CME Tool (Communication Made Easy) for Smart Classroom Communication

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Abstract— This project is a communication tool for educational institutions for data (text) transmission to individual or multiple classrooms and to students via SMS using NRF technology and GSM module respectively. i.e. The faculty can send the data from office to classrooms directly without interference of the third person. Here we use GLCD screen to display the data, NRF module to communicate and Arduino board to process the data before transmission and after reception. We have also included a biometric sensor in each classroom for taking attendance. This project helps in sending information without any data interruption and saves a lot of time.

Key words: Smart Classroom, NRF Module, GLCD Module, Arduino Board, Biometric Sensor

I. INTRODUCTION

In most of the institutions, the convention followed to deliver any information to students is to appoint a third person or a middleman or faculty has to call the students personally. But there is a possibility of message to be misinterpreted and keeping track of student's attendance will cost in wastage of time. To overcome this problem, we have developed a Real time system. In this proposed system, faculty in an institution will have a transmission module while the which receives the data and feeds to the microcontroller that displays the message classrooms will have one receiver module each. If the faculty wants to convey any message to class or multiple classrooms and students (via SMS), he/she can send information through the transmitting module which is interfaced with a screen. Receiver section consists of a module on GLCD. A buzzer is also interfaced to the microcontroller on the receiver side, which gives intimation that data is received; the same data is also sent directly to the student's mobile of the respected class through SMS. Adapting this technique one can eliminate the need of a third person for communication, so that the exact message is delivered to the concerned class or student.

We use Arduino board to interface LCD and NRF module. At the transmitting side the given data (text) is processed by Arduino and transmitted via NRF module. At the receiver side, the transmitted data (text) is received by NRF module and processed by Arduino and the data is displayed on LCD. The multiple receivers can be designed for multiple classrooms, so that the burden of conveying information to each classroom is reduced. We also use a Biometric module for taking attendance, wherein it saves lot of time for the faculty, and sends the total attendance to the respective lecturer.

II. LITERATURE SURVEY

Hoang Van Toan., Vo-Nguyen Quoc Bao., Hung Nguyen-Le., C have presented in [1] about Unique office communication system using RF, http://www.edgefxkits.com/unique-office-communication-system-using-rf. This project is an extremely useful PC based RF communication system management tool in a modern office for data transmission to multiple users. The data is transmitted to multiple users using RF module. Receiver section consists of a receiver module which receives the data and feeds to microcontroller which displays the data on a LCD. A buzzer is also interfaced to microcontroller at the receiver side which gives intimation that the data is received.

Raviprakash shrivas., Nikesh Pated,. Asif Bherani., Arti Khajone., Manish Raut have presented in [2] about Touch screen based ordering system for restaurants that the system consists of microcontroller which is interfaced with the input and output modules. The input module is the touch screen sensor which is placed on GLCD to have graphical image display, which takes the input from the user and provides the same to the microcontroller. The output module is a RF module which is used for communication between system at table and system at ordering department. Microcontroller also displays the menu items on the DLCD. At the receiving end the selected items will be displayed on the LCD and the ordering department will note down the order received.

Hichen Bargaoui., Rawia Bdiwi have presented in [3] about Smart Classroom: Design gateway for Ubiquitous Classroom. Here the students or faculty should be able to share resources easily so that it's accessible by everyone, at any time. The project should be able to support interaction of heterogeneous devices connect through wireless links to a get way. This encourages communication of information between learners and faculty.

III. PROBLEM DEFINITION

In many educational institutions to convey a notice to the students, the lecturer himself has to go to the required classroom or he/she may take help of a middleman and then convey the message. This might lead to misinterpretation of the message due to human error and can be manipulated. After all these problems, the notice is conveyed, and if the student is absent due to some genuine reasons, then he might not be aware of the notice which was announced in class. But that notice could be very important to him.

