RESEARCH HUB – International Multidisciplinary Research Journal (RHIMRJ)
Research Paper
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Security Based Control System Using RFID

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Abstract: ***The framework joins RFID innovation and biometrics to fulfill the required undertaking. At the point when the RFID per user introduced at the passage of inn identifies a number, the framework catches the client picture and outputs the database for a match. In the event that both the card and caught picture have a place with an enlisted client, access is allowed; generally the framework turns on the alert and makes a crisis call to the security van through GSM modem. Along these lines, the suspicious persons can be gotten.***

Index Terms— Security and access control, RFID

I. INTRODUCTION

Programmed recognizable proof and get to control framework has ended up important to defeat the security dangers confronted by numerous associations in Pakistan nowadays. By introducing the framework at the passage will just permit the approved persons to enter the association. The framework can likewise be introduced at different focuses inside the association to track the person's development and to confine their entrance to delicate regions in the association. In such a way, suspicious persons can be gotten which will doubtlessly enhance the security level in the association.

Radio recurrence ID (RFID) is a remote innovation that can be utilized to build up the entrance control framework. The writing has uncovered the utilization of this innovation to mechanize different procedures going from modern part to home control [1]. Bo Yan [2] has reported the utilization of RFID innovation to computerize sight spot ticket administration framework. The framework equipment comprises of RFID electronic tickets, RFID peruses, work stations, optical systems, PC servers and site controllers. Electronic ticket contains the S-DES encoded type of information including picturesque district number, grand spot number, ticket sort, ticket date, site number, serial number and check bit. The RFID per user at the site peruses the information inside the e-ticket and transmits it to the work station and servers however the system. The information is unscrambled at the terminal and its validness is checked. The site controller then permits the right vacationer to enter the spot. This framework recognizable proof and verification procedure is done at three sub-levels to be specific the deal sub-framework, the choice sub-framework and the administration sub-framework. All these procedures speak with each other through database data. G. Ostojic [3] has built up a programmed vehicle stopping control framework in light of RFID innovation in the city of Novi Sad, Republic of Serbia. The equipment of the framework comprises of RFID tag and per user working at a recurrence of 13.56MHz for validation, inductive circle for metal discovery, a limit sensor for numbering vehicles, Siemens MC 39i GPRS modem for correspondence amongst passage and way out entryways and FEC FC440 programmable rationale controller (PLC) which is the heart of the framework. At the point when the auto stops on the inductive circle at the passage, RFID tag is perused by the per user. The information on the tag incorporates the special recognizable proof number (UID), legitimacy period and check bit for checking the stopping status. This information is controlled by PLC and access is allowed for stopping the vehicle if labeled data contains right UID, legitimacy period and stopping status. After the vehicle has entered the parking area, its stopping status will be changed by the RFID per user/essayist to keep the passage of another vehicle on the same card. The same strategy is rehashed when the vehicle is leaving the parking garage. Nova Ahmed [4] has portrayed RFID based indoor direction and observing framework known as Guardian Angel in pervasive environment. The magnificence of the framework is that it can create dynamic inquiries progressively through client interface. Nature in the framework is furnished with RFID labels and is separated into different zones. The middleware of the framework is partitioned into two layers specifically direction layer and observing layer. The direction layer is given handheld RFID per user to give territory data to the observing layer occasionally. In this way checking layer has the data of the whole environment. Test results have demonstrated that framework is about 100% precise in giving the zonal data in this way permitting the development of extremely powerful direction and observing applications. Kuo-shien Huang [5] has depicted a plan of action based methodology for using RFID innovation in mechanizing the procedure as per venture vital vision and objectives. The creator has manufactured a plan of action for bicycle leasing framework and utilized RFID innovation to execute the framework. The traditional method for getting the bicycle on rent which incorporates the recording of client information by pen and after that inputting the information to the PC is supplanted by giving a RFID card to the client and settling a RFID tag on the bicycle. The bicycle is labeled to monitor its area from the leasing store to the arrival store. The data is shared amongst the stores through web interface. Along these lines, fruitful RFID system is manufactured and sent.

