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Door Lock Security System Using Raspberry Pi & QR Code

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Abstract - *Home Security Systems are a need of the modern day houses. It is possible to design a simple home security solution by using Raspberry Pi and utilizing the power of Internet of Things. The home security system designed in this project is a simple and easily installable device built using Raspberry Pi 3, Web Cam and PIR Motion Sensor. The Raspberry Pi 3 Model B comes equipped with on-board Bluetooth (BLE) and Wi-Fi (BCM43438 Wireless LAN), so, it can be easily connected with a Wi-Fi Router to access a cloud service.*

The device designed in this project can be installed at the main entrance of a house. It detects motion of any visitor with the help of PIR sensor and starts capturing the images with the help of a USB web cam. The images are temporarily stored on the Raspberry Pi and pushed to the Google Cloud from where they are sent as email alert to the house owner. So, the user gets the images of any visitor immediately on email which he can check from his smart phone. The Raspberry Pi connects with the Google Cloud over TCP-IP stack. The Raspberry Pi 3 is one of the IoT boards which comes equipped with on-board TCP/IP stack, so, it can be readily connected to an IoT network. The Pi uses OpenCV library to capture images from the Web Cam and send them over registered Email address of the user.

Key Words: **Quick Response system, QR, Smart Classroom, Raspberry Pi**

1. INTRODUCTION

An electronic lock is a secure device which operates through electric current. Recently, keyless electronic door locks have become one of the most popular security systems that are being installed in many residents and business places as well as the classroom university. The key characteristic behind such system lies on the reliability in which the authorized individuals can obtain permission to access the doors throughout a secure system that has an interactive interface such as using fingerprint or using designated password to enter it.

Security vulnerability is mainly caused by the keys of mechanical door lock often lost, copied or stolen. To overcome the problem, keyless door lock systems have been introduced but the technology also has several security issues, for instance, an intruder can copy the access code or password to access the door. In addition, existing system that utilizing Radio Frequency Identification (RFID) technology is costly and complex. Therefore, QR scanner is believed as the best method which is much cheaper than RFID, and easy to handle Apart from that, additional security such as the monitoring device is also important. Without monitoring, system, the laboratory administrator will not have information of the activity happen in the classroom or laboratory. Apart from that, in high institution, securing the classroom has become one of the concerning issues facing by many facilities department. When the lecturers or educators are not around and the students need to do self-learning, the activity in the classroom needs to be monitored. In order to prevent illegal activity such as burglary and misused of the equipment inside the class, it is necessary to observe who have accessed into the classroom at a specific time. For this matter, smart security door system has been proposed to strengthen the security control. Therefore, the study is aimed to develop a web-based security door using QR code system for the university laboratory where at the same time the authorized person can perform access monitoring the students' attendance. The data logging system is developed to monitor the ingoing and outgoing activities when accessing the security door from the web-based website server. To test the system functionality, the number of students and staffs accessing the room during working hours were recorded.

2. SYSTEM BLOCK DIAGRAM

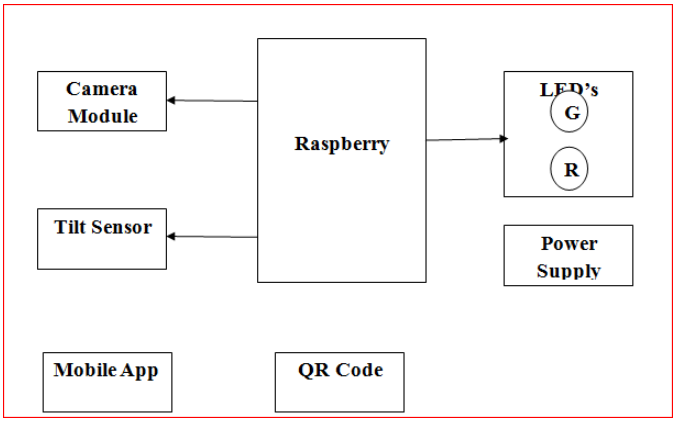


Fig. 1 Block diagram of Door Lock Security System Using Raspberry Pi Qr Code

3. HARDWARE DESCRIPTION

1. Raspberry Pi Camera

1. Raspberry Pi Camera Camera module is Pi camera interfacing to the raspberry pi module. Its resolution is 5-megapixel and still picture resolution 2592 x 1944, Max image transfer rate 1080p: 30fps, this Pi camera module is used for captures an image and send captured image to the Raspberry pi module.

