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Guard Monitering System Using RFID

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ABSTRACT
A system is implemented for the automation of visiting time updating using RFID technology. The inspection officials or other authority persons and faculty members are provided with RFID devices or tags. When these tags pass through the reader generated interrogation field, they transmit information back to the reader, thereby identifying them. The RFID system makes it possible to monitor the movement of tagged users and record their real time data and pass it to processing system to maintain a log. Using the recorded information, this system is capable of making authorized entry and a dedicated web site for the availability of the processed data for the users of the system. The processed data can be monitored by the higher authorities to make sure that security or concerned person is doing his or her job and for the inspection need as well. The entire processing is done without human intervention. The system is comprehensive, effective, efficient, thus can help in automatic visiting time updating using IoT.

I. INTRODUCTION

INTRODUCTION OF EMBEDDED SYSTEM

An embedded system is a computer system designed for specific control functions within a large system, often with real time computing constraints. It is embedded as a part of complete device often including hardware and software parts. By contrast, a general purpose computer such as Personal Computers it is designed to be flexible and to meet a wide range of end user needs.

CHARACTERISTICS OF EMBEDDED SYSTEM

Embedded systems are designed to do some specific task, rather than to be a general purpose computer for multiple tasks. Some also have real time performance constraints that must be met, for reasons such as safety and usability others may have low or no performance requirements allowing the system hardware to be simplified to reduce costs.

Embedded systems are not always standalone devices. Many embedded systems consist of small computerized parts within a large device that serves a more general purpose. Embedded systems have wide variety of applications in almost all fields.

The program instructions are written for embedded systems are referred to as firmware and are stored in read only memory or flash memory chips. They run with limited computer hardware resources little memory, small or non-existent keyboard or screen. Real time systems based on embedded systems plays a key role in all advanced automated machineries and large scale industries.

APPLICATIONS OF EMBEDDED SYSTEMS

- Communication devices like mobile phones, pager, PDA.
- Medical diagnostics devices such as dialysis machines, blood analyzers, protein analyzers, etc.
- Household appliances, home control systems, microwave ovens, automatic washing machines, digital watch, video game player etc.

RFID TECHNOLOGY

A RFID system is made up of two parts: a tag or label and a reader. RFID tags or labels are embedded with a transmitter and a receiver. The RFID component on the tags has two parts: a microchip that stores and processes information, and an antenna to receive and transmit a signal. The tag contains the specific serial number for one specific object. To read the information encoded on a tag, a two-way radio transmitter-receiver called an interrogator or reader emits a signal to the tag using an antenna. The tag responds with the information written in its memory bank. The interrogator will then transmit the read results to an RFID computer program.

There are two types of RFID tags: passive and battery powered. A passive RFID tag will use the interrogator's radio wave energy to relay its stored information back to the interrogator. A batter powered RFID tag is embedded with a small battery that powers the relay of information. In a retail setting, RFID tags may be

attached to articles of clothing. When an inventory associate uses a handheld RFID reader to scan a shelf of jeans, the associate is able to differentiate between two pairs of identical jeans based upon the information stored on the RFID tag. Each pair will have its own serial number. With one pass of the handheld RFID reader, the associate can not only find a specific pair, but they can tell how many of each pair are on the shelf and which pairs need to be replenished. The associate can learn all of this information without having to scan each individual item.

IoT IMPLEMENTATION

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally.

The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed. IoT can also make use of artificial intelligence (AI) and machine learning to aid in making data collecting processes easier and more dynamic.

II. EXISTING SYSTEM

There were a set of traditional methods which were implemented in guard monitoring systems which included many wireless communication prototypes and are also used till date. The ultimate aim of all the systems was to monitor the responsible person or authority who has do his work accurately, maintain the log and provide security for the company.

The existing models were initially used a Bluetooth, which was available for some distance. These Bluetooth connected devices were subordinated and interacted with some server type devices, which enables the nearest allocated Bluetooth devices, whenever the person passes the place. It has a good communication protocol which defined each and every Bluetooth device with a master controller which is an Aurdino. Since the controller was not a CISC type embedded system, they were easy to decode and the data may be lost.

'IBeacon' was a wireless was a wireless communication protocol developed by Apple provided their broadcast ID for a new monitoring system. The broadcast ID were associated with the database which they maintained a daily log consisting of name, time, date, etc. but the real time usage has difficulties.

NFC cards, were also used for the monitoring purposes, they use the communication between two devices with a proximity distance. With the help of Smartphone they transferred small data only.It enables Host Card Emulation Service to Android mobiles which require separate APP in mobile. QR codes were also a part of these NFC technologies. QR code is placed in the buildings and the scanner is given to the guard, once the guard scans the QR code, the information of the buildings is read and stored in the memory which is then transferred to a main server using data cables or USB drives which can be used for future references.

