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GSM BASED WIRELESS E-NOTICE BOARD

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***Abstract*— In the last couple of decades, communication technology has developed by leaps and bounds. It has already established its importance in sharing the information right from household matters to worldwide phenomena. Apart from sharing information, it is also used for remote control of machines and electronic appliances. In our day-to-day life, we use many such appliances at home, office and public places for our comfort and convenience. Every device requires one or the other kind of operation control for which it has a HMI (human-machine interface). Communication technology not only helps us to exchange information with human beings but also allows us to carry out monitoring and controlling of machines from remote locations. This remote control of appliances is possible with wired or wireless communication interfaces embedded in the machines. The use of "Embedded System in Communication" has given rise to many interesting applications. One of such applications is public addressing system (PAS). Many companies are manufacturing audio / video systems like public announcement system, CCTV, programmable sign boards etc. But all these systems are generally hard-wired, complex in nature and difficult to expand. So, by adding wireless communication interface such as GSM to these systems, we can overcome their limitations.**

I. INTRODUCTION

The GSM based wireless e-notice board also called Campus Display System (CDS) is aimed at the colleges and universities for displaying day-to-day information continuously or at regular intervals during the working hours. Being GSM-based system, it offers flexibility to display flash news or announcements faster than the programmable system. GSM-based campus display system can also be used at other public places like schools, hospitals, railway stations, gardens etc. without affecting the surrounding environment. The CDS mainly consists of a GSM receiver and a display toolkit which can be programmed from an authorized mobile phone. It receives the SMS, validates the sending Mobile Identification Number (MIN) and displays the desired information after necessary code conversion. It can serve as an electronic notice board and display the important notices instantaneously thus avoiding the latency. Being wireless, the GSM based CDS is easy to expand and allows the user to add more display units at any time and at any location in the campus depending on the requirement of the institute.

Information Transfer:

A coordinated sequence of user and telecommunication system actions that causes information present at a source user to become present at a destination user. An information transfer transaction usually consists of three consecutive phases called the access phase, the information-transfer phase, and the disengagement phase.

Broadcast:

A term to describe communication where a piece of information is sent or transmitted from one point to all other points. There is just one sender, but the information is simultaneously sent to all connected receivers. In networking, a distinction is made between broadcasting and multicasting. Broadcasting sends a message to everyone on the network whereas multicasting sends a message to a select list of recipients. One of the most common examples is broadcast through a cellular network service. This serves as multiple end users at different locations in a simulcast fashion. Practically every cellular system has some kind of broadcast mechanism. This can be used directly for distributing information to multiple mobiles, commonly, for example in a mobile telephony system, the most important use of broadcast information is to set up channels for one to one communication between the mobile Trans-receiver and the base station. This is called paging. The details of the process of paging vary somewhat from network to network, but normally we know a limited number of cells where the phone is located (this group of cells is called a location area in the GSM system). Paging takes place by sending the broadcast message on all of those cells. This project aims at integrating the expansiveness of a wireless cellular network and the ease of information transfer through the SMS with the coverage of campus display boards. It can also be a modest effort to realize the complete potential of public display boards in instantaneous information broadcast in swift response to events of interests.

Notice board is primary thing in any situation/ organization or public utility places like bus stations etc. But sticking notices day-to-day is a difficult process. The current work deals with an advanced wireless notice board. The main objective of this project to develop a wireless notice board that displays messages sent from the user's side. When a user sends a message from our website, it is received by a SIM loaded GSM modem at the receiver unit.

II. LITERATURE REVIEW

Guifen GU and Guili Peng[1] have presented a character of GSM (Global System for Mobile communications) network. GSM system is today a worldwide standard for second generation mobile telephony.GSM system is very popular and important in whole world. It has a lot of advantage and conveniences. The advantages of this are, Knowledge about GSM services and we can connect without

internet, its disadvantages are communication consumes cost and it's not free service.

ForamKamdar, Anubbhav Malhotra and PritishMahadik [2] have presented the notice board system which saves time, energy and hence environment. Cost of printing and photocopying is also reduced as information can be given to a large number of people from our fingertips. Thus we can conclude that this paper gives an idea to make use of GSM in communications to a next level. Main advantages are we can use in advertisement world and in the public utility areas. The disadvantage is that there is limitation of number of characters used in SMS.