Fig. 2 Pi Camera

2. Tilt Sensor

A tilt sensor is an instrument that is used for measuring the tilt in multiple axes of a reference plane. Tilt sensors measure the tilting position with reference to gravity and are used in numerous applications. They enable the easy detection of orientation or inclination. Similar to mercury switches, they may also be known as tilt switches or rolling ball sensors.

Specifications of Tilt Sensors

The functionality of tilt sensors is influenced by factors such as gravity, vibration, temperature, zero offset, linearity, cross-axis sensitivity, acceleration/deceleration, shock, clear line of sight between the user and the measured point, and calibration of tilt sensors.

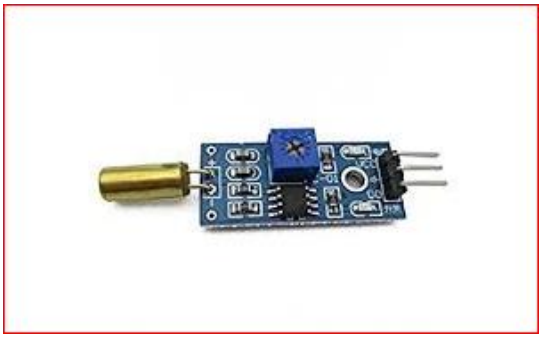


Fig.3 Tilt Sensor

3. Led' S

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

Features

- ECO-Friendly.
- High Reliability & safety.
- Ultra-Efficient LED Lighting.
- Save Energy.
- Save Money.
- Low Cost.
- No More Maintenance.
- Long life: 50000 hours.

Applications

- General Lighting.
- Electronic Equipment.
- Display Screen.
- Backlight Sources.
- Automotive

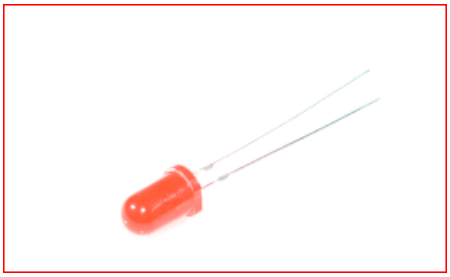


Fig.4 Red Led

Fig. 5 Green Led

RASPBERRY PI

The Latest Raspberry Pi 3 – Model B Original quad-core 1.2GHz 64Bit SoC and onboard WiFi and Bluetooth is the latest product in Robu.in among raspberry pi family. The Latest Raspberry Pi 3 – Model B Original is a third generation product which maintains the same popular board format as other raspberry pi modules, but it has faster 1.2GHz 64Bit SoC, and onboard WiFi and Bluetooth

Raspberry Pi 3 Model B ARMv8 w/ 1GB RAM provides the same Pi features as before but with double the ram and a much faster processor. The Pi 3 has two major upgrades. The first is a next-generation Quad-Core Broadcom BCM2837 64-bit ARMv8 processor. This processor has speeds of up to 1.2GHz compared to the previous 900MHz on the Pi 2. The second upgrade is the addition of a built-in BCM43143 WiFi chip, allowing the Pi 3 to go wireless without additional peripherals. No more WiFi adapters. The Raspberry Pi 3 is also an excellent IoT solution with onboard Bluetooth Low Energy (BLE).

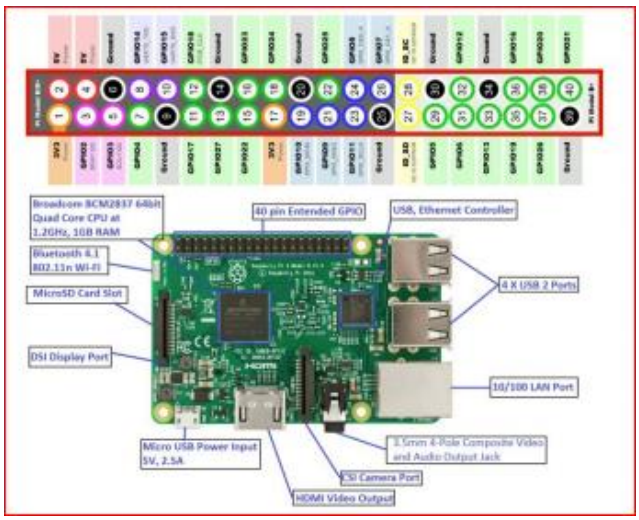


Fig.6 Raspberry Pi 3B+

Raspberry pi is Broadcom BCM2837 64bit ARMv7 Quad Core Processor powered Single Board Computer running at 1.2GHz.

