

BLUETOOTH BASED DIGITAL NOTICE BOARD WITH SOLAR

Prof. Gaurav S. Karlekar² Prachi V. Dhamange² Pallavi S. Duratkar² Shrushti S. Vaidya⁴,
Ankita R. Zilpe⁵, Simran S. Gujar⁶

²Asst. Professor of Electrical Engineering Department, Ballarpur Institute of Technology, Ballarpur, India

^{2,3,4,5,6}Student of Electrical Engineering Department, Ballarpur Institute of Technology, Ballarpur, India

Abstract- Notice Board plays a vital role to convey any message with the advent of digital technology. It is efficient to represent the information on digital devices. It is mandatory to use the digital media rather than use the conventional media like paper printing. This project is mainly about with Bluetooth in which there is an android application that is connected with LED display via Bluetooth. The message received by Bluetooth is sent to microcontroller that further displays it on notice board. The notice board and LED display interfaced to microcontroller, powered by regulated power supply from main supply of 230v AC supply and solar energy.

Key Words: Solar panel, LED, microcontroller, Bluetooth module, android application.

1. INTRODUCTION

Traditionally notice board is all about sticking information, but sticking various notices day to day is a difficult process and consumes more time. To overcome this problem here is a project deals with and innovative wireless notice board with solar technology. The system is comprised of both software and hardware. Software area includes the Bluetooth android application development and code algorithm for microcontroller to receive and display a notice on graphical dot matrix display. In this project, we used AVR studio software for coding and ProgISP software to load code into microcontroller. The hardware area includes the development of receiver hardware using Atmega328 microcontroller are its configuration of both module. The development system reflects the minimum requirement to realize wireless notice board. This digital notice board project is design to develop a mobile controlled scrolling message display for notice board. This scrolling display made up off matrix LEDs. Android mobile can be used to change the display on the notice board. In this project we are using Bluetooth technology to excess the display. Here we used solar as a solar energy which is stored in battery and supply is given to dot matrix display. In this project there is another way to give power supply by 230v AC mains. Whenever used to turn power supply then the system display default message on the LED display. Whenever user needs to change the message on the notice board, the user had to type a message on an application installed on an android mobile and send it to the microcontroller using Bluetooth technology.

2. LITERATURE SURVEY

1. Nivetha, Puritha, Preeti and Yashvanthini (2013) designed an SMS driven automatic display using ARM-LPC2148 to interface multiple graphical display. With this technology, a single notice could be sent to several e-notice boards via ARM-LPC2148.

2. Rahul Kamboj and Preeti Abrol (2013) designed and developed a GSM based multiple LED display boards using AT89S52 microcontroller, GSM module. LCD and several moving LED displays. Multiple moving LED displays were connected via different GSM modules at different geographical locations such that the same SMS sent was displayed on all the moving LED displays. Though with few limitations, this work proved to be cost-effective, secured and efficient as compared to previous works.

3. Gowrishankar Kasilingam, Mritha Ramalingam and Chandra Sekar (2014) proposed development of GSM based digital notice board. The complete system would have a dual system in terms of changing message display, dual power supply switchable between solar power system and alternating current (AC) from the utility supply and inbuilt motion detector that could automatically switch OFF the whole system after working hours and would automatically switch ON if any motion sensed by the motion detector after the programmed working hours. This work would probably prove highly efficient in terms of ensuring better communication and continuous power supply.

4. Raj Hakani (2014) worked on GSM based alphanumeric scrolling display system using PIC16F877A microcontroller interface with GSM modem via MAX232 level convertor. Hardware also include DS1307 real time clock, alphanumeric panel and multiple 16*2 character LED displays and microcontroller coding was done using Embedded C and MpLab. In this research, multiple users were authorized to update notices on the digital notice board. This design can only maximum of 60 characters on the board.

3. PROPOSED METHODOLOGY

The system is comprised of both software and hardware. Software area includes the Bluetooth android application development and code algorithm for microcontroller to receive and display a notice on graphical dot matrix display. The hardware area includes the development of receiver hardware using ATmega328 microcontroller and its configuration with both modules. The developed system reflects the minimum requirements to realize the wireless notice board.