N. Jagan Mohan Reddy and G. Venkeshwaralu [3] have developed a photo type laboratory model of wireless notice board system with GSM modem connected to it, which displays the desired message of the user through an SMS in a most populated or crowded places. Notice boards are one of the widely used ones ranging from primary schools to major organizations to convey messages at large. They have used remote notice board by using GSM device. Advantages of this are effective use of LCD display and effective use of electronic boards and disadvantage is the network problem could happen at some places.

Neetesh Saxena and Narendra S. Chaudhari [4] has explained that the Easy SMS protocol is successfully designed in order to provide end-to-end secure communication through SMS between mobile users. The analysis of the proposed protocol shows that the protocol is able to prevent various attacks. The transmission of symmetric key to the mobile users is efficiently managed by the protocol.

Yi-Bing Lin,Sok-ian Sou and Chao-Liang Luo [5] have presented the analytic models to investigate two multi-segment XI short message transmission policies. The analytic models were validated against by more than 100 millions measured data obtained from a 6-month commercial SMS operation. This analytic model can effectively speed up network planning for commercial SMS operation. They have used transmission policies for SMS services. The advantages of this paper are, it defines process of communication and shows working of short message services (SMS). And disadvantage is limited character should be accepted while transmitting SMS.

III. MATERIALS AND METHODS

1) *Flow Diagram*

We tend to use mobile phones as a message sender, causing messages to notice board by sending applicable SMS and receiving SMS whenever there's no problem. A GSM modem is connected to the LED display hardware is employed to receive the SMS and send it to the controller circuit of the LED display. Then the controller circuit of the LED display filters the message content in SMS and changes the display text in LED display dynamically. The system uses a GSM modem at the display side to receive SMS. An IC ATmega328P belongs to microcontroller act as controller to drive the LED display panel. Together with these a power supply unit and supporting hardware for microcontroller is employed. Figure 1 shows the Flow diagram of GSM Based Wireless e-Notice Board.

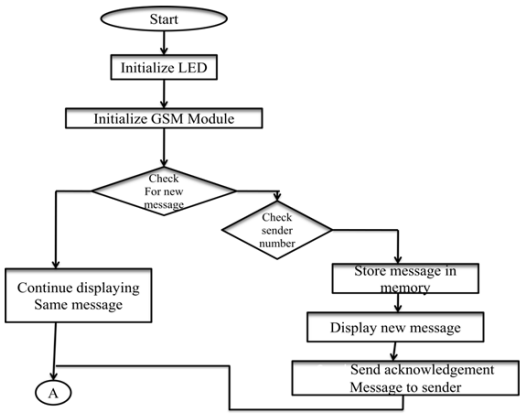

Figure 1: Flow diagram of GSM Based Wireless e-Notice Board

2) *Components*

The various components used in the present work are outlined in this section.

Microcontroller

The ATmega328P microcontroller is high performance, low power controller from microchip. ATmega328P is an 8-bit microcontroller based on AVR RISC architecture. It is the most popular of all AVR controllers as it is used in ARDUINO boards. The internal security of ATmega328P is designed with low current consumption features. The chip contains 32 kilobytes of internal flash memory, 1 kilobytes of EPROM and 2kilobytes of SRAM. The EPROM and the flash memory are the memories which saves information and that information still exists every the power is disconnected or off but the SRAM is a memory which only saves the information until power is supplied and when the power is disconnected all the information saved in SRAM will be erased.

SIM800A

SIM800A is a Dual-band GSM/GPRS module that works on frequencies EGSM 900MHz and DCS 1800MHz. the Functional diagram of SIM800A is shown in Figure 2.