The process of taking attendance is very time consuming. During uncontrollable crowd of students, taking attendance might be little hectic job for any faculty. There is high scope of giving proxy for the absentees. Above problems are quite common in all educational institutions. So here we have come up with a solution to these problems which is our project "CME (Communication Made Easy) tool for smart classroom communication"

IV. PROPOSED SYSTEM

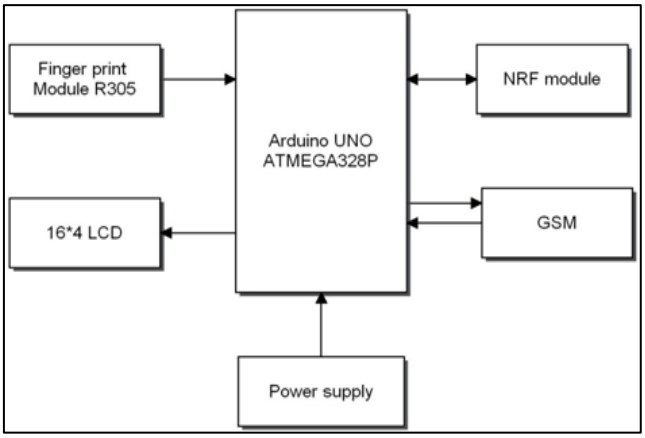

Fig. 4.1 Block Diagram

We use Arduino board to interface LCD module. At the transmitting side the given data (text) is processed by Arduino and transmitted via transmitting module. At the receiver end, the transmitted data (text) is received by receiving module and processed by Arduino and the data is displayed on LCD. The multiple receivers can be designed for multiple classrooms, so that the burden of conveying information to each classroom is reduced. We also interface finger print sensor to Arduino for the sake of attendance.

V. METHODOLOGY

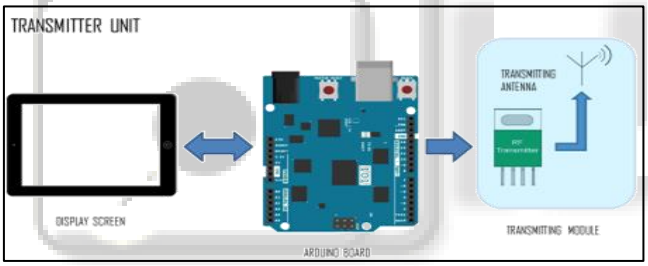

Fig. 5.1: Transmitting Module

The above designed system facilitate smart way of communication between faculties and students in educational institutions with the help of Arduino and NRF module and binds the communication gap which we addressed. Also this system helps in keeping track of student's attendance. This might yield to a better way to convey message which doesn't require a middleman, and the messages will be delivered effectively.

The entire project communicates in terms of modules. There are three modules; one for Principal/HOD room, two for each class (just for demonstration). All modules work in sync. The principal-room module consists of a LCD screen, Microcontroller (Arduino UNO board), NRF transmitter. We give input (circular or any message) serially to the Arduino and it can be viewed on the LCD display, this circular or message can be sent to the class using NRF transmitter, then from the class that message will be forwarded to all the students of that class through SMS with the help of a GSM module.

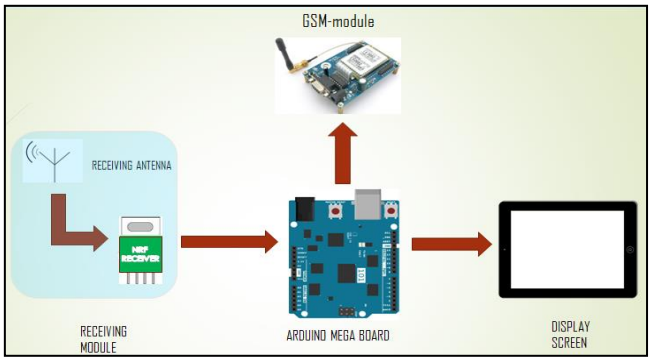

Fig. 5.2: Receiving Module Interfaced with GSM Module

NRF has two modes to operate; Read mode (Receiver mode) and Write mode (Transmit mode) and it only works in any one of these modes. Hence to make the notification to be sent from principal's room, the principal-room module should be set in Write mode (Transmit mode), and the classroom modules should be in Read mode (Receiver mode). We've configured the one of the classroom module in Read mode to receive the circular or any important message from the principal's room and displayed on the screen.

