JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

RFID & IoT-Based Locker

Dr Mohan Kumar Naik, Andrea Leo Antony, Sarang Mohammed Saleef, Abdul Azim K M, Acharya Shriya Shridhar

Mechatronics Engineering, Mangalore Institute of Technology and Engineering

Abstract- The main goal of this paper is to design and implement a locker security system based on RFID and IoT technology that can be used in banks, secured ofces, and homes. Our RFID and IoT-based locker security system has a door-locking system that can activate, authenticate, and validate the user while simultaneously unlocking the door for secure locker access. The use of passive RFID and IoT has the major beneft of being much more secure than other systems. This system is made up of a Solenoid lock, RFID tag, Esp32 module, and mechanical system. The user can access the password page (based on a mobile application) by scanning the RFID tag. If the password is entered correctly, the locker unlocks and notifes the owner via text. If the password is entered incorrectly, the owner is notifed and a buzzer is triggered if the wrong password is entered thrice. Additionally, this system keeps a log of every user's check-in and check-out times.

Index Terms- RFID technology, IoT security system, Locker security system, Access control and authentication.

I. INTRODUCTION

Safety is a primary concern for individuals in both urban and rural areas, and protecting personal belongings is crucial. Traditional security measures, such as locks and alarm systems, have limitations in terms of efectiveness. In response, this research proposes an innovative locker security system based on RFID and IoT technology. The system incorporates RFID-based access control to restrict access to the number pad solely to authorized users with registered MAC addresses via a mobile phone-generated link. An RFID system is made up of an antenna or coil, a transceiver with a decoder, and a transponder containing pre-programmed electronic information. RFID systems are available in various frequency ranges, including low, mid, and high frequency. Passive RFID tags are a preferred choice due to their lower cost and weight compared to active tags. In case of incorrect password entry, the system will trigger a buzzer and capture a picture of the unauthorized user with a camera module. This system ensures that only authorized individuals can access and retrieve valuables from the locker. Overall, this research presents a comprehensive approach to enhancing locker security with advanced technology, ofering greater peace of mind to individuals in a variety of settings.

II. METHODOLOGY

Radio Frequency Identifcation (RFID) is a wireless communication technology that uses electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to identify objects, animals or people. An RFID system typically consists of three

components: a scanning antenna, a transceiver, and a transponder.

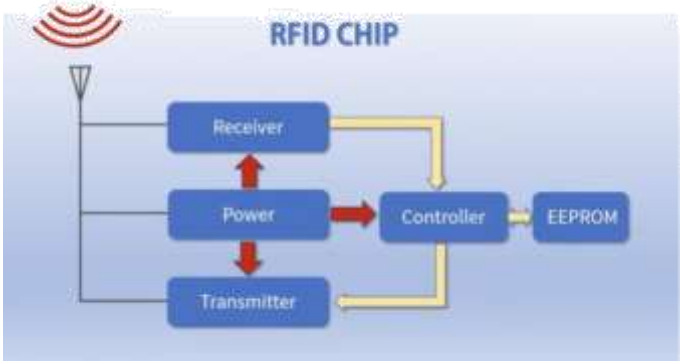

Fig 1: Working of RFID Chip

The scanning antenna and the transceiver are combined into an RFID reader or reader, which is divided into two types: fxed reader and mobile reader. An RFID reader is a network-connected device that can be portable or permanently attached. It uses radio waves to send a signal to activate the RFID tag.

Once activated, the beacon sends a wave back to the antenna, where it is converted into data and sent to a computer for processing. An RFID reader usually consists of a radio frequency module (transmitter and receiver), a control unit and coupling elements for the transponders. Many RFID readers also have additional interfaces (e.g. RS 232, RS 485) allowing them to transmit the received data to another system, such as a computer or a microcontroller.

iddleware sofware is used for communication between RFID readers, it sends information from RFID tags for specifc purposes such as collecting, fltering and setting certain rules received from RFID readers. Middleware is built on the mainframe for inventory tracking, asset management, or other types of applications.

As mentioned above, an RFID system consists of three main components: a tag containing an antenna to transmit data, an RFID reader as a radio frequency transmitter and receiver, and middleware for communication between the reader and the host. The transponder is located inside the RFID tag. The read range of an RFID tag varies depending on factors such as tag type, reader type, RFID frequency, and interference from the environment or other RFID tags and readers. Tags with higher power supplies also have longer read ranges.

These devices communicate with other related devices and act on the information they get from one another. Although people can interact with the devices, for instance, to set them up, give them instructions or access the data, the devices do most of the work without human intervention.

