

ARDUINO BASED ENTRANCE MONITORING SYSTEM USING RFID AND REAL TIME CONTROL

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Abstract—The system proposed is a door unlocking system containing multiple doors any of which can be used to access a certain zone e.g. a laboratory or library. The system is implemented using a central server which contains a central database gathering all the information about the authorized personnel. The hardware components required are RFID reader, passive RFID tags, an Arduino microcontroller. Software assistance of Arduino IDE and Processing Development Environment (PDE) are required for control. There is also provision for real-time monitoring of users' activities i.e. entry and exit. This is made possible by automatic synchronization of the system with a secured webpage via internet and offline system.

Index Terms— Internet of Things (IoT); Arduino; RFID; door unlocking system; secure access; real time control

INTRODUCTION

We are living in 21st century the traditional system of attendance is pen paper mode but in such high-tech world it is not much useful and difficult to maintain the system as well as we are not able to monitor it from long distances Nowadays we use door keys to open the door locks also we use passcode to open some doors as well as fingerprint and RFID are also available but we are not able to monitor them. Manual control can be used in offices, laboratories and libraries where it is essential to keep a record of the people entering and exiting. But manual control is not capable of it so we developed below system which can monitor the access over the miles through internet. The system proposed can be basically used for offices, laboratories and libraries where it is essential to keep a record of the people entering and exiting. Research on home automation systems include several such sophisticated systems. It has often been seen that sometimes it becomes necessary for the supervisor of a particular office or lab or library needs to monitor the people coming in or going out immediately when it happens. In line with this thought an automatic attendance system along with secure access through RFID door locking is proposed. The log is automatically updated in a dedicated webpage and hence can be accessed from anywhere and from any device supporting internet. The main focus is to design a simple, cheap system which can be installed easily and also can be fully customized based on application specific requirements. The rest of the project is structured as follows. First, the hardware components required is described and then a brief introduction of the system is given followed by a flowchart and a block diagram of the proposed system. Then we

describe the basic working of the system along with snapshots of the actual webpage created. It will explain how a serial is being sent depending on the number stored in the RFID tag and the door from which it is accessed. Finally, in the conclusion the advantages of the system over the ones in market already are discussed and also improvements are suggested.

LITERATURE REVIEW

Previous works has been mainly on Home Automation systems which have higher costs due to added sophistication like speech recognition [1], face recognition [2] [3], internet access at all the door, etc. Yong Tae Park et al [3] proposed a RFID based door lock system using ZigBee module for exchanging information. Md. Nasimuzzaman Chowdhury et al [4] introduced the feature of remote access via internet but the main constraint was also the cost.

3. PROBLEM DEFINITION

All of the door opening system use traditional ways such as lock and keys, latches, passcode or password locks .It encounters number of limitations that is , access is not time based and id based. Due to this we are following drawbacks.

1. No Time Limitations

Persons having access enter at any time they want and exit at anytime they want. This causes lack of master's eye on ongoing activities and entries.

2. Anyone Can Enter

In traditional systems there are no limitations on who can enter only manual control (security guards) are available.

SCOPE

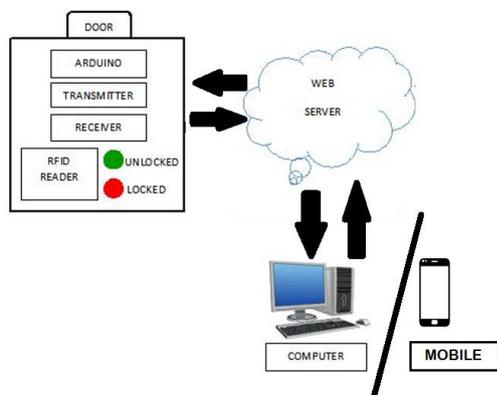
The focus is on implementation of arduino based door unlocking system with real time control and implementing security system to avoid illegal and wrong time access. The hardware implementation would enable the project to be used in real time practical condition.

PROPOSED SYSTEM

The central database contains all the information of the authorized users say their names, occupation, age and the

serials which are written within their RFID cards or tags. The users are uniquely identified by the server by the serial assigned to card. When a new user is first registered to the system new serial is generated randomly and is burnt to the new card using RFID reader. Next time when this user approaches to enter through door the new serial is processed in the same manner as it is already included in the central database. When a user comes to entry point only the serial number is fetched from the card and it is checked that whether the serial is an authorized one or not. If the serial is authorized the entry request is accepted by the server. Accordingly, the door at that particular entry point is unlocked and after a specified time delay it is locked again giving some time to the user to enter. But if the serial is unauthorized access to that door is denied with an alarming sound (sound not included in the prototype). This entry-exit information is also stored in the central database in the form of a log file with date, time and door number. The system can also be controlled manually for any emergency or at the time of any disaster such as fire or earthquake. Two buttons are provided at the server terminal one for manual opening and another for manual closing of all the doors at a time. There is also an online monitoring system. This allows the in charge of the system to monitor the check-in activities of the users as well as to control the status of each and individual door even when the person is out of station or out of that zone.