III. SUMMERY

By proper analysis of the conventional technique it is clear that thedata which the person collects should have the accurate time, date, name, information about the building, etc. also the security of the existing system is to be noted. It shows that there may be data lost and literally some protocols are not enough for a company's efficient working regarding to the security.

DISADVANTAGE

- The main drawback of the serial implementation is time consumption and inaccuracy in data transmission and is due to the serial bit transfer.
- Bluetooth connection and other systems require its own time for establishing communication with microcontroller.
- Accuracy is low for NFC and QR codes, also the working range is small and QR requires an android or iOS application for working.
- Working at dim light or night shifts is difficult in QR codes. Range and focus issues.
- Bluetooth and QR codes may lead to damage or wear and tear respectively.

PROPOSED SYSTEM

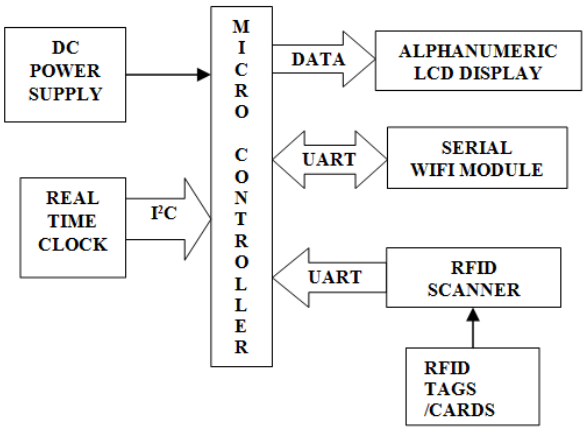
The proposed system uses two out of three different communication protocols in it. The 'I^2C' bus and 'UART' are those protocols which are implemented here. The I^2C is a serial bus protocol consisting of two signal lines such as 'SCL' and 'SDL' lines which are used to communicate with the devices. The SCL stands for a 'Serial Clock Line' and this signal is always driven by the 'Master device'. The SDL stands for the 'Serial Data Line', and this signal is driven by either the master or the I^2C peripherals. Both these SCL and SDL lines are in open-drain state when there is no transfer between I^2C peripherals.

The I^2C bus protocol is most commonly used in master and slave communication wherein the master is called "Microcontroller", and the slave is a 'RTC module'; the clock which shows the date and time of functioning.

The UART is also a serial bus protocol consisting of two lines i.e., the transmitter and receiver. The communication is done properly on a fixed baud rate known as 'SPBRG'. SPBRG stands for 'Serial Port Baud Rate Generator' which is a calculated numerical value and controls the baud rate generation. 'BRGH' stands for 'High Baud Rate Select Bit' which may be high (1) or low (0).

There are two slaves using the UART bus in this case, namely the 'EM18 reader' and 'NodeMCU'. The UART bus can only communicate with a single slave one at a time, so in order to access both the slaves properly, a time delayed 'Relay' is used for switching the data bus.

BLOCK DIAGRAM



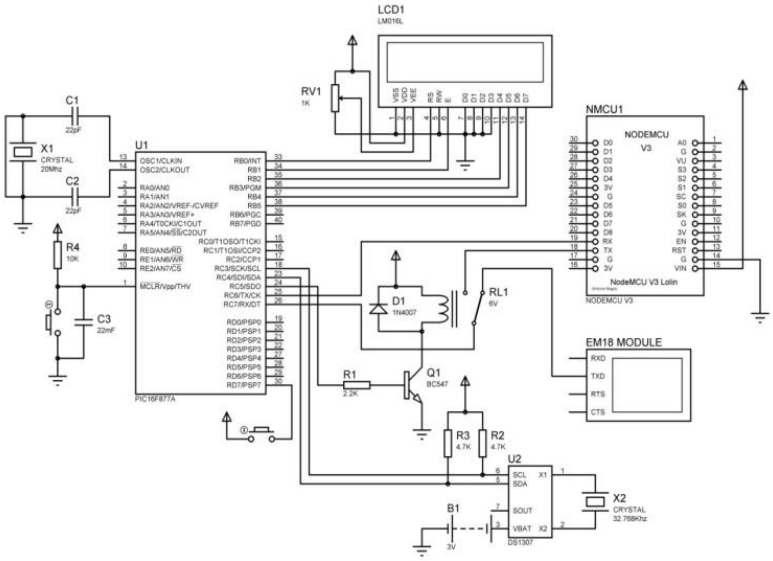
FUNCTION OF SYSTEM

The system is powered ON by a battery which initializes the LCD display and the RTC module. Initially the RTC send the date and time through SCL and SCD to the controller and is then displayed in the LCD. This communication is done by I^2C bus. When the push button is pressed, the I^2C communication is stops and the UART communication initializes.