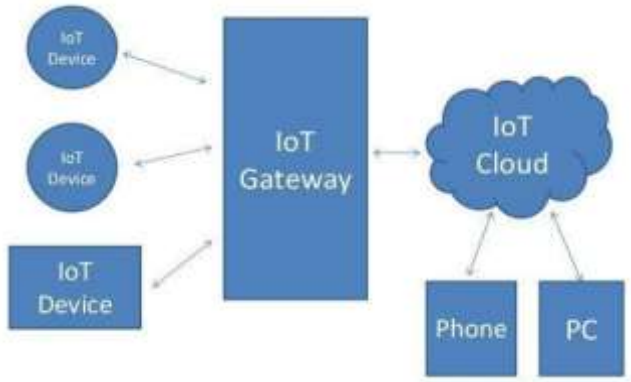

Fig 2: Representation of IoT Architecture

The system known as Internet of Things (IoT) involves a network of computing devices, mechanical and digital machines, animals, people, or objects, each with a unique Identifer (UID) and the ability to transmit data over a network without requiring human interaction. An IoT device can be a variety of objects, from a person with a medical implant to an automobile with built in sensor. This technology is increasingly being utilized by organizations in various industries to improve efciency, customer service, decision making and overall business value. In an IoT ecosystem web enabled smart devices use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on

data. They share the data they collect by connecting to an IoT gateway or other edge device, which then either analyses the data locally or sends it to the cloud for analysis. IoT devices ofen communicate with each other and perform tasks autonomously, but can also be interacted with by human for setup, instruction or data access.

Fig 3: An example locker

It is a smart locker system that works on your fngertips. You can be smarter by choosing a card/Web-page to open the door. These locks are designed with a sensor that works on a signal frequency as soon as the card is taken near the lock. It is an easy-to-use lock system that is preferable for personal and professional use as well. It is a convenient one to use without putting much efort and time. we are using fngerprint scanner RFID tag and a pin lock for the safety system which will have a response system through a web page or Application integrated with the safety pin entering.

The RFID system is used for the identifcation purpose of this project. The fngerprint sensing system is used for the recognition of an individual based on their fngerprint and the safety pin. The entering system is connected with IoT and with a response system from the database.

III. DESIGN

The 3D design of a safety locker has been created using Autodesk Fusion 360, a powerful cloud-based sofware platform for professional product design and manufacturing. The locker is made of steel and has a length of 3000mm, a width of 3000mm, and a height of 200mm. To ensure the safety and security of valuables, a prototype of the locker has been simulated using specialized sofware.

The simulation takes into account factors such as weight distribution, stress points, and potential vulnerabilities to ensure that the fnal product is reliable and durable. With this level of precision and attention to detail, the safety locker is sure to meet the highest standards of quality and performance.

Fig 4: 3D design of locker

A Sample model has been created in simulation sofware and the prototype is simulated the safety locker system.

VI. ADVANTAGES

1) Enhanced security: The system allows only authorized individuals with registered MAC addresses to access the locker. It also captures a picture of unauthorized users and triggers a buzzer in case of incorrect password entry.

2) Convenience: The system ofers a password page based on a mobile application, making it easy for authorized users to access the locker.

3) Log keeping: The system keeps a log of every user's check-in and check-out times, allowing for better tracking and management of locker usage.

V. RESULT

The RFID and IoT-based locker security system was successfully designed and implemented using a solenoid lock, RFID tag, Esp32 module, and mechanical system. Passive RFID tags were chosen due to their lower cost and weight compared to active tags. The system was able to activate, authenticate, and validate the user while simultaneously unlocking the door for secure locker access.

The system also had a password page that could be accessed via a mobile application. If the password was entered correctly, the locker unlocked, and the owner was notifed via text. If the password was entered incorrectly, the owner was notifed, and a buzzer was triggered if the wrong password was entered thrice. Additionally, the system kept a log of every user's check-in and check-out times.

VI. REFERENCE

[1] Kamran Ahsan, Hanifa Shah, and Paul Kingston, “RFID Applications: An Introductory and Exploratory Study,” IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 1, No. 3, January 2010.

[2] Elisabeth Ilie-Zudor, Zsolt Kemeny, Peter Egri, Laszlo Monostori, “RFID technology and its current application,” The Modern Information Technology in the Innovation

[3] R.Ramani, S. Selvaraju, S.Valarmathy, P.Niranjan " Bank Locker Security System based on RFID and GSM Technology" International Journal of Computer.

[4] Y.Huang, “Secure Access Control Scheme of RFID System Application” Fifh International Conference on Information Assurance and Security, Vol.1, pp-525-528,2009.

[5] S.Rasid, F.Rashid, A.Sabri, R.Islam “ Design and Construction of an Automatic Security System of a Door Using RFID Technology” International Journal of Scientifc & Engineering Research (IJSER)Vol.9,pp-1067-1073,2018.