This paper talks about the outline of a security and access control framework utilizing RFID innovation. The framework is contained three modules to be specific passageway checking, exit observing and mess observing. These modules impart to the PC framework through primary controller. After the data from these modules is handled by the PC, the control orders are issued to the modules for conceding or denying access to the client.

  ISSN: 2349-7637 (Online)

II. OVERVIEW OF RFID TECHNOLOGY RFID

framework comprises of three segments specifically transponder (label), questioner (per user) and PC containing the database, as appeared in Fig. 1. The investigative specialist peruses the label information and transmits it to the PC for verification. The data is handled and upon check, access is conceded. The framework offers various recurrence band extending from low frequencies to microwave frequencies [5]: • Low Frequency: 125-134 KHz • High Frequency: 13.56 MHz • Ultra High Frequency: 902-928 MHz • Microwave Frequency: 2.4 GHz Depending upon the wellspring of electrical vitality, RFID labels are delegated either dynamic or aloof. The dynamic labels utilize a battery for driving the circuit on the tag and transmit the label data upon the per user demand. Be that as it may, these labels are extremely costly and occasional utilized. On alternate hands, detached labels get vitality from the per user to control their circuit. These labels are exceptionally financially savvy and thus the greater part of the applications use them. An examination of these labels highlighting essential elements is appeared in Table I [6]-[8]. In the present work, inactive RFID labels have been utilized. A detached RFID tag transmits data to the per user when it comes in the region of electromagnetic field produced by the per user. The marvel depends on Faraday˝s law of electromagnetic prompting. The present moving through the curl of examiner delivers an attractive field which connections to the transponder loop in this manner creating a current in the transponder loop. The transponder curl then differs this current by changing the heap on its radio wire. This variety is really the adjusted sign (plan is known as burden tweak) which is gotten by the cross examiner loop through common prompting between the curls. The cross examiner curl interprets this sign and goes to the PC for further preparing.

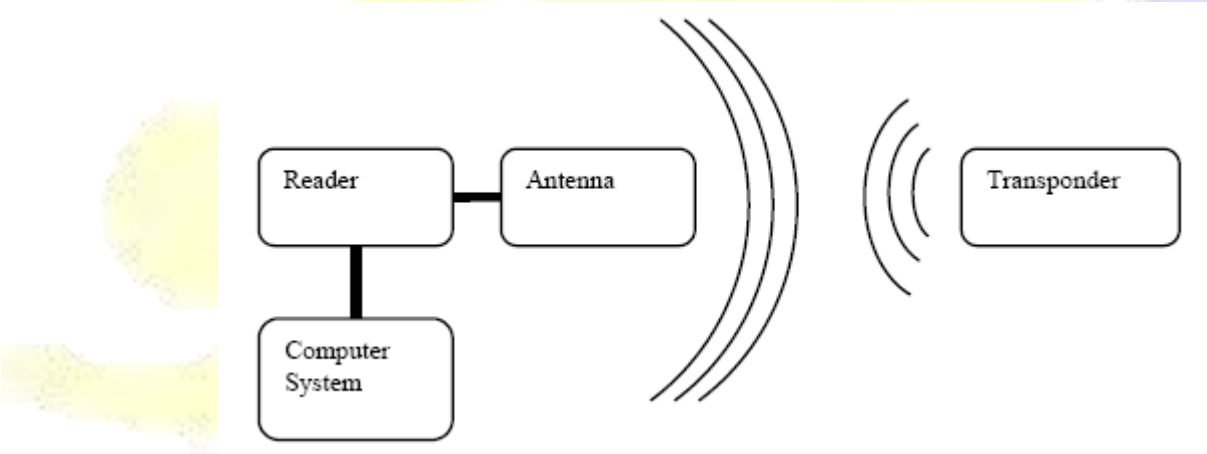

Fig. 1. Basic RFID system.