For wireless and ease of communication, the Bluetooth module HC-05 was used in this work. This module permits any microcontroller with a standard RS232 serial port to communicate with a PC or a Smartphone equipped with a Bluetooth Master module. Bluetooth HC-05 normally works on a master-slave principle. The Master device searches to pair up with the slave device automatically under specific conditions. There is only point to point communication for modules, but the adapter can communicate with multi-modules. The Bluetooth HC-05 is easy to use because of the presence of an LED indicator. The red LED in Bluetooth module indicates the status of the connection: when flashing, the module is in the phase of interconnection with other modules located in the same area. When the LED is ON, it indicates that the module is already synchronized or "paired" with another Bluetooth master module and therefore is ready to transmit and receive information.

Now, let's see how to edit the data of the LED Matrix display using the Bluetooth feature. For this purpose, from the data sending end, a smartphone installed with a Bluetooth chat Application is required. In the data receiving end i.e., in the LED Display, a Bluetooth module is required. The UART Peripheral of the microcontroller is used to interface the Bluetooth module. The Bluetooth module should be configured as a slave that accepts connection with any device. The module should be connected to a serial terminal to interact with the module. For this purpose, a USB-TTL Serial converter is used. Connect the module to USB-TTL serial converter as shown below. This configuration is required if we want to change the parameters of the module. Otherwise, this part can be skipped off. The program flow contains verification of password within the entered message. So, the system is secured even if an unknown device connects to the module.

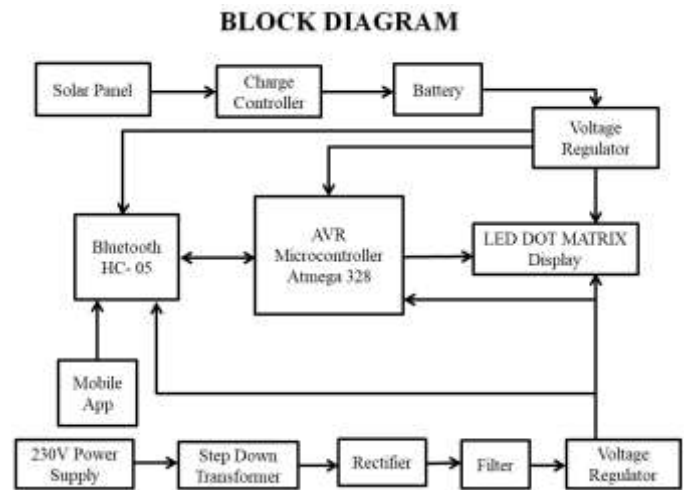


Fig.3.1. Block Diagram of Bluetooth Based Digital Notice Board With Solar

In this project, there are two ways to give power supply. First way is by giving normal 230V AC main and another way is by using solar energy.

When we give 230V AC power supply, firstly we have to convert 230AC into 12AC by using simple step down (230/12V) transformer. Secondly, output of this transformer given to the rectifier circuit, which will convert AC supply into DC supply. The output of the rectifier circuit that is DC contains the ripples in the output voltage. To filter out these ripples, capacitor of 2200uf, 25V is used. Lastly, the output of the capacitor that is pure DC is then given to the voltage regulator IC 7805 which will regulate the output voltage at 5V and that 5V we further used in our system.

When use solar energy for giving power supply, we will use battery to stores this energy. Here, we require charge controller which limits the rate at which electric current is added to or drawn from electric battery and prevents over charging and may protects against over voltage which can reduced battery performance or lifespan and may pose a safety risk. The energy stored in battery which is in DC form. The microcontroller requires 5V DC power supply therefore here we used voltage regulator, to regulate the voltage at fixed 5V. We used Bluetooth device for communication between user and display. The message is then send by mobile and Bluetooth will receive that message which then sends to micro controller. Further, micro controller converts this message into pre-defined language by using software and finally, it will display on notice board.

