

Microcontroller based Automated Attendance System for Employees using Zigbee Module

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Abstract

Microcontroller based student attendance system makes use of RFID based detection system to calculate attendance of student in college and do further calculations. This system has been designed to improve reliability of attendance system in the organization. It also aims at building accuracy in electronic attendance and thus reducing human errors. The application of RFID to student attendance monitoring as developed and deployed in this study is capable of eliminating time wastage during manual collection of attendance and an opportunity for the educational administrators to capture face-to-face classroom statistics for allocation of appropriate attendance scores and for further managerial decisions.

Keywords: Microcontroller, LCD, Proteus, attendance, RFID.

1. INTRODUCTION

Microcontroller based student attendance system calculate attendance of students in the organization and perform further calculations. This software has been designed to reduce the manual attendance for student in the organization. It also aims at building accuracy in taking attendance electronically and thus reducing human errors. Attendance data is sensed by microcontroller through keypad then it is send through zigbee transmitter (CC2500). The controller sends processed data derived from the received signals to a host computer [1]. This attendance management system would be the best effective way to regulate the attendance in the regulatory firm like student of university, employee attendance management system rather the tedious manual attendance system. The authority of accessing the records is limited. Username and password are provided to department person. He can make new entries; modify particular field as well as search for records. We have included various search algorithms based on RFID number, DATE, Employee ID etc. The reports have been generated in various formats [2].

2. AUTOMATED ATTENDANCE SYSTEM

The purpose of “Automated Attendance System” is for the recording the attendance of students. It is developed to manage the attendance information so that college can access attendance information quickly and easily as and when required, improving its operational efficiency and effectiveness [3].

2.1 Transmitter Section

The transmitter section is shown in Fig.1. The system uses hardware to take the attendance of student. Each student is provided with an individual roll number and its record is maintained in a database. When he/she uses enter key for first time in a day, time will be fetched and stored as in time field. Thus record is maintained whenever the students enters and leaves the premises. Data is sensed by microcontroller through keypad and is send through zigbee to cell controller. The cell controller sends processed data derived from the received signals to a host computer. The host computer collects the data and resolves them into positional estimates [4].

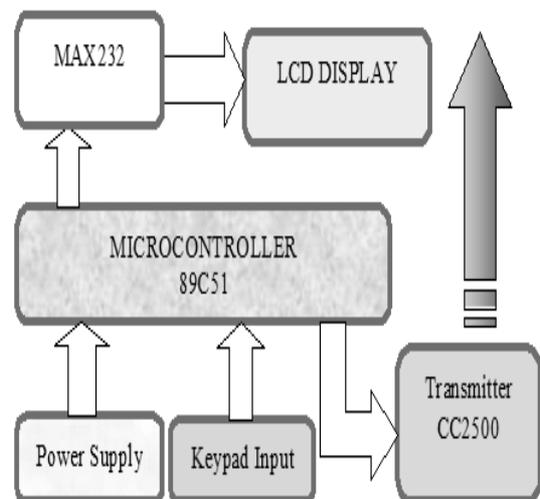


Fig.1 Transmitter Section

2.2 Receiver Section

The receiver section is shown in Fig.2. The host computer collects the data and resolves them into positional estimates. The host computer archives data in a data warehouse, such as a Microsoft access. Every day evening calculation is carried out by PC about activity of each and every student. The authorities of accessing the records are limited. Username and password are provided to the department person. The authority can make new entries, modify them and even search for information based on a particular field.