III. RELATED WORK

Numerous analysts have used RFID innovation in creating access control framework. Filipe [7] has built up a RFID based observing and get to control framework comprising of RFID terminal, camera, server and a ready gadget. After recognizing a transponder, the terminal catches a photograph and transmits the information including the UID and photograph to the server through TCP/IP association. The server searchers the database for this specific inquiry and sends the outcomes back to the terminal to permit or deny the entrance. The framework likewise screens illegal acts e.g., a man tries to enter when the entryway is open without finish of confirmation process and turns on the ready gadget utilizing web administrations. The execution of the framework is tried by introducing RFID units with radio wires covering a scope of 10cm and tasteful results are acquired. Xiang-Lei Meng [9] has portrayed a RFID based implanted security verification framework with novel face acknowledgment structure. The framework involves two stages in particular enlistment and acknowledgment. In enrollment stage, ten pictures of client face with various feelings are gathered and eigen data is gotten with an extraction calculation. This data alongside a UID is composed on RFID tag. In acknowledgment stage, a camera tracks the face and an extraction calculation returns eigen data of the face in the photo. This data is then coordinated with the data as of now put away on the tag for validation. The whole preparing is done on implanted ARM11 processor, S3C6410 rather than work station/server which has brought about quicker reaction time, around 57ms with verification exactness up to 86.5%. The execution of the framework is contrasted and the current database frameworks and is found to have much better reaction time with the same verification precision. Dong-Liang Wu [10] has portrayed an entrance control framework in light of RFID in conjunction with face acknowledgment in view of neural system. The framework perceives the substance of individual holding RFID card and denies the entrance if individual is observed to be unapproved. Outspread premise capacity neural system (RBFNN) has been utilized for taking even with approved persons. Foremost segment examination (PCA) has been utilized for extricating the elements from the picture and straight discriminant investigation (LDA) for refining these components. The system is prepared with restricted speculation blunder model (L-GEM) for improving its speculation capacities.

Experimental results have shown that proposed system can improve the security of RFID access control.

ISSN: 2349-7637 (Online)

IV. SYSTEM COMPONENTS

A. RFID Tag

IPC80 passive RFID tag operating at a frequency of 125KHz is issued to the user. The tag transmits information to the reader in ASK format [11].

B. RFID Reader

IP10 proximity card reader with operating frequency of 125KHz and reading distance up to 4 inches is used. The reader can be easily installed on metal doors, provides the tag information serially in RS232 format and is suitable for indoor as well as outdoor operations [11]. Three such readers are installed for hostel security: hostel entrance gate, hostel exit gate and mess entrance gate.

C. Camera Logitech

C500 webcam is used to capture images. The camera has 1.3 mega pixel sensors and can capture video up to 1280x1024 pixels. Two such cameras are installed for hostel security: one at the entrance and other at the exit. No camera is used for entering in the mess hall to reduce the overall complexity.

D. GSM Modem

Nokia 12i GSM modem is used to make emergency call to the security van. Nokia 12i offers advance GSM connectivity and supports EDGE/GPRS and HSCSD with automated GSM connection establishment it is equipped to provide reliable remote connections and offers application level watchdogs, inbuilt self check mechanisms and a reliable Virtual Machine (VM) for JAVATM. Nokia 12i also supports reliable inbuilt internet protocols: TCP/IP for reliable data transfer, UDP/IP for audio and video streaming and HTTP for accessing web pages. The module can also be connected to an external GPS device that supports National Marine Electronics Association (NMEA) standard. The inbuilt NMEA parser can parse the location data from the output that it receives from the GPS device. External microcontroller can use AT commands to communicate with Nokia 12i and simple remote I/O applications can easily be controlled via text messages.

E. Microcontroller

AT89C52 microcontroller is selected because it is a powerful microcomputer which has low power consumption and provides a highly flexible and cost-effective solution to many embedded control applications. It has 8K bytes of in system reprogrammable flash memory, 256 bytes of internal RAM, 32 programmable I/O lines, three 16 bit timers/counters, eight interrupt sources and a programmable serial channel [11].

F. Nonvolatile

RAM 256K Nonvolatile RAM (NV-Ram) DS1230Y-85 is used for storing passwords against registered RFID numbers. NV-RAM is selected because it combines the best of RAM and ROM: the read and write ability of RAM and non-volatility of ROM. The DS1230 Nonvolatile SRAM is 262,144-bit, fully static, nonvolatile SRAM organized as 32,768 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors VCC for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

G. Door Locks

Solenoid operated door locks are used in entrance, exit and mess gates of hostels. A relay is used to energize the solenoid to open the gate.