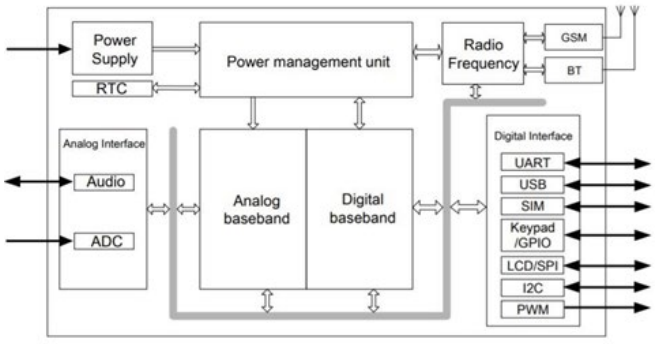

Figure 2: SIM800A Functional diagram

Features include: GPRS multi-slot class 12/ class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 24*24*3mm, SIM800A can meet almost all the space requirements in user's applications, such as smart phone, PDA and other mobile devices. SIM800A is a SMT package with 68 pads, and provides hardware interfaces as below: One

full function UART port One USB port for debugging and firmware upgrading Audio channel which includes a microphone input and a receiver output One SIM card interface Support up to 4*5 Keypads One display interface One I2C master interface for peripheral management Programmable general purpose input and output Two PWM output One ADC input Bluetooth antenna interface GSM antenna interface SIM800A is designed with power saving technique so that the current consumption is as low as 0.55mA in sleep mode.

LED (Light Emitting Diode) Display

The P10 single color is a high brightness, low power consumption, long life time display module.

IV. IMPLEMENTATION

Implementation is the carrying out, execution, or practice of a plan, a method, or any design for doing something. As such, implementation is the action that must follow any preliminary thinking in order for something to actually happen. In an information technology context, implementation encompasses all the processes involved in getting new software or hardware operating properly in its environment, including installation, configuration, running, testing and making necessary changes.

1) Interfacing between GSM module and Arduino Nano

Figure 3 shows the Interfacing between GSM and Arduino.

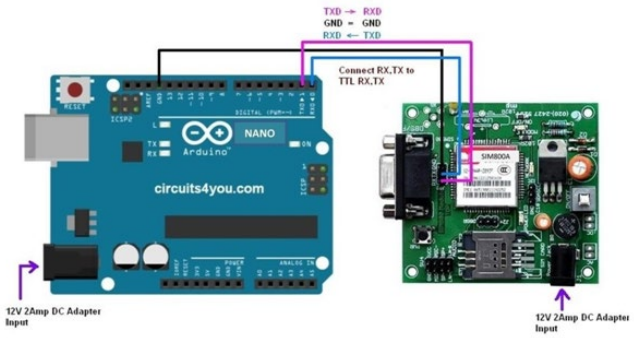

Figure 3: Interfacing between GSM and Arduino

There are two ways of connecting GSM module to Arduino. In any case, the communication between Arduino and GSM module is serial. So we are supposed to use serial pins of Arduino (Rx, Tx). So if you may connect the Tx pin of GSM module to Rx pin of Arduino and Rx pin of GSM module to Tx pin of Arduino.

GSM Tx =>Arduino Rx

GSM Rx=>Arduino Tx

Now connect the ground pin of Arduino to ground pin of GSM module. So that we made 3 connections and the wiring is over now we can load different programs to communicate with GSM module and make it work. On setting the baud rate at 9600 bps, the USART is ready to communicate with the GSM module. To communicate with GSM, Attention (AT) commands are sent to GSM module through USART of atmega32. Initially to ensure successful connection with GSM module, the data ”AT” is sent through USART. If in return ”OK” is received by USART from GSM, then the connection is successful else failed. After ensuring connection, the GSM module is set to text mode so that it reads the SMS in text mode otherwise it is displayed in binary mode.

The command ”AT+CMGF=1” is sent to GSM module which sets the SMS at index 1 in text mode. Since, it is known that the latest SMS is always stored at index 1, the data sent is ”AT+CMGF=1” where 1 is the index number of the message. To read the message the command ”AT+CMGR=1” is sent to GSM. This is sent to read the message at index number 1 as it is the latest SMS received by the SIM in GSM. Only the message between the special characters is read and it is sent to LCD in 8-bit mode and is displayed.

2) Microcontroller ATmega328P to PC interfacing:

Figure 4 shows the Microcontroller ATmega328P to PC interfacing.