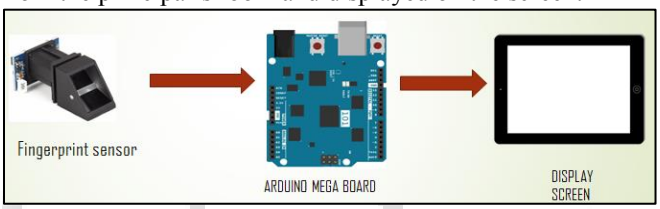

Fig. 5.3: Finger-Print Module

This will eliminate the involvement of a middle man or a third person in delivering the message to a particular classroom. Because of some genuine reason, what if student is absent and still needs to be notified with the circular..! For enhancement of our project, we use GSM module to forward the notification received from the principal's room to student mobile through SMS. The classroom module consists of a LCD display, NRF receiver, Microcontroller (Arduino UNO board), GSM module. The student's number has to be registered before so that GSM module could forward the message.

The CME tool also addresses the issue related in taking attendance. We interface a Finger print module to take the attendance and notify the concerned person about it. To demonstrate this, we interface the Finger print module to another classroom module. Since there are only one set of Tx-Rx pins in Arduino UNO board, it doesn't satisfy the need, so we use 2 Arduino UNO boards for each of the classroom modules. Once a student places his/her finger the attendance gets counted and same will be displayed on the LCD display. We used the COUNTER-logic to keep a count of student's attendance. Once the attendance is made by a particular student, even if that student gives his attendance again the system will not consider that. If any unauthorized person or a student from another class tries to give his attendance to a class which is no-where related to him, the system displays a error message telling "Access Denied".

VI. COMPONENTS DETAILS

A. Arduino Uno Board

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 6 analog inputs, 14 digital input/output pins (of which 6 are PWM outputs), a 16 MHz crystal oscillator, a power jack, a USB connection, a reset button and a ICSP header. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

B. 16x4 GLCD

A 16x4 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display.

C. GSM Module

GSM is a mobile communication modem. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates. The Modem is designed with RS232 Level converter circuitry, which allows you to directly interface PC Serial port .The baud rate can be configurable from 9600-115200 through AT command.

This GSM/GPRS RS232 Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.

D. NRF Module

NRF24L01 is a single chip radio transceiver for the world wide 2.4 - 2.5 GHz ISM band. The transceiver consists of a fully integrated frequency synthesizer, a power amplifier, a crystal oscillator, a demodulator, modulator and Enhanced Shock Burst™ protocol engine. Output power, frequency channels, and protocol setup are easily programmable through a SPI interface. Current consumption is very low, only 9.0mA at an output power of -6dBm and 12.3mA in RX mode.

E. Finger Print Module (R305)

Finger Print Sensor Module or Finger Print Scanner is a module which captures finger's print image and then converts it into the equivalent template and saves them into its memory on selected ID (location) by Arduino. Here all the process is commanded by Arduino like taking an image of finger print, convert it into templates and storing location. Here we are using 4 push buttons to Enroll/back, Delete/OK, UP and Down. Every key has double features**.**

VII. INTERFACING

The Inter-integrated Circuit (I2C) Protocol is a protocol intended to allow multiple "slave" digital integrated circuits ("chips") to communicate with one or more "master" chips. We use this IC chip to interface the 16x4 LCD display. I2C acts as a mux and converts the 16 pins LCD pins to simplified 4 pins. These 4 pins can be attached to the Arduino board, and can be programmed accordingly.