While pressing the button, the RFID reader will be ready to get data from the cards placed in the buildings. When the card data is received, they are displayed in LCD for the user and the RTC module automatically triggers up, showing the time. This entire process is done until the last desired card is read completely.

After the readings are complete, the controller enables a signal to the Relay which triggers the UART to the NodeMCU side. Since there are two slaves in UART, the triggering is done with a proper time delay.
And finally through request and acknowledgement method, the PIC sends the data to NodeMCU and is then uploaded to the desired server, through Wi-Fi network. When the entire process is complete, the controller comes back to its initial stage and show the date and time

CIRCUIT DIAGRAM DESCRIPTION



Circuit Diagram of System

When the power is turned ON, the LCD display shows the date and time which is already programmed in the PIC microcontroller through DS1307 RTC. The RB0-RB5 are the data pins chosen for display all the dates' which comes from the PIC microcontroller. The RTC clock data is gathered through RC3 and RC4 pins which is serial clock and serial data pin respectively. A separate 3v button cell is fixed in DS1307 RTC for continuous working of clock.

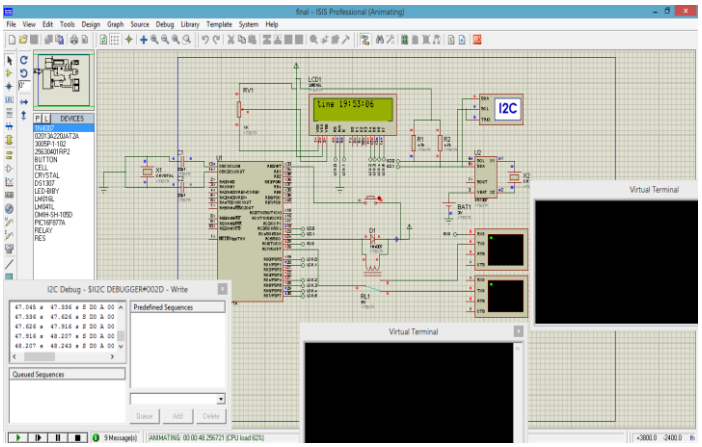
When the push button is pressed once, the time displayed is stopped and the controller initiates the UART communication. Now the RFID Scanner reads the data from card and stores it in the PIC memory via a relay. The relay, at this stage, will be on Normal Close (NC) condition to get and transfer the data to the controller via RC7 i.e. the Receiver pin. After getting the card data, the controller itself stops the UART communication and goes back to then I^2C communication to run the date and time once again.

After reading the first data, i.e. Name, the push button is pressed once again and to collect the next set of data of the buildings. This process is same as mentioned above and transfers the data through NC relay path to the RC& pin. After collecting the necessary dates', the controller provides a signal of 5v via RC5 pin to the Relay which switches to the Normal Open (NO) position.

Through UART communication with a desired baud rate, the PIC controller transfers the data to NodeMCU, which is a Wi-Fi, through the RC6 transmitter pin. In this period, the RFID Scanner will be in Cutoff position and the communication between Mater and Slave is done by 'Request and Acknowledgement' method.

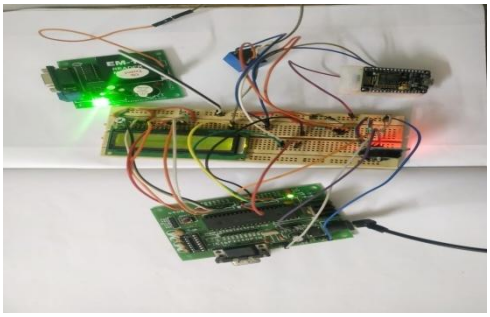
When all the dates' are send to the slave NodeMCU, a final acknowledgement is given to the Master, which turns OFF RC5 pin and the relay comes back to its NC position. The dates' in the slave controller is transferred through internet via a hotspot connection, to Google Script or to the organization's server.

When all the process is complete, the push button at MCLR should be pressed to reset the microcontroller for the next set of readings on that day



IV. CONCLUSION

In our paper a Guard monitoring system is designed using the RFID technology which reduces the man power and allows organizations to continuously monitor their guards on a daily basis manner. With the help of IoT, daily data is collected and is stored in a log or in a server. The PIC microcontroller with the help of DS1307 RTC, stores the date and time of data entry using I^2C communication. Then the data is send to a slave controller, ESP8266 NodeMCU, with in a limited time period using UART communication. Through this, a lot of data and time is saved with in a highly cost effective method. Due to its versatile properties, the model is more flexible and advantageous than the existing model.The advanced model of the proposed system can have a biometric or finger print scanner. This will reduce the risk of impersonation problems, effectively and makes the system more reliable



Experimental Setup

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