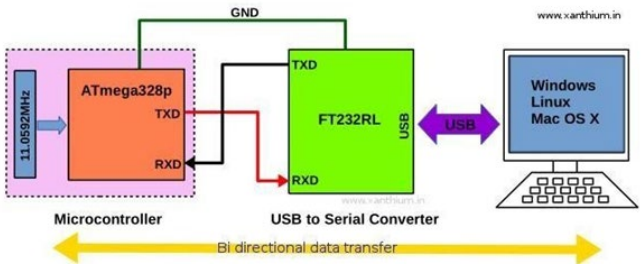

Figure 4: Microcontroller ATmega328P to PC interfacing

The ATmega328P microcontroller will send and receive data to a PC running either Linux or windows operating system using its UART pins.

Hardware Connection Setup

Atmega328P is clocked with an external Quartz crystal running at 11.0592MHz.

- Tx of ATmega328P is connected to Rx of USB serial converter.
- Rx of ATmega328P is connected to Tx of USB to serial converter. ATmega328P UART

Universal Asynchronous Receiver and Transmitter is a configurable peripheral of ATmega328P which supports the asynchronous communication protocols.

3) LED interfacing with Arduino

Figure 5 shows LED interfacing with Arduino.

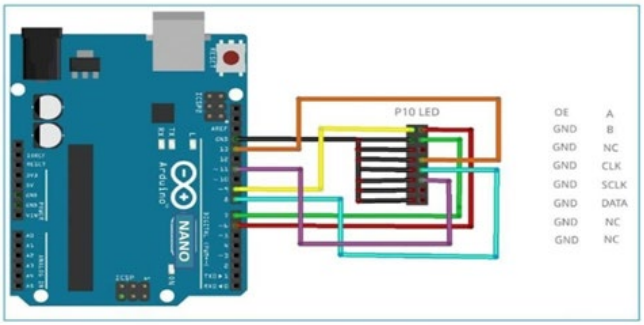

Figure 5: LED interfacing with Arduino

The arduino is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins. 8 analog pins, 2 reset pins and 6 power pins. Each of these digital and analog pins is assigned with multiple functions but their main functions are to be configured as input or output. Arduino Nano comes with a crystal oscillator of frequency 16MHz. It contains everything needed to support the microcontroller, simply connect it to a computer with USB cable or power it with an AC-to-DC adapter or battery to get started.

4) Task Specification

Table I shows the various tasks along with their goals, inputs and outputs.

Table I. Task Specifications

TASK	**GOALS**	**INPUTS**	**OUTPUTS**
GSM Configuration	To configure GSM and make it enables to receive SMS and store it through AT commands.	Sending SMS from mobile phone to the GSM	Receiving SMS and authenticating the number and stores and forward SMS if authorized.
Interfacing GSM and microcontroller	The GSM is interfaced with microcontroller in order send the SMS to microcontroller received by the GSM.	Received SMS is sent to microcontroller.	Microcontroller receives and fetches the SMS from GSM.
Interfacing module to the LED display	The LED display is then connected to the module	Microcontroller sends the message to the LED display.	LED display displays the message.

V. RESULTS

Figures 6(a) through 6(f) shows the snapshots of the results. Figure 6(a) shows the initial project setup. Figure 6(b) shows that the message is sent from the mobile phone to GSM. Figure 6(c) shows decoding of the message sent from the phone to GSM. Figure 6(d) shows that the microcontroller sends the message to the display board and then it displays the message that has been sent. Figure 6(e) shows sending new message from the phone. Figure 6(f) the displaying of new message on notice board.