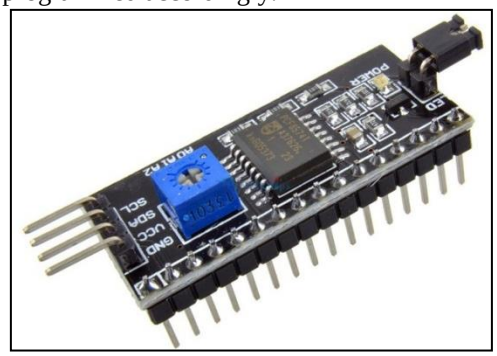

Fig 7.1: I2C Interfacing Chip

The GSM module has to be powered from an external 12v source. This 12v input will provide necessary power to the board to catch the signal. We get 1 set of Tx-Rx pins in GSM module which can be attached to the Arduino board. To check if your modem supports this text mode, you can try the following command:

AT+CMGF=1 <ENTER>, If the modem responds with "OK" this mode is supported.

In order to send a SMS, the modem has to be put in SMS text mode first using the following command:
AT+CMGF=1 <ENTER>

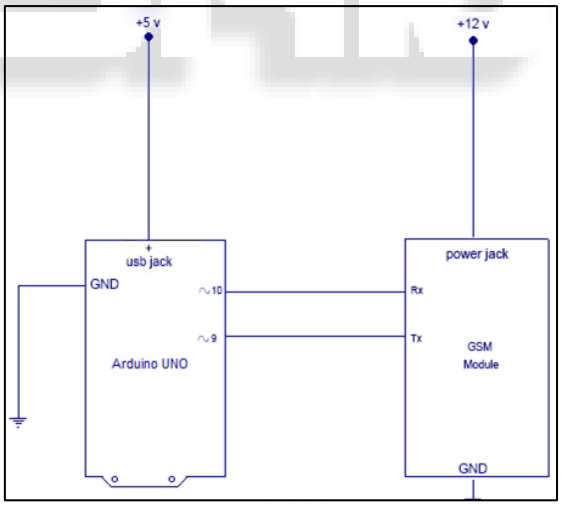

Fig. 5.11: Arduino interfacing with GSM Module

Both the NRF module and Finger print sensor will be provided with a set of input (Rx), output (Tx), VCC, Gnd pins. These can be attached to the Arduino UNO board directly. Rest all can be programmed using the Arduino IDE software.

VIII. RESULTS & CONCLUSION

The whole project consists of two modules, in which one of it is placed in Principal's room called as "Principal-room" module. Another module will be placed in every classroom called as "Classroom module". The classroom module will

also incorporate another board for the sake of the attendance in which it interfaces a Finger print module.

Fig. 8.1: Display at Principal Room

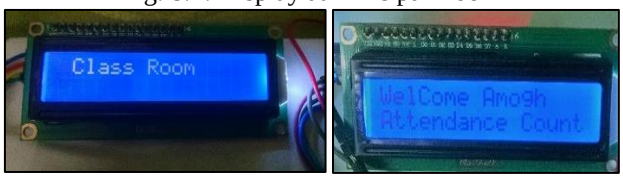

Fig. 6.2: Display at Classroom Module for Notification & Attendance

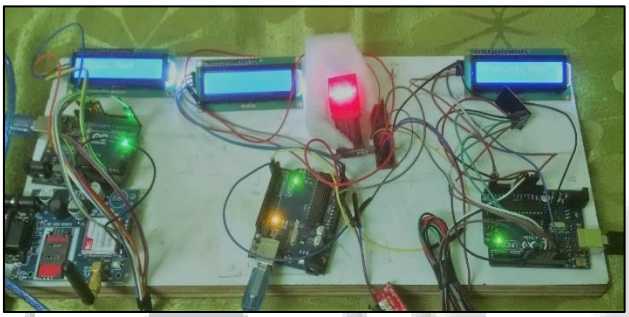

Fig. 6.3: Project Module

The above designed system facilitate smart way of communication between faculties and students in educational institutions with the help of Arduino and RF module and binds the communication gap which we addressed. This might yield to a better way to convey message which doesn't require a middleman, and the messages will be delivered effectively. We believe that our project work on CME TOOL, will serve the above purpose and generate the necessary enthusiasm and motivation for future in this field.

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