the nano board and the smartphone. This communication link supports the execution of commands sent by the smartphone by the microcontroller.

Gaps: Since the usage of the fingerprint sensor is present on the phone this project doesn't allow multiple users to access it. Because it is constrained to owner fingerprints only.

[2] The digital lock contains the text password entry keypad and the thumbprint biometric scanner. It has a local database or cloud storage connection. A home or office door is integrated into the digital lock. They need to enter the text password or biometric thumb impression if the person wants to enter inside or outside the home or office. The individual is allowed and their information is already stored in cloud storage or database.

Gaps: The guest wants to enter the home or office. They need to select the guest option. The digital system automatically captures the image and sends it to the respective admin or owner through mobile application or E-mail. May take more time for this process.

[3] The proposed system uses a low-cost controller interface system with Raspberry Pi that consumes less power. When viewer motion is detected at the Door, the camera module interfaced to Raspberry Pi captures images, saves them to the system, and sends them as an email alert via TCP/IP. The authority concerned may control the system and view the video stream of the camera module via Smart Mobile Phone. The system also provided the relevant authority to use the Smartphone to send a voice alert command when an intruder is identified.

Gaps: Since usage of the many sensors for protection the model is bulky.

[4] The wireless LAN module, which is attached to the board, receives the transmitted signal and transmits it to the microcontroller. The microcontroller transmits the data to the servo engine in order to complete the operation on the door.

Gaps: If a fire is of high density then the lock might get damaged easily. Leads to system failure.

[5] The keypad is interfaced to allow the user to enter a password. The LCD is also interfaced to display the password and other visual details such as the correct/incorrect password. When the user enters the keypad password correctly, the door will be opened. The light or any other device is connected to the relays in the home.

Gaps: As it involves a single shared among multiple users it has a high risk of getting stolen. Security of the key is low.

[6] The calling bell is placed on the door so that if someone visits the use, the person presses the bell and the bell sends a signal to the raspberry pi denoting the presence of the person. The camera is the most important input contrivance. It is used to take a snapshot of that

person and to transmit it to the raspberry pi. Raspberry pi processes these inputs as when the call bell is received as an input that transmits a signal to the camera to capture a visitor's image. Within the time the picture is taken, Gmail alerts the user that someone has arrived in front of the door.

Gaps: One of the final drawbacks of RFID door locks is that electrically powered systems. It may not work happily in the event of a loss of power. There is no excellent product, but people are going to continue to idealize an unlimited approximation.

[7] At first, the system detects humans and automatically takes a snapshot of the image acquisition part of the raspberry pi. After the image is attached and mailed to the user, the image processing part is mail & tweet. At last, when the user sends a door lock retweet or opens according to the user's command, the magnetic lock opens or closes.

Gaps: The system must always be monitored in such a way that internet bills are paid in due time to keep connected to their own home.

[8] The Raspberry Pi, ultrasonic sensor, reset button, LEDs, and input and output power are included in the package. The prototype will be positioned next to a door and connected to a magnetic lock that, when the approved user accesses the device, is switched off/unlocked. If unauthorized staff attempt to open the door, the door will remain locked and the picture of the user will be kept in memory. The prototype box will be mounted about 1.6 m from the ground and the door will be put on top of the magnetic lock. A wall plug is taken from the power supply and this is the only input and output from the box. Raspbian OS is used as the Raspberry pi OS. Next, the Python and OpenCV library was installed for the algorithm implementation.

Gaps: Limitation of facial recognition is the physical background of the image being processed. If an image is taken at low light conditions the algorithm fails to identify the target's parameters and fails to read the required data.

[9] Based on the proposed conceptual framework, a prototype device was created that combines a hardware component and a desktop application to automatically control the door via voice command. Raspberry pi, Arduino, Sonar sensor, Webcam, Speaker etc. are the components needed for hardware implementation and the software portion was programmed by python and OpenCV.

Gaps: The system needs to be installed by taking assistance from another person before being used by a visually impaired user. The delay in detecting voice is very high.

[10] The display is connected to a processor-interfaced camera to provide input on who is entering the door and to capture the image via Raspberry Pi to apply facial recognition computing, to start with a Windows 10 IOT version of Raspberry Pi, then to interface the display

with the ARM processor. The processor is connected to a two-way relay module, which in turn is attached by a solenoid. The processor, which has the characteristics of a doorbell, is connected by a push button.