H. Alarms

Two alarms are installed; one at the entrance and other at the exit gate. These alarms are turned on if an illegal person tries to enter the hostel premises.

V. SYSTEM OPERATION

The security and access control framework is involved two stages: enrollment stage and acknowledgment stage. In the enlistment stage, ten pictures of the inn client are caught while issuing a RFID tag. These pictures are utilized to prepare a food forward neural system with back engendering preparing calculation and the merged weights are put away relating to a specific client. The acknowledgment stage comes when the client needs to enter the inn. Now, in the wake of getting RFID client number, picture of the client is caught and went to the neural system for acknowledgment. On the off chance that a match is discovered, access is conceded to the client. The client genuineness is checked at three spots: inn passage, lodging exit and chaos passageway. The passage and way out modules use RFID and face acknowledgment for ID while mess module use RFID with a secret word to concede authorization. These modules speak with PC framework through a fundamental controller. The principle controller transmits the modules data to the PC framework. The PC framework subsequent to handling these intrudes on issues charges to the modules through principle controller. The information trade between the fundamental controller and PC framework is through

ISSN: 2349-7637 (Online)

serial port while parallel port information and control lines are utilized for handshaking purposes. The piece graph of the framework is appeared in Fig. 2.

A. Entrance Monitoring Controller

Passage checking controller includes a RFID peruser, a GSM modem, a NV RAM, entryway lock, caution, scroll keys and 16x4 LCD; all interfaced to AT89C52 microcontroller as appeared in Fig. 3. In the wake of identifying and getting RFID label information through a serial interfere with schedule, microcontroller scans the NV-RAM for this number. On the off chance that no match is found, the microcontroller makes a crisis call to the security van through GSM modem. In the meantime, it sends a solicitation to the PC framework through fundamental controller to catch the client picture and turns on the caution signal. Then again, if a match is found, the microcontroller checks the passage status of the client by examining NV-RAM. On the off chance that the client has not entered in the inn yet, the controller sends a solicitation to the PC framework to catch and process the client picture. The PC framework performs two capacities. To begin with, it confirms the client against the got RFID number utilizing face acknowledgment calculation and after that checks whether the client is a defaulter or not. In the wake of handling, the PC framework produces one of the three messages: „access granted" relating to enlisted and clear client, „access denied" comparing to a non-enrolled client and „user is a defaulter" relating to an enlisted and defaulter client. In the event of non-enrolled client, overwhelming fine is incorporated into client inn contribution on a record of utilizing the RFID tag of other client. The passageway controller gets the message from PC framework and presentations it on 16×4 LCD. The points of interest on LCD can be perused with the assistance of parchment keys. On the off chance that the message „access granted" is gotten by the controller, it opens the passage door by exchanging the hand-off. In the meantime, hypnotize status of the client is redesigned in the non unpredictable RAM. The passageway checking module therefore guarantees the section of enlisted and clear clients in the inn furthermore helps in getting suspicious persons that are not approved to enter. The stream outline depicting the operation of passage observing module is appeared in Fig. 4.

