Attendance Monitoring System Using RFID Technology

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ABSTRACT:
In Schools, Colleges, Institutions there is a problem of irregularity of students that affects the overall academic performance of Students. Currently, in some institutions, the attendance is taken by calling roll call which is very time consuming and space consuming. So, in this paper we wants to present an RFID and GSM Based Attendance Monitoring System using android system. In this paper RFID Reader receives the data from RFID tag. Each student is issued an RFID tag. A predefined program is stored in this tag for Student ID. Whenever the Student enters into the institution, he has to swipe that RFID tag near RFID Reader that is attached externally to our microcontroller based embedded system. At that moment the reader will checks whether the information of the students is correct or not and then it will decide whether the student is permitted to enter or leave. If the student’s information is correct then the door of the institution is opened and he will be permitted to enter inside. After some time, the door will be closed and if the information is not correct then he will not permit inside, as the door will not get unlocked. The Student Details will be indicated on the LCD display and send through GSM SIM 300 Modem to parents to display whether the student is present or not. The designed system provides an acknowledgement to the parents whose attendance has been taken and when. By using android and Bluetooth technology we can generate the automatic attendance system.

Keywords: GSM SIM 300 Modem, Keil C Compiler, RFID, 8051 Series Microcontroller, Android, Bluetooth

Introduction
In recent years, there is a problem of irregularity of students which may affect the student growth in education. This problem is also faced by parents as they don names or passing a sheet of paper. Both ways have respective drawbacks. First way of taking attendance is time consuming as well as prone to errors and in second case there are chances of having proxy attendance [2]. So RFID and GSM Based Attendance Monitoring System using door locking/unlocking system aims at removing all these problems and drawbacks. In this System, Each student is assigned a RFID Tag that has a unique ID. Whenever the Student enters the college premises, he will sweep that card near the Reader. The Reader will read the Student’s Information and if that information is correctly matched then the door of the Institution is opened and student is permitted to enter. After some time the door gets closed automatically and at the same time message will get displayed on LCD indicating that at the attendance has been taken. At the same moment SMS will be send to the parents mobile via GSM SIM 300 Modem to alert the parents that their ward is attending the college/school. Here Microcontroller is used for controlling the events This System is implemented using RFID Card Reader AT89S52 Microcontroller, RFID Tags, Driver unit for door/locker control, GSM SIM 300 Modem and LCD display. As similar as other technology.

I .RFID Technology
Radio frequency identification (RFID) is a technology that transmits data using radio waves from an RFID tag attached to an object by the reader for tracking and identifying objects. RFID system contains two main components; the reader and the tags. The tag’s normally attached to the component or any object to be monitored and carries data or information in a microchip. The reader on the other side detects tags that are within its frequency range or particular defined area.

A .The RFID Tag
The RFID tag is a kind of a memory device that can transmits its data when being scanned by the reader. The memory consists of binary digits called the bits, and the transmission and receiving of data has done by communication channel. The tag can be an electronic circuit with its own power supply (active device) or a very low power supply circuit (passive device) which get energy from the scanner to transmit its data. In a tag, the transmission power is very low and is measured in milliwatts of watt i.e. microwatts. Tag can be passive, semi-passive or active this are three basic types. It can also be categorized based on memory type and based on the transmission channel. Passive RFID tags have no internal energy source present; for activation of CMOS it required the radio frequency wave which is helpful for activation of tag’s. The
A semi passive tag provide constant power the integrated circuit of the tag and the need for an aerial to get energy from the incoming signal is removed.

**Fig 1. RFID TAG**

**B. The RFID Reader**

The RFID reader sends a signal of radio waves to the tags for its response. The tag detects this signal and sends back a response; the tag ID number and possibly other information as well. The RFID reader can be classified based on the design and technology used (read or read-write) or based on the confirm of the device. The read only RFID reader only reads data from tags, usually a microcontroller based unit with a wound output coil, peak detector hardware, comparators and firmware which are designed to transmit energy to tags and read information back from them by detecting their backscattering modulation, different types for different protocols and standards existing.

**II. GSM Technology**

GSM (Global System For Mobile Communication) is widely used digital mobile telephony system. It works on TDMA (Time Division Multiple Access) system and it is used in three digital wireless telephony technologies (TDMA, GSM and CDMA). Today, more than 700 mobile networks provide GSM services across 215 countries and GSM represents 87.5% of all global mobile connections. According to GSM World, there are now more than 5 billion GSM mobile phone users worldwide.

**Fig 2. Introduction to GSM Technology**

**A. WHAT IS GSM MODEM?**

The special feature of this modem is that it also accepts a SIM card, and just like a mobile phone, it operates over a contribution to a mobile operator. So, it gets look like a mobile phone. It perform various applications like SMS for sending and receiving messages over the modem. The charges are to be taken for sending and receiving messages as done on a mobile phone. All these operations are performed on a GSM modem and that modem must support an “extended AT command set” for sending/receiving SMS messages [5].

**Fig 3. Introduction to GSM Network [5]**
B. WHY GSM SIM 300 MODEM WITH RS232 IS USED?

I. It is a tri-band GSM modem which include three frequency bands (900 MHz, 1800 MHz, 1900 MHz). A facility of serial TTL direct interface to microcontroller is available.

II. It also controls by the Standard AT commands.

III. It comes with a standard RS232 interface which can be used to easily interface the modem to microcontrollers and computers.