Gaps: This project is implemented in neural networks, and neural networks have few drawbacks in real-time with respect to accuracy and method.

[11] The door lock system for face recognition uses a camera to capture images linked to the Raspberry Pi module for face recognition. The door will open if the image is identified, and if the image is unknown, it will send the image to the website where the owner of the house will determine whether or not to open the door based on the image.

Gaps: To replace the standard relay, a low power relay was used, but this can only be used for small voltage loads. This is one of the drawbacks of the existing Raspberry Pi board.

[12] For real-time use, this project will design face recognition. To conduct smart home protection systems, it is integrated with IoT. This project uses a deep learning system. Several major steps, such as data collection, implementation, monitoring, and troubleshooting, need to be carried out to ensure the desired results are obtained.

Gaps: Time taken for face detection is high. Image processing is less efficient.

[13] The Home Protection system contains two distinct sensors that can track the conditions of the home. The Passive Infrared sensor and Infrared sensor are the sensors used in this article. Next, to link all sensors together and serve as the main controller, the ESPresso Lite V2.0 is used. As a switch, the Blynk program is used to turn the system ON and OFF. For the receipt of data sent from ESPresso Lite V2.0.0, the FAVORIOT platform is used.

Gaps: BLYNK application, which served as a change. It is aimed at turning the project on and off. Provide the connected board with restricted access only.

[14] The framework is implemented using the ESP32 microcontroller, the Arduino programming language, and a mobile application based on Android. The ESP32 Microcontroller is used to combine all electronic devices into one single unit. ESP32 is used because there are two cores in ESP32, one core for running WIFI functions and one core for uploaded programs to run. There is also a Wi-Fi and Bluetooth module for ESP32, and a 36 GPIO. The memory of ESP32 is reasonably high. ESP32 uses low power and also has an internal touch sensor that makes it ideal for use in projects to build door protection systems. PIR Sensor is used to detect motion and in addition, a magnetic sensor is used to detect door status whether it is open or near.

Gaps: The detection is less accurate when the movement is above 1.6 meters.

[15] Basically, this paper consists of three significant sections, i.e. systems for sensing, tracking, and controlling. Sensors such as flex sensors, accelerometers, etc. perform the first part of a sense. The monitoring role is performed by the cloud network and our microcontroller unit, i.e. Arduino UNO performs the controlling part. The sensors, appliances, and Wi-Fi module are interfaced with Arduino UNO. The value of the sensors changes the status of our appliances.

Gaps: When operating the appliances, the flex sensor depends on our finger gestures.

[16] A triple-layered strategy is used in this mission. The first layer is the motion detection layer, which is the output of the python script, and the actions are then activated in the second layer according to the configuration file. Supported operations, such as sending an email to a user or saving images/videos to an FTP/SFTP server, are performed on the third layer.

Gaps: The security elements are in doubt since the transmitted and retrieved data cannot be encrypted and decrypted by devices with limited processing capacity.

III. EXISTING SYSTEM

In a normal door security system, the camera is placed above the door for capturing the image of the person standing outside. The image of the guest is shown in the dedicated specialized device screen (phone connected to Bluetooth) to let in.

To allow the individual in, the owner has complete access to the picture outside. The lock system in some models consists of a special password code that must be entered to visit the residence by the visitor/owner. In certain instances, biometrics, i.e. fingerprint sensors, are used for guest/owner authentication so users' fingerprints are stored in the database and other registered confirmed users can only be easily added.

Some of these devices may not use a database to store guest information, so it can take some time to unlock the door. For instant unlocking without much owner intervention in the protection process, Facial Recognition is also adopted in these systems. But they have less accuracy in detection and also there is no user app interface available for these systems.

IV. CONCLUSION

One of the greatest revolutions in the technological sector is the Internet of Things. In the smart home and building automation scenario, as we described before, digital lock systems play an important role in providing security and reducing human capital. Our system is improved because it contains multiple security alerts provided simultaneously through sensors and cameras. In order to alert the early arrival of the visitor and also those who want to harm the door system, it includes motion detector sensors. Since we use a database for known visitors, processing the unlocking of the door will be much quicker. The admin app interface is designed to make the door protection system simple to manage.
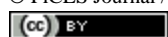
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