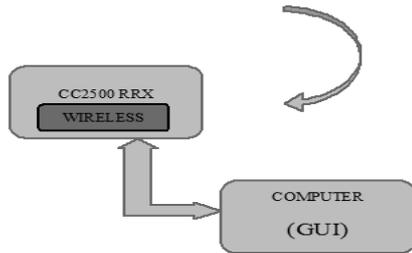


Fig.2 Receiver Section



Fig.3 20X4 LCD Display

3. HARDWARE COMPONENTS

3.1 Microcontroller

A microcontroller is a computer-on-a-chip, single-chip computer. Micro suggests that the device is small, and controller is the device used to control objects, processes, or events. A microcontroller is embedded controller because the microcontroller and its support circuits are often built into or embedded in the devices they control. Consumer products that use microcontrollers include cameras, video recorders, compact-disk players and ovens. A microcontroller is similar to the micro-processor inside a personal computer [5].

Features of 89C51:

- 4K bytes internal ROM (program)
- 128 bytes internal RAM (data)
- Four 8-bit I/O ports
- Two 16-bit timers
- Serial interface
- 64K external code memory space
- 64K external data memory space
- 210 bit-addressable locations

3.2 MAX232

Max232 is designed by Maxim Integrated Products. This IC is widely used in RS232 Communication systems in which the conversion of voltage level is required to make TTL devices to be compatible with PC serial port and vice versa. MAX232 comes in 16 Pin Dip and many other packages and it contains Dual Drivers. It can be used as hardware layer convertor for systems to communicate simultaneously. Max232 is one of the versatile IC to use in most of the signal voltage level conversion problems.

3.3 Liquid Crystal Display

The LCD used in this system is a 20X4 LCD which means 20 characters and 4 lines. These modules are not quite as advanced as the latest generation, full size, full colour, back- lit types used in today's laptop computers, but far from being "phased out," character-based LCDs are still used extensively in commercial and industrial equipment, particularly where display requirements are reasonably simple. The modules have a fairly basic interface, which mates well with traditional micro- processors. Shapes and Sizes Even limited to character-based modules, there is still a wide variety of shapes and sizes available. Line lengths of 8, 16, 20, 24, 32 and 40 characters are all standard, in one, two and four-line versions.

LCD modules conform to a standard interface specification. A 14-pin access is provided (14 holes for solder pin insertion or for an IDC connector) having eight data lines, three control lines and three power lines. The connections are laid out in one of two common configurations, either two rows of seven pins or a single row of 14 pins. Pins 1 and 2 are the power supply lines V_{SS} and V_{DD} . The V_{dd} pin should be connected to the positive supply and V_{SS} to the 0V supply or ground. Pin 3 is a control pin, V_{EE} , which is used to alter the contrast of the display. Ideally, this pin should be connected to a variable voltage supply. A preset potentiometer connected between the power supply lines, with its wiper connected to the contrast pin is suitable in many cases, but be aware that some modules may require a negative potential; as low as 7V in some cases. For absolute simplicity, connecting this pin to 0V will often suffice. Pin 4 is the Register Select (RS) line, the first of the three command control inputs. When this line is low, data bytes transferred to the display are treated as commands, and data bytes read from the display indicate its status. By setting the RS line high, character data can be transferred to and from the module. Pin 5 is the Read/Write (R/W) line. This line is pulled low in order to write commands or character data to the module, or pulled high to read character data or status information from its registers. Pin 6 is the Enable (E) line. This input is used to initiate the actual transfer of commands or character data between the module and the data lines. When writing to the display, data is transferred only on the high to low transition of this signal. However, when reading from the display, data will become available shortly after the low to high transition and remain available until the signal falls low again. Pins 7 to 14 are the eight data bus lines (D0 to D7). Data can be transferred to and from the display, either as a single 8-bit byte or as two 4-bit "nibbles." In the latter case, only the upper four data lines (D4 to D7) are used.

3.4 Matrix Keypad

A keypad is the most widely used device in digital circuits, microcontrollers or telephone circuits. Many applications require large number of keys connected to a computing system. A matrix keypad consists of arrangement of switches in matrix format in rows and columns with the microcontroller I/O pins connected to the rows and columns of the matrix. The switches in each row are connected to one pin and switches in each column are connected to another pin. Matrix keypads are well known for their simple architecture and ease of interfacing with any microcontroller.

