

Wireless Network for Access Control and Authentication System

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Abstract—The advancement in the field of computer science and boom of electronic gadgets and smart phones in the market since past decade have generated necessity of developing more advance devices. Due to increasing crimes it is also necessary to invent highly advanced devices for security and in this research, a smart technology for automation of opening and closing the door is done. It is done using android based smart phones and RFID readers. It also includes IP Camera along with Arduino Module and Solenoid Locks. This paper mainly analyzes existing authentication and access control methods and design a feasible security system.

Keywords: Authentication, Access Control, RFID, tags, readers, IP Camera, Android

1. INTRODUCTION

The wireless automation applications that can be implemented without any changes in the existing infrastructure and can be installed easily. It lets the user to control the appliances from smart phone. The main objective of this project is to develop a wireless network security system using IP camera and RFID'S.

Authentication and access control technologies are known as the central elements to address the security and privacy problems in computer networks[2]. They can prevent unauthorized users from gaining access to resources, prevent legitimate users from accessing resources in an unauthorized manner, and enable legitimate users to access resources in an authorized manner.

The aim of this paper is –

- To design a wireless network system for access control and authentication system
- To design its hardware setup, and
- Interfacing its hardware and software.

2. COMPONENTS USED

- Android smart phone, b) ESP32 module, c) RFID cards and tags, d) Relay, e) Solenoid Lock, f) IP camera, g) Wires

3. METHODOLOGY

ESP32 microcontroller is used. It is interfaced with RFID reader MFRC522. The reader is used to detect rfid cards and tags. With its unique individual identity it is easy to detect them.

On the other hand, a 12V Solenoid lock is used which is controlled by microcontroller in such a way that when RFID card/tag having trusted Id is detected by the reader, the Solenoid lock unlocks.

Apart from this the user can also allow access to other people not having RFID's with the help of server by providing live streaming to the main controller so that the user can grant remotely unlocking of the Solenoid lock.

4. PROCESS DISCRPTION

A) ESP 32 MODULE

ESP32 is a series of low cost, low power system on chip microcontroller with integrated Wi-Fi and dual-mode Bluetooth. It can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. It can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I²C/ UART interfaces.

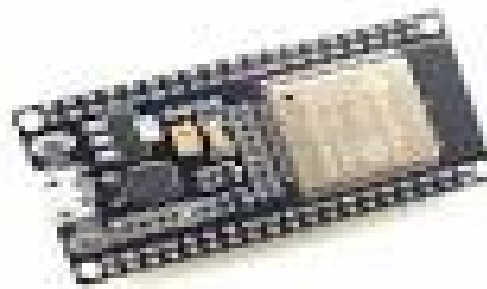


Figure 1- ESP32 Module^[16]

B) INTERNET PROTOCOL CAMERA

An Internet protocol camera, or IP camera, is a type of digital video camera commonly employed for surveillance and which, unlike analog closed circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet.

An IP camera is typically either centralized (requiring a central network video recorder (NVR) to handle the recording, video and alarm management) or decentralized (no NVR needed, as camera can record to any local or remote storage media)[13].

Some advantages to this approach include:

1. Two-way audio via a single network cable allows users to listen to and speak to the subject of the video (e.g. gas station clerk assisting a customer on how to use the pay pumps).
2. The use of a Wi-Fi or wireless network.

C) RFID TECHNOLOGY

RFID stands for radio frequency identification[1].It is an automatic identification technology whereby digital data encoded in a RFID tag or “smart label” is captured by a reader using radio waves.

It has three building blocks: small tags built around microchips that carry a digital identification code; scanners also known as readers; and networking hardware and software to link scanners to computer databases.

RFID tagging is an ID system that uses small radio frequency identification devices for identification and tracking purposes. An RFID tagging system includes the tag itself, a read/write device, and a host system application for data collection, processing, and transmission. An RFID tag (sometimes called an RFID transponder) consists of a chip, some memory and an antenna. RFID technology is built around tags and readers. RFID tags are either “passive” (no battery) or “active” (self-powered by a battery). Tags can also be read-only (stored data can be read but not changed), read/write (stored data can be altered or re-written), or a combination, in which some data (such as the serial number identification or SID) is permanently stored while other memory is left accessible for later encoding or updates[4].

D) ANDROID

Android is an open-source operating system which means that any manufacturer can use it in their phones free of charge. Android is built on the open Linux Kernel. Furthermore, it utilizes a custom JAVA virtual machine that was designed to optimize memory and hardware resources in a mobile environment.

E) SOLENOID LOCK

Solenoids are basically electromagnets: made of a big coil of copper wire with an armature in the middle. The solenoid lock denotes a latch for electrical locking and unlocking[6].

Electric locks use magnets, solenoids, or motors to actuate the lock by either supplying or removing power.

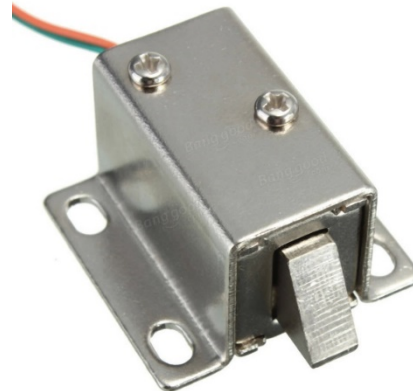


Figure 2- Solenoid Lock^[15]

5. CONCLUSION

In this paper we showed how to implement a mobile RFID reader using hardware and software components which are easily available in the market. The door automation control system has been experimentally proven to work satisfactorily. The door was successfully controlled from a wireless mobile device using android application. Also the status of door is updated manually by using web service as well as windows application, thus proving it wide compatibility. This project won't solely offer the convenient to the disabled and old individuals however are a boon for them. Analysis results show that our approach can prevent attacks like eavesdropping, the man-in-the-middle, key control attack, and replay attacks.

6. APPLICATIONS

The main application of this project is to provide a more secure system for authorized and unauthorized access[2]. The system can be installed anywhere such as offices main gates or industry main gates etc. The owner will be able to watch live streaming from IP camera on his smartphone through a developed application[13]. The owner can control door locking and unlocking by himself. Apart from this RFID tags are given to trustworthy people who are always authorized to access the place. RFID reader detects the RFID tag and matches the unique code, if it is matched the person is granted access, if not access is denied. The access to control the system is protected by password that makes it more secure to use[6].

Apart from controlling the access, we can customize this system by adding some detectors such as smoke detector to detect smoke or gas leakage, temperature sensor, the output from these sensors and detectors is shown on the application[5].

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