3.1 Components and Description

1. Solar Panel

Photovoltaic comes from the words photo, means light and volt, a measurement of electricity. Solar cells are made up of silicon, the same substance that makes up sand. Silicon is the second most common substance on earth. Photovoltaic solar panel absorbs sunlight as a source of energy to generate direct current dc electricity. The action of the electrons starts to flow an electric current. A photovoltaic module is a packaged, connected assembly of PV solar cells available in different voltages and wattages. PV modules constitute the PV array of a PV system that generates and supplies solar electricity in commercial and residential application. The solar panel used in our project is of mono-crystalline. These types of panels are made up of silicon wafers. To build them wafers are assembled into rows and columns to form a rectangle which is covered with a glass sheet and framed together. In these types of panel's solar cells are made from cut of a single pure crystal of silicon. The panel used is of ratings 18W, 21V and current in milli-ampere. The advantages of these panels are require less space for installation, higher efficiency of 19% than other panels to maximize the energy bill saving.



Fig. A: Solar Panel

A. LED Display

LED display is one of the main screen displays that are being commercially used. The biggest advantage of the LED display is its efficient and low energy consumption which is especially needed for handhelds and chargeable devices such as mobile phones and tablets. An LED display consists of a number LED panels that in turn consist of several LEDs. LEDs have numerous advantages over other light-emitting sources that can be used alternatively. Aside from being power efficient, LEDs produce more brilliance and greater light intensity. LED display is different from the vacuum fluorescent display used in some consumer electronics. The LED display used in this project is 16x64 bit dot matrix P10 model display of 5 volt.



Fig. B: LED Display

2. Battery

The battery used in this project is sealed lead -acid rechargeable battery of 10 volt and 7.5 Ah. The battery is used to store the energy in the form of electrochemical energy. According to the construction of battery the liquid electrolyte is gelled into moistened separators and the enclosure is sealed. Safety valves allow venting during charge, discharge and atmospheric pressure changes. A battery consists of two voltaic cells. Each cell consist of two half cells connected in series by a conductive electrolyte containing metal cations. One half cell includes electrolyte and negative electrode that is anion which is negatively charged ions and the other half cells includes electrolyte and the positive electrode which is cations that is positively charged ions. Each cell has an electromotive force in it. The optimum operating temperature for lead-acid battery is 25°C and it has a life of 5years.



Fig. C: Battery

3. AVR Microcontroller ATmega328

The AVR Microcontroller Atmega 328 is a single chip microcontroller created by Atmel in Mega AVR family. It is a low power CMOS (Complimented Metal Oxide Semiconductor) 8-bit microcontroller based on AVR enhanced RISC (Reduced Instruction Set Computer) architecture. It is a high performance and faster microcontroller which has 28 pins. The Atmega 328 provides 32KB of in system programmable flash with read-while-right capabilities, 1KB EEPROM (Erasable Programmable Read Only Memory), 2KB SRAM, 23 journal purpose I/O lines. This microcontroller convert pre-defined message into coding language.



Fig. D: AVR Microcontroller ATmega328

4. Bluetooth Module

The Bluetooth module HC 05 is used in this project which is the most popular module in the Indian market and this module is mostly used in the embedded projects. The HC 05 Bluetooth modules are easy to use and simple, its price is low and these types of modules are interfaced with Arduino, Raspberry Pi, and Microcontroller through the serial UART interface. This wireless connection setup and it is very easy to use in the Bluetooth serial port protocol. The serial port Bluetooth module is highly qualified Bluetooth with the version of V2.0+Enhanced Data Rate of 3Mbps. The modulation has completely 2.4GHz radio transceiver and baseband. These serial port Bluetooth modules use the CSR Bluetooth 04-external single chip Bluetooth system by using the CMOS technology and also with the Adaptive Frequency Hopping Feature. The footprint of this Bluetooth module is as small as 12.7mm \times 7mm. Hence, it will help in the overall design and development cycle.