SYSTEM ARCHITECTURE



SYSTEM ANALYSIS

People for long time have tried to sort out the problems faced in the unlocking and locking system but as these problems exists even now a secured and easy unlocking system is been evolved and done more effectively. The advantages are every individual free to access the system only with owners permission given through network.

In this system , only master user can send the commands to the system and thus can establish communication and perform the prescribed tasks in secured fashion. The various slave users of the system can be connected to a single master in a secured formal. Also when the master gives the order of

shutdown the whole system is shut downed and no one can enter unless and until master turns on the system again

Methodology

XAMPP is a free and open source cross-platform web server solution stack package developed by Apache Friends,^[2] consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes. Everything needed to set up a web server – server application (Apache), database (MariaDB), and scripting language (PHP) – is included in an extractable file. XAMPP is also cross-platform, which means it works equally well on Linux, Mac and Windows. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server extremely easy as well

Algorithm

Algorithm 1: Operation of DOOR Arduino for processing RFID card information

1. get message from server
2. if message==0
3. unlock door
4. go to 22
5. else if message==1
6. lock door
7. go to 22
8. else if message==2
9. normal operation resumed
10. else
11. look for new card
12. if card found
13. read id from a specific block of the card
14. write door number to another block
15. serial=door number + id
16. send serial to server
17. get response from server
18. if response==door number
19. unlock door
20. else
21. keep door locked
22. go to 1
23. end

Algorithm 2: Operations of SERVER Arduino

1. get door status from processing (if changed)
2. if door status='Open'
3. send 0 to door
4. else if door status='Closed'
5. send 1 to door
6. else if door status='Normal'
7. send 2 to door
8. get serial from door
9. send serial to processing
10. receive verdict from processing
11. if verdict=door number
12. send door number to door
13. else if verdict=0
14. send 0 to door
15. go to 1
16. end

Algorithm 3: Processing algorithm for authorization and synchronization with web server

1. obtain database from website
2. obtain door status from website
3. if door status='Open'
4. send 'Open' to server Arduino
5. else if door status='Closed'
6. send 'Closed' to server Arduino
7. else if door status='Normal'
8. send 'Normal' to server Arduino
9. receive serial from server Arduino
10. retrieve door number and id from serial
11. check in database for match
12. if matches
13. send verdict=door number to server Arduino
14. save data to log file
15. upload log file to webpage
16. else
17. send verdict=0 to server Arduino
18. go to 1
19. end

HARDWARE AND SOFTWARE REQUIRMENTS**HARDWARE****1. Arduino UNO Microcontroller**

Arduino UNO is used to control the operations of RFID reader at the doors as well as the transmitters and receivers. Arduino UNO is a microcontroller board which is based on the ATMEGA 328P [5]. It has 14 digital Input /Output pins, 6 Analog Input/ Output pins, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It also includes: Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader, SRAM 2 KB (ATmega328) EEPROM 1 KB (ATmega328). [6]

2. RFID Reader and Tag

A RFID reader needs to be installed at all the doors. It reads information on the "tag". Here we used a MFRC522 RFID reader [7] with a S50 Fudan card [8]. The reader has an operating frequency of 13.56MHz and the maximum data transfer rate is 10Mbit / s.

3.ESP8266 WIFI Module

- ESP8266 is used to upload data from arduino to web server through wifi. The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.^[1]
- The chip first came to the attention of western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer, AI-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.^[2] The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive.

SOFTWARE

- **Arduino IDE** :- Integrated development environment

The software is based on c/c++

It consists of two functions mainly

Setup():-this function called once when sketch starts after power up or reset.

Loop():-after setup() has been called, it executes repeatedly in main program

- Xamp server

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- **Processing**

Processing is Open Source Software. The PDE (Processing Development Environment) is released under the GNU GPL (General Public License). The export libraries (also known as 'core') are released under the GNU LGPL (Lesser General Public License).

APPLICATIONS

It will also be used to monitor the access to door.

It can reduce chances of entry of tracepasser (unknown person)

It can avoid time consumption of manual attendance records

It improves whole system by making it online and high-tech

It helps to find who and when accessed the system

CONCLUSION

Attendance monitoring technology becomes a new frontier in case of security and its dependability. Each area needs to be exclusively programmed. Maintenance is bit costly than traditional system but it is negligible in front of its features. Our system confirms high accuracy and we are confident about its success. However further research and development in this management system could bring that extra edge. So far we have made this system to ease and monitor security systems knowing about human identities would make it more artificially intelligent. The system has many advantages. It is easy to install. Here we can remotely control the status of the door as well as check the Entry/Exit logs. Since the size of the database depends on the memory capabilities of the server a large number of RFID tags can be registered for use. Also, full customization of the system is available (for example, if we want the Security Personnel to be allowed entry between 6pm-9pm, it can be programmed accordingly). Also, Fire control can be provided to unlock all the doors in case of emergency. Range can be extended by using intermediate nodes. Commercially available RFID

locking systems are dedicated for controlling a single door whereas this system can be installed to control even a multistoried building if adequate number of intermediate nodes are introduced. It is also a low cost system. It uses Wi-Fi for transmission and receiving of data.

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