In-built:

- BCM43143 WiFi on board¬
- Bluetooth Low Energy (BLE) on board¬
- Micro SD port for loading your operating¬ system and storing data
- 1GB RAM¬
- 40pin extended GPIO¬
- 4 x USB 2 ports¬ 4 pole Stereo output and Composite video port¬
- Upgraded switched Micro USB power source¬
- (now supports up to 2.4 Amps) CSI camera port for connecting the Raspberry¬
- Pi camera.

4. SOFTWARE DESCRIPTION

The software components are used for the project has been mentioned below:

4.1 Raspbian OS:

Raspbian is an unofficial port of Debian Wheezy armhf with compilation settings adjusted to produce optimized "hard float" code that will run on the Raspberry Pi. This provides

significantly faster performance for applications that make heavy use of floating point arithmetic operations. All other applications will also gain some performance through the use of advanced instructions of the ARMv6 CPU in Raspberry Pi.

4.2 Python:

Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

The Python interpreter and the extensive standard library are freely available in source or binary form for all major platforms from the Python Web site, https://www.python.org/, and may be freely distributed. The same site also contains distributions of and pointers to many free third party Python modules, programs and tools, and additional documentation.

The Python interpreter is easily extended with new functions and data types implemented in C or C++ (or other languages callable from C). Python is also suitable as an extension language for customizable applications.

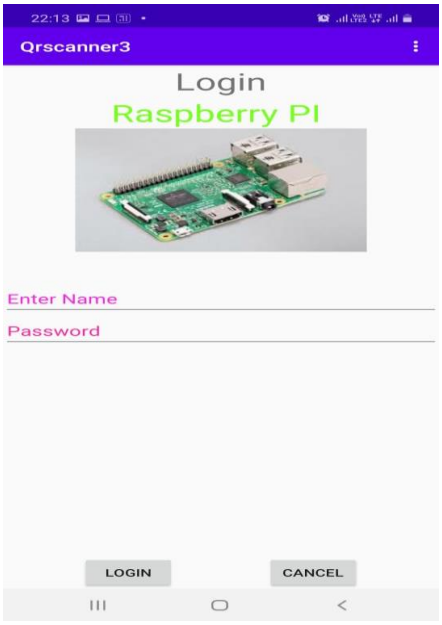
4.3 Open CV:

Open CV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. Open CV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSDlicensed product, Open CV makes it easy for businesses to utilize and modify the code. It is free for both commercial and non-commercial use.

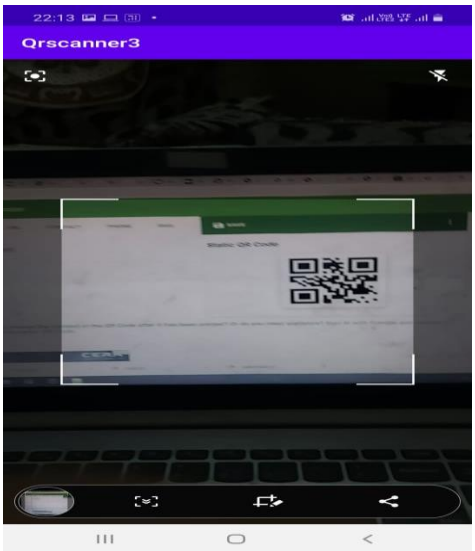
5. ANDROID APP QR CODE SCANNER

QR Code menus are digital versions of physical menu cards at restaurants. Diners scan these QR Code menus to access the restaurant menu on their mobile phones. Using these touch less menus limits the spread of the Coronavirus through physical objects that go through multiple hand exchanges.

QR Code Scanner



Log in to QR scanner



6. ADVANTAGES

1. The device was capable in distinguishing between human and animal intrusion using sensor for body temperature detection.
2. It was using an alarm system which uses to alert the owner by making sound.

7. DIS-ADVANTAGES

1. The use of sensor for body temperature detection increases the cost of the project.
2. The sound was made by device will not be recognized by the owner, if he/she is not present there.

8. CONCLUSIONS

This paper presents the design and implementation of a two-way authentication door lock security system for general users. The security level is increased due to the usage of Raspberry pi which sends the door status to the user, has inbuilt capabilities and is easily connectable to external devices. Raspberry pi proves to be smart economic and efficient platform for implementing the home security system. Two advantages provided by the system are that Necessary action can be taken in current status span of time in the case of emergency condition and design of a PCBboard which is also small in size. Reduced size makes it more applicable to commercial manufacturing and distribution. A raspberry pi and open source applications with its ever-growing community and development provide great hope in the near future

9. ACKNOWLEDGEMENT

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