IV. A low power consumption of 0.25 A during normal operations.

V. Operating Voltage is up to 7 – 15V AC or DC (onboard rectifier is present).[5]

III. 8051 MICROCONTROLLER

In 1981, Intel Corporation introduced an 8-bit microcontroller called the 8051. The 8051 is an 8-bit processor, meaning that the CPU can work on only 8 bits of data at a time. There are various family members present of 8051 but in this paper we use AT89S52 Microcontroller. The controller is ATMELE’S AT89S52 which is a 40 pin microcontroller with 32 input/output lines. The microcontroller communicates with the RFID Reader and GSM SIM 300 Modem using RS232 protocol for which MAX232 IC is required. This IC is used for converting the CMOS (0-5V) voltage levels into RS232 (plus/minus 12V) voltage levels.

**AT89S52 IS USED**

The AT89S52 is a low power as well as high performance CMOS 8 bit microcontroller with 8K bytes of in-system programmable Flash Memory. This AT89S52 is manufactured by ATMELE Company. Reprogramming is to be done by the onchip Flash memory. The features of AT89S52 are: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two level interrupt architecture, a full duplex serial port, onchip oscillator, and clock circuit.

![Block Diagram of 8051](image)

**Fig 4.Block Diagram of 8051[5].**

IV. Android:

A. Home Automation System (HAS) using Android for Mobile Phone

Android’s releases prior to 2.0 (1.0, 1.5, 16) were used exclusively on mobile phones. Most Android phones and some Android tablets now use a 2.x release and Android 3.0 was a table- oriented release but it not used officially on mobile phones. The current Android version is 4.3. Android’s releases are nicknamed after dessert items like Cupcake (1.5), Frozen Yogurt (“Froyo”) (2.2), Ginger Bread (2.3), Honeycomb (3.0), Ice Cream Sandwich (4.0), Jelly Bean (4.1) and KitKat (4.4) being the recent use. Android applications are written in the Java programming language. The Android SDK provides tools for code compilation and packaging data and resource files into an archive file with ‘.apk’ extension called as an Android package. Android devices used the ‘.apk’ file to install the applications which are going to used. Android's application framework allows for the creation of extremely feature rich and novel applications by using a set of reusable components. The combination of the Android development environment with the Bluetooth wireless technology is known by Android’s support for the Bluetooth network stack, which permits a device to wireless exchange data with another Bluetooth device. The application framework enables access to the Bluetooth functionality using the Android Bluetooth APIs. These APIs allow wireless applications to connect to other Bluetooth devices for point-to-point and multipoint wireless features.
B. An Android application can carry out the following functions:

I. Research for other Bluetooth devices
II. Calibrate about the local Bluetooth adapter for paired Bluetooth devices
III. Establish the RFCOMM channels
IV. It is connected to other devices through service discovery
V. Exchange the data from sender to receiver devices
VI. Administer multiple connections are present.

Android had comical support for Bluetooth in Android-powered devices including: Classic Bluetooth for more battery-intensive operations such as streaming and communicating and with low power consumption, Android 4.3 (API Level 18) introduces API support for Bluetooth Low Energy.

c. Bluetooth

Wireless networks for short range communications have a wide usage of Bluetooth radio transmissions between 2400–2480 MHz by Telecom vendor Ericsson since 1994. Bluetooth technology forms small networks termed as Personal Area Networks (PANs) also provides a mechanism to emulate the RS-232 data cables, supervised by the Bluetooth Special Interest Group, since 1998. Modern mobile devices embed small, low-powered and cheap integrated chips functioning as short-range radio transceivers for Bluetooth radio communications. Device pairing, authentication, encryption and authorization techniques have given recognition to Bluetooth technology due to its vital security mechanisms. Different types of Bluetooth applications can be developed using Android platform architecture using the Bluetooth profiles. The device manufacturers provide the services using the support of these profiles in their devices to maintain compatibility for the Bluetooth technology. The Bluetooth profile used in Home Automation System (HAS) Android mobile phone application is the Bluetooth Serial Port Profile (btSpp). RFCOMM is a connection-oriented protocol. It provides streaming communication between the devices. The btSpp profile and RFCOMM protocol are used in the application to access the serial port and communicate using streaming data. All of the Bluetooth APIs is available in the android.bluetooth package.

D. Keil Vision IDE

Keil development tools for the 8051 Microcontroller Architecture support every level of embedded software development. The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Singleboard Computers, and Emulators support all 8051 derivatives. ‘C Language Program code’ for AT89c51 microcontroller is developed, compiled and debugged using Keil Vision IDE.

E. UC Flash+ Programmer

The ucFlash+ Programmer is an affordable, reliable, and fast programmer for MCS51/AVR Microcontrollers and 24Cxx I2C EEPROMs. The programmer is designed to operate with the Intel Pentium-based IBM-compatible desktop computers and notebook computers. No interface card is necessary to plug the module into a PC (this feature is especially handy for notebook computer users). The menu-driven software interface makes it easy to operate. ucFlash+ Programmer is used here for programming AT89C51 microcontroller for HAS.

V. Automated

Automated is an actual system and known as circuit for Home Automation System which is shown in Home Automation Circuit comprises microcontroller AT89C51, Serial Bluetooth Module, octal peripheral driver array ULN2803, regulator IC 7812, IC7805 and a few components. Here in this circuit, microcontroller AT89C51 is worked as main programmable switching unit which receives data from Bluetooth module and transferred appropriate program data to ULN2803 for operating relay ON and OFF operation. The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory. The Atmel AT89C51 provides a highly-flexible and less-cost solution to many embedded control applications. The AT89C51 provides the many standard features such as: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, five vector two-level interrupt architecture, a full duplex serial port, and on-chip oscillator and clock circuit.

References


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