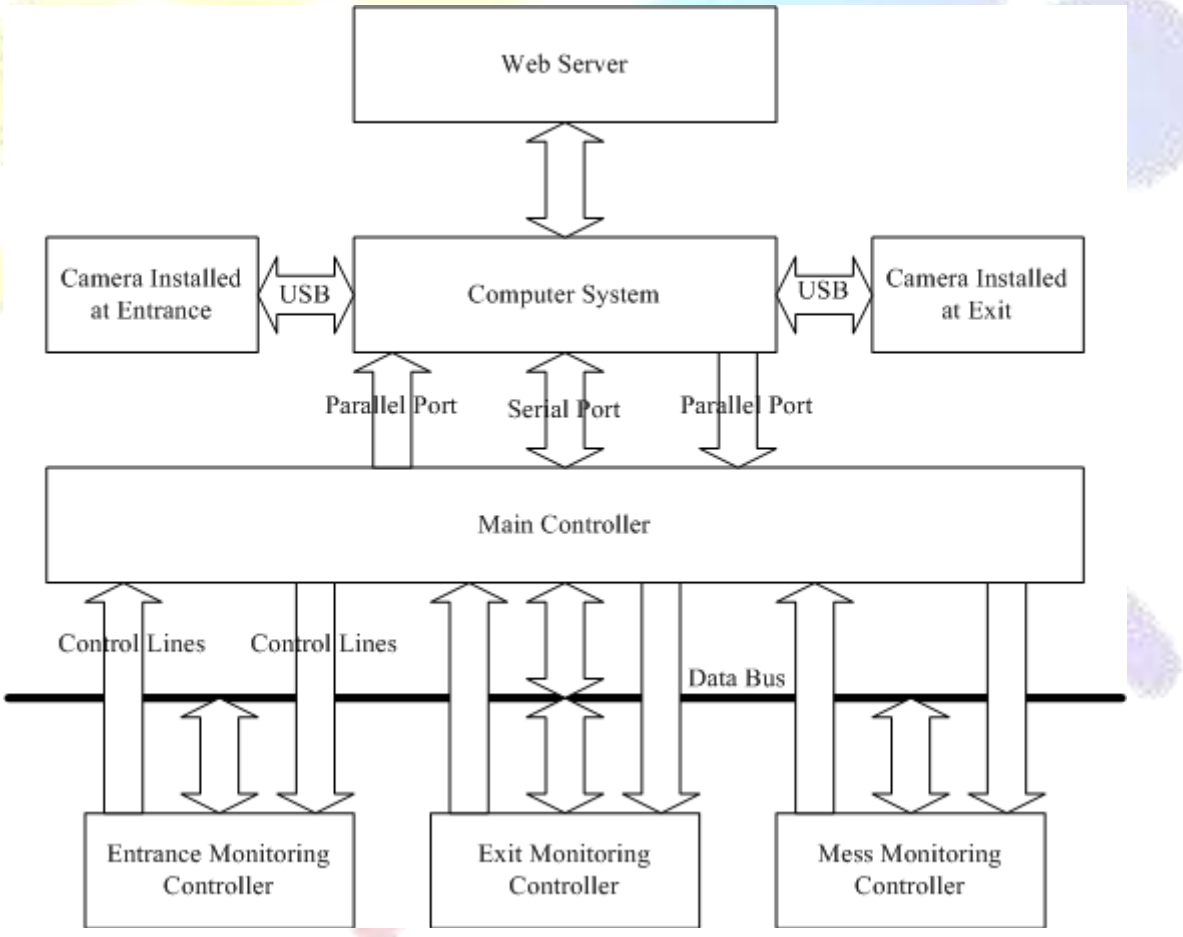

Fig. 2. Block diagram showing modules interconnection with the computer System.

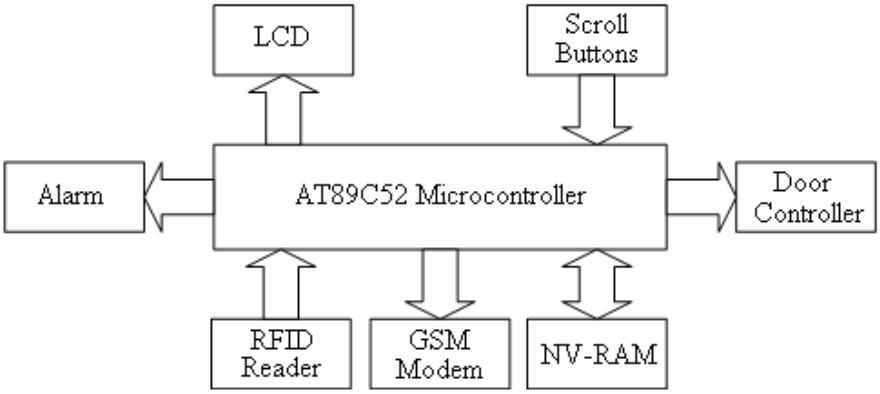

Fig. 3. Block diagram of entrance monitoring controller.