3.5 Zigbee (Radio Frequency Module)

An RF module (radio frequency module) is a small electronic device used to transmit and/or receive radio signals between two devices. RF communications incorporate a transmitter and/or receiver. ZIGBEE module is targeted at applications that require a low data rate, long battery life, and secure networking. ZIGBEE module supports bit rate of 250 Kbits/s. It is best suited for data or a signal transmission from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range wireless transfer of data.

4. SOFTWARE COMPONENTS

4.1 Visual Studio

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Microsoft Windows, as well as web sites, web applications and web services. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silver light. It can produce both native code and managed code. Visual Studio includes a code editor supporting IntelliSense (the code completion component) as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a forms designer for building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that enhance the functionality at almost every level-including adding support for source-control systems (like Subversion) and adding new toolsets like editors and visual designers for domain-specific languages or toolsets for other aspects of the software development lifecycle (like the Team Foundation Server client: Team Explorer) Visual Studio supports different programming languages and allows the code editor and debugger to support (to varying degrees) nearly any programming language, provided a language-specific service exists. Built-in languages include C [6] C++ and C++/CLI (via Visual C++), VB.NET (via Visual Basic .NET), C# (via Visual C#), and F# [8]. Support for other languages such as M, Python, and Ruby among others is available via language services installed separately. It also supports XML/XSLT, HTML/XHTML, JavaScript and CSS, Java (and J#) were supported in the past.

4.2 Proteus

Proteus is Virtual System Modeling (VSM) software that combines circuit simulation, animated components and microprocessor models to simulate the complete microcontroller based designs. This is the perfect tool for engineers to test their microcontroller designs before constructing a physical prototype in real time. It allows users to interact with the design using on-screen indicators and/or LED and LCD displays and if attached to the PC, switches and buttons. One of the main components of Proteus 7.0 is the Circuit Simulation- a product that uses a

analogue simulator kernel combined with an event-driven digital simulator that allow users to utilize any SPICE mode by any manufacturer. Proteus VSM comes with extensive debugging features, including breakpoints, single stepping and variable display for a neat design prior to hardware prototyping.

4.3 KEIL μ Vision

Keil Software provides software development tools for 8051 based microcontrollers. With the Keil tools, you can generate embedded applications for virtually every 8051 derivative. Keil Software development tools for the ARM microcontroller family supports professional applications engineer as well as new learners. The industry-standard Keil C compilers, macro assemblers, debuggers, real-time kernels, and single-board computers support all ARM-compatible derivatives. M Vision is an IDE (Integrated Development Environment) that helps to write, compile, and debug embedded programs. It encapsulates the project manager, a make facility, tool configuration, editor etc

4.4 Flash Magic

An NXP semiconductor has produced a range of micro-controllers that feature both on-chip flash memory and the ability to be reprogrammed using In-System Programming technology. Flash Magic is windows software from the Embedded Systems Academy that allows easy access to all the ISP features provided by the devices. These features include:

- Erasing the Flash memory (individual blocks or the whole device)
- Programming the Flash memory
- Modifying the Boot Vector and Status Byte
- Reading Flash memory
- Performing a blank check on a section of Flash memory
- Reading the signature bytes
- Reading and writing the security bits
- Direct load of a new baud rate (high speed communications)
- Sending commands to place device in Boot loader mode

5. FLOW CHARTS

The transmitter program execution is represented by the flow chart given below.