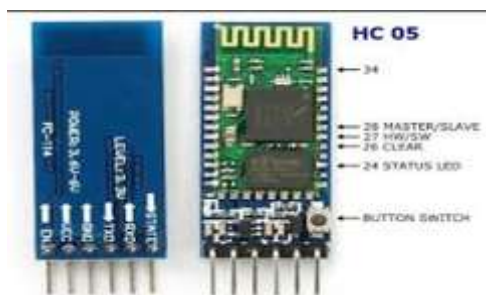


Fig. E: Bluetooth Module

5. Charge Controller

A charge controller limits the rate at which electric current added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan and may pose a safety risk. It may also prevent completely draining (“deep discharging”) a battery, to perform controlled discharges depending on the battery technology, to protect battery life. The term “charge controller” or “charge regulator” may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery charger. Linear voltage regulator we are used in charge controller. LM317 is a linear voltage regulator. It can

control up to 36volt/1.5Amp coming from solar panel. A potentiometer is used for controlling and output of LM317.



Fig. F: Charge Controller

G. Voltage Regulator

The LM78XX/LM78XXA series of three-terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a Wide range of applications. Each type employs internal current limiting, thermal shutdown and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output Current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

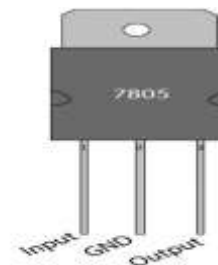


Fig. G: Voltage Regulator

3.2 Flow Charts

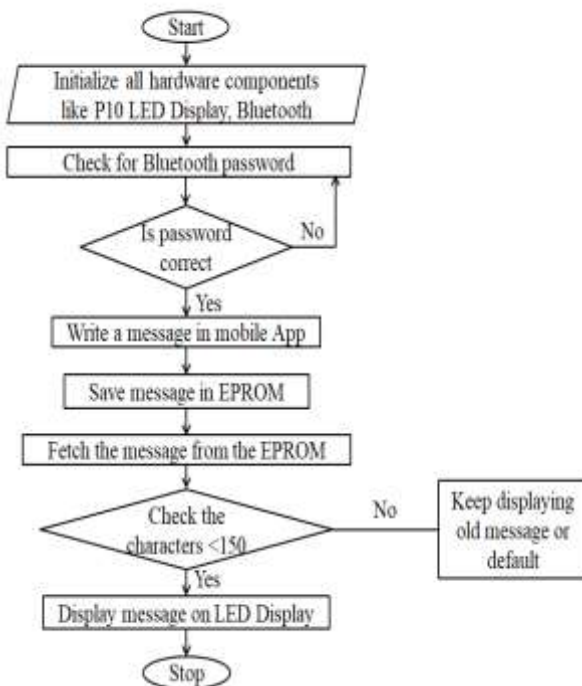


Fig.3.2: Flow Chart

4. APPLICATIONS

- Campus display system in colleges and university for displaying day to day information continuously.
- It is also used in organisation, railway stations, offices, etc.
- In crime prevention: display board put on road will display tip on the public security, accident prevention.
- Advertisement : shopping malls
- In metropolitan cities for managing traffic.
- Bluetooth system offers flexibility to display flash news or announcement.

5. ADVANTAGES

- Flexible and low power consumption
- Save the resources like time, printer, printing ink and paper
- Most secure, reliable and confidential
- User friendly with android app
- Automatically delete the message
- Dual power supply
- Longer life

6. RESULT

Now our world is moving towards digitalization, so if we want to do some changes in the previously used system, we have to use new techniques. Wireless technology provides fast transmission over long range data transmission. It saves time, cost of cables and size of the system. User name and password type authentication system is provided for adding securities. Previously the notice board using black board was used.



Fig: Output

7. CONCLUSION

The display boards are one of the major communications medium for mass media. Local language can be added as a variation in this project. This can be achieved by using graphics and other decoding techniques. Also, we realize that this project 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 project is just a start, an idea to make use Bluetooth Module in communication to a next level.

8. FUTURE SCOPE

- A commercial modal can be able to display one message at a time.
- By including priority conditions we can enhance the project.
- Robots can be controlled in a similar fashion by sending command to the robots.
- As this technology emerges, in may be new device and hence new markets will evolve.
- The project itself can be modified to achieve a complete Home Automation.

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