A. Exit Monitoring Controller

The way out observing module involves RFID peruser, an alert and entryway bolt; all interfaced to AT89C52 microcontroller as appeared in Fig. 5. In the wake of accepting RFID label data through peruser, microcontroller sends a solicitation to the passageway checking controller to seek the client and its passageway status in NV-RAM. After accepting a „no" signal from the passageway controller, exit controller squares RFID tag and sends a solicitation to the PC framework to catch the client picture. In the meantime, it makes a crisis call through GSM modem interfaced to passage controller and turns on alert sign. Then again, if a „yes" sign is gotten, the way out controller sends a solicitation to PC framework to catch and process client picture. The PC framework utilizes face acknowledgment calculation to check the client. In the event that a match is discovered, PC framework requests that the way out controller award consent to the client to leave the lodging. After the client has left the lodging, exit controller sends a solicitation to the passage controller through principle controller to overhaul the client passageway status. If there should be an occurrence of non-enrolled client, substantial fine is incorporated into lodging duty of the client for utilizing the card of other individual. The way out observing controller in this manner empowers the framework to permit the substantial individual to leave the lodging. The stream diagram portraying the operation of way out observing controller is appeared in Fig. 6.

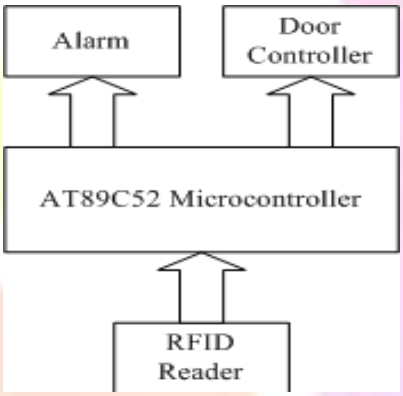

Fig. 4. Flow Chart for entrance monitoring module.

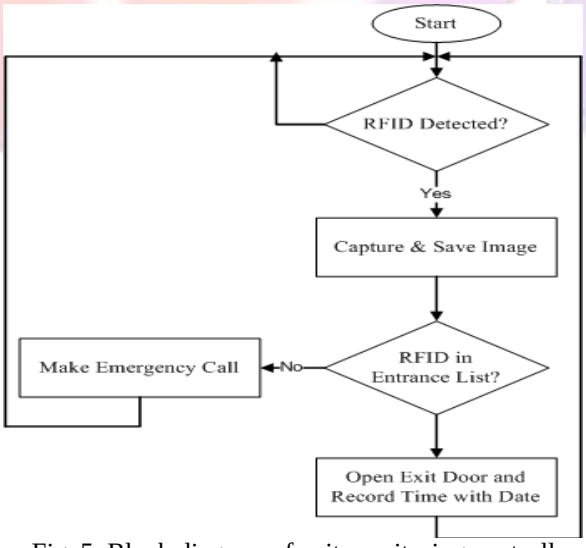

Fig. 5. Block diagram of exit monitoring controller.

B. Mess Monitoring Controller

While passageway and way out observing controllers help in following the clients, mess checking controller mechanizes the wreckage participation framework. The wreckage observing module includes a RFID peruser, 4x3 keypad, 16x4 LCD, a NV-RAM, entryway bolt and caution marker; all interfaced to AT89C52 microcontroller as appeared in Fig. 7. After accepting RFID label number, the controller looks it in a rundown of enlisted numbers put away in NV-RAM. On the off chance that a match is discovered, controller requests that the client enter the secret key. The secret key rundown of enlisted clients is additionally kept up in NV-RAM relating to RFID label numbers. In the event that the entered watchword is right, controller awards access to the client for entering the wreckage corridor. In the meantime, controller sends the client data alongside chaos participation to the PC framework through primary controller. The PC framework overhauls the database and sends „attendance recorded‟ message to the chaos controller. Along these lines, the precise chaos charges are kept up in on-line database. The stream diagram depicting the operation of wreckage checking controller is appeared in Fig. 8.