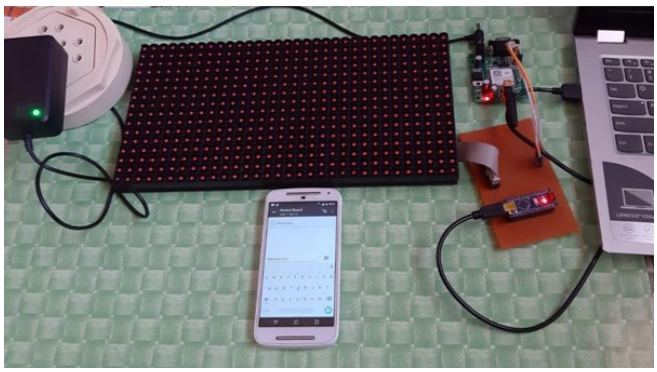

Figure 6(a)**:** Initializing

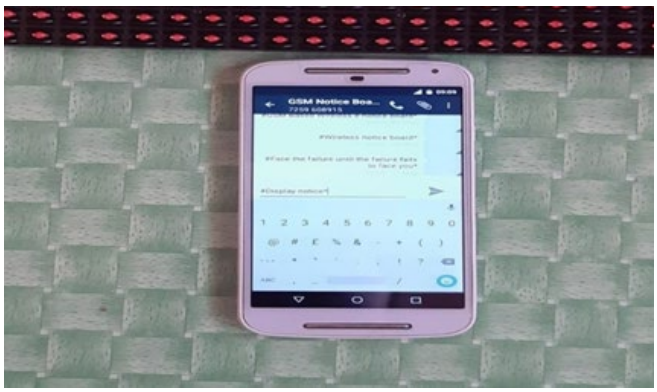

Figure 6(b)**:** Typing the message in the mobile

Figure 6(c): Message sent
Figure 6(d): Displaying message

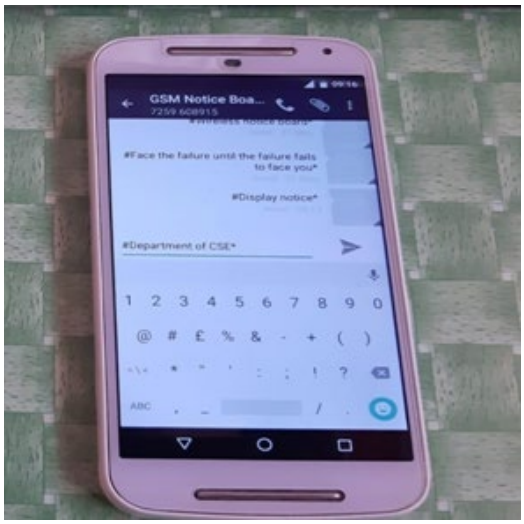

Figure 6(e): Sending new message

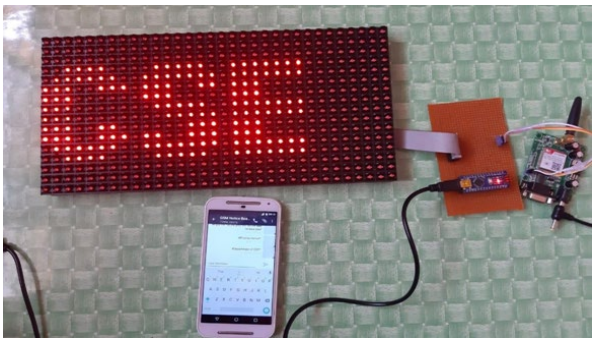

Figure 6(f): Displaying new message

VI. CONCLUSION

The prototype of the GSM based display toolkit is efficiently designed. This prototype has facilities to be integrated with a display board thus making it truly mobile. The toolkit accepts the SMS, stores it, validates it and then displays it in the LCD module. The SMS is deleted from the SIM each time it is read, thus making room for the next SMS. The major constraints incorporated are the use of „*" as the termination character of the SMS and the display of one SMS as a time. These limitations can be removed by the use of higher end microcontrollers and extended RAM. The prototype can be implemented using commercial display boards. In this case, it can solve the problem of instant information transfer in the campus.

Multilingual display can be another added variation of the project. The display boards are one of the single most important media for information transfer to the maximum number of end users. This feature can be added by programming the microcontroller to use different encoding decoding schemes in different areas as per the local language. This will ensure the increase in the number of informed users. MMS technology along with relatively high end microcontrollers to carry on the tasks of graphics encoding and decoding along with a more expansive bank of usable memory can make this task a walk in the park

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