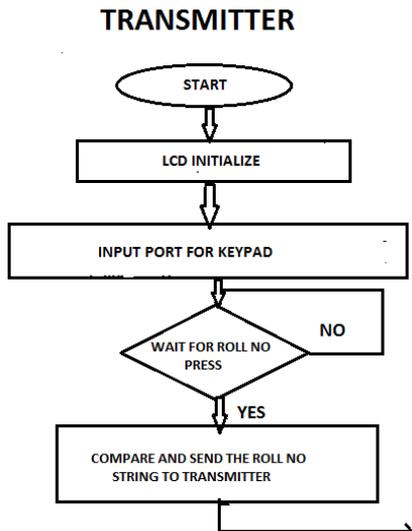


Fig.4 Algorithm of transmitter section

Modern software development tools are used primarily by people working together. One approach to designing these tools is to create a separate tool for each part of the development process. Everyone on the team might then agree to use a particular tool for versioning source code, another for tracking bugs, and a third for managing tests. This approach can certainly work it's much better than having no tools at all. Algorithm of transmitter section is shown in Fig.4. The sequences of operation are:

- Input to keypad
- Initialize the LCD
- Input port to keypad
- Enter the roll number
- **Transmission of string:** Compare the entered roll no. If it is valid then it sends to the transmitter. Then transmitter sends the string using CC2500 transmitter

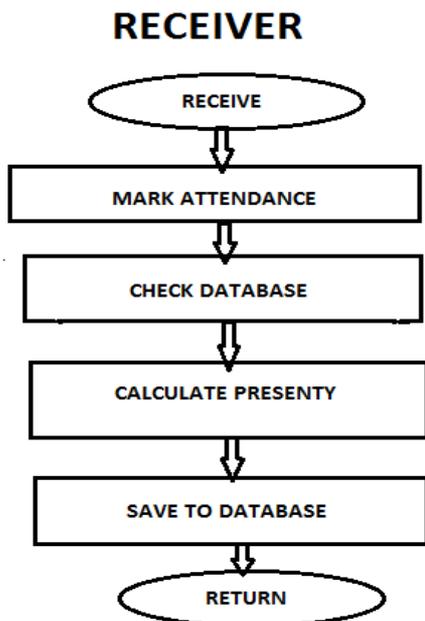


Fig.5 Algorithm of receiver section

Algorithm of receiver section is shown in Fig.5. The sequences of operation are:

- Reception of string: CC2500 receiver receives the string.
- Marking of attendance into database and recorded.
- Calculation of attendance.

6. EXPERIMENTAL RESULTS

This is image of transmitter section which is at the input side is shown in Fig.6.



Fig.6 Transmitter Section

The string of roll number is transmitted by using this section. The string is also displayed on display.

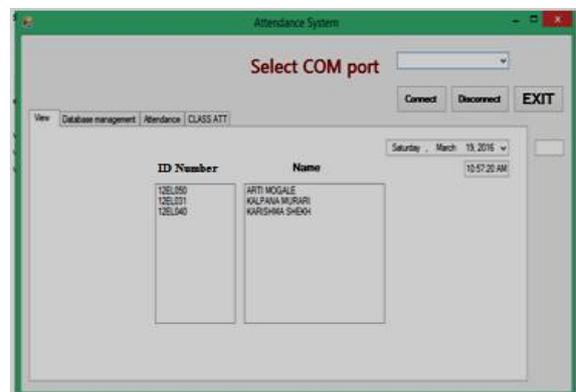


Fig.7 Receiver Section

We can receive string of roll number by receiver section. The reports have been generated in various formats like .doc, .pdf etc. The purpose of system is to reduce human error as well as manual work. The key characteristics of the application include:

- Perform automated attendance.
- Generate report of attendees for a particular course.
- Error free reception of data.
- Easy scalability to incorporate more records.
- Integrity and security in data storage.

7. CONCLUSION

Microcontroller based student attendance system makes use of RFID based detection system to calculate attendance of student in organization and do further calculations. This

system has been designed to improve reliability of attendance system in the organization. It also aims at building accuracy in taking attendance and thus reducing human error. The authority of accessing the records is limited. Username and password are provided to department person. He can make new entries; modify particular field as well as search for records. We have included various search algorithms based on RFID number, DATE, Employee ID, etc. The reports have been generated in various formats.

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