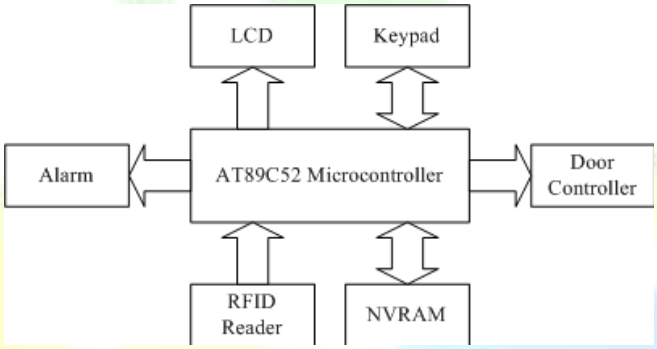

Fig. 7. Block diagram of mess monitoring controller.

C. Computer System and Web Server

The information provided by the system modules is maintained in a database inside the computer system. The database keeps record of user history including check-in time and date, check-out time and date, electricity, gas and mess charges, fine (penalty) details, RFID card lost details and user‟s visitor record. In addition to this, database also keeps record of illegal persons trying to enter the hostel premises.

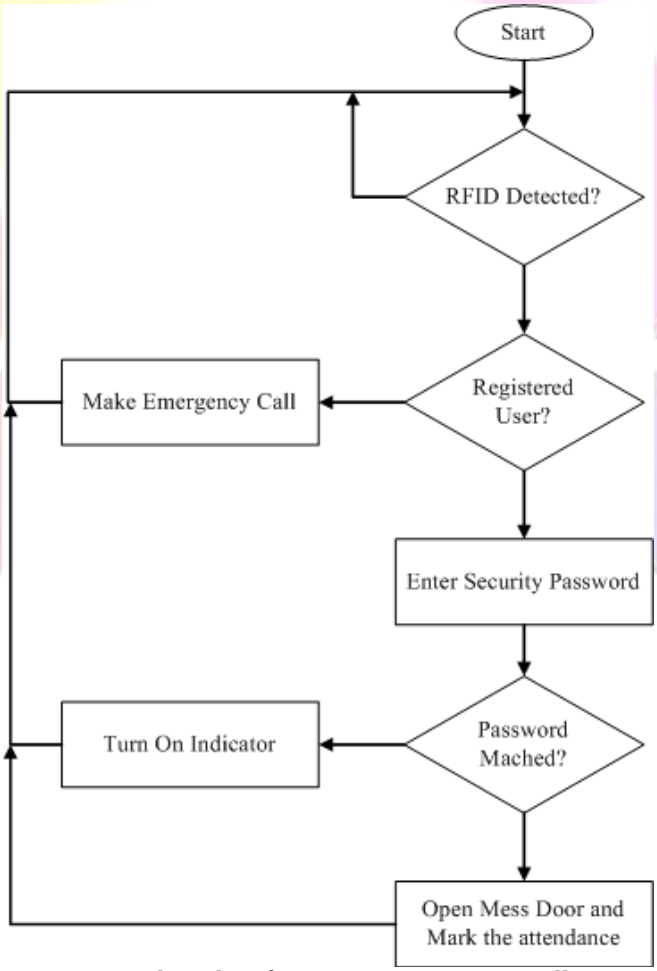

Fig. 8. Flow chart for mess monitoring controller

VI. CONCLUSIONS

In this paper, The framework utilizes radio recurrence distinguishing proof with biometrics innovation to separate amongst substantial and invalid clients. The framework achieves the security and access control errand by preparing data from sub-controllers. These controllers incorporate passageway observing controller, exit checking controller and wreckage observing controller introduced at passageway door, exit entryway and chaos entryway individually. These controllers read RFID label issued to the client and search this label number in non-unstable RAM. On an effective match, the controllers ask for the work station to catch the client picture. The PC framework utilizes neural system prepared face acknowledgment module to confirm the client credibility and reacts to the controllers by sending them „access granted" or „access denied" message. The controllers give the entrance to the client or make crisis call in like manner. This framework is made brought together with the assistance of a web server. The web server takes data from work stations in inns and monitors a specific client. In spite of the fact that the created framework is valuable in lessening security dangers to the lodgings, there is an opportunity to get better in the reaction time of the framework. The reaction time can be enhanced by utilizing committed processors rather than PC frameworks equipped for handling the pictures progressively.

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  ISSN: 2349-7637 (Online)