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Design and Development of digital Smart Screen

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***Abstract*- With the development of digital technology, notice boards play a crucial function in communicating any information. Information can be efficiently represented on digital devices. Instead of using traditional media like paper printing, using digital media is required. The major Bluetooth component of this project is an Android application that connects to an LED display through Bluetooth. The Bluetooth-received message is transmitted to a microcontroller, which then displays it on a notice board. The notice board and LED display were connected to a microprocessor and were fuelled by solar energy and a controlled power source from the main 230v AC supply.**

Keywords: **Solar panel, LED, microcontroller, Bluetooth module, android application.**

I. INTRODUCTION

The traditional purpose of a notice board is to post information, however doing so constantly is challenging and takes more effort. Here is a project that uses a cutting-edge wireless digital notice board with solar technology to solve this issue. Both hardware and software make up the system. Development of Bluetooth Android applications and algorithmic code for a microcontroller to receive and display a notice on a graphical dot matrix display are included in the software area. In this project, we loaded code into the microcontroller with ProgISP software and programmed with AVR studio software. Hardware development includes the design of receiver hardware using an Atmega328 microcontroller and its module arrangement. The development system takes into account the essential elements needed to implement a wireless notice board. The goal of this project on a digital notice board is to create a mobile-controlled scrolling message display for a notice board. Using matrix LEDs, this scrolling display was created. The notice board's display can be changed using an Android mobile device. In this project, the display is enhanced utilising Bluetooth technology.

Here, solar energy was employed as a source of power for a dot matrix display after being stored in a battery.
Another method of providing power supply by 230v AC mains is included in this project. The system displays the default message on the LED display whenever the power supply is turned on.

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The user had to compose a message on an application loaded on an Android cell phone and send it to the microcontroller using Bluetooth every time they needed to alter the message on the notice board.

II. LITERATURE SURVEY

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.

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.
Gowrishankar Kasilingam, Mritha Ramalingam and Chandra Sekar (2014) proposed development of a 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

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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.
Raj Hakani (2014) worked on a GSM based alphanumeric scrolling display system using PIC16F877A microcontroller interface with GSM modem via MAX232 level converter.
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 authorised to update notices on the digital notice board. This design can only have a maximum of 60 characters on the board.

III. PROPOSED METHODOLOGY

Both hardware and software make up the system. Development of Bluetooth Android applications and algorithmic code for a microcontroller to receive and show a notice on a graphical dot matrix are included in the software area display. The hardware part also includes the development of receiver hardware using an ATmega328 microcontroller and its setup with both modules.
The devised system accounts for the barest necessities required to set up the wireless notice board. In this study, the Bluetooth module HC-05 was employed for wireless communication. With the help of this module, any microcontroller with an RS232 serial port can interact with a computer or smartphone that has a Bluetooth Master module. In most cases, the Bluetooth HC-05 operates on the master-slave model.

In certain circumstances, the Master device automatically tries to couple up with the Slave device.
Modules can only communicate point to point, however the adapter can do so with multiple modules.
Because there is an LED indicator, the Bluetooth HC-05 is simple to operate. The Bluetooth module's red LED flashes to show the state of the connection with other modules that are nearby when the module is in the interconnection phase. The LED will be ON when the module is ready to transmit and receive data and has already "paired" or synced with another Bluetooth master module.

Let's now look at how to use the Bluetooth function to edit the data on the LED Matrix display. A smartphone with a Bluetooth chat application installed is needed for this purpose on the data sending end. A Bluetooth module is needed in the LED Display, which is the data receiving end. The Bluetooth module is connected to the microcontroller using the UART Peripheral. It is recommended to set up the Bluetooth module as a slave that will connect to any device. To communicate with the module, it must be linked to a serial terminal. A USB-TTL Serial converter is employed for this. As indicated below, attach the module to the USB-TTL serial converter. Alternatively, you can skip this section. The program flow includes a step where the message that was entered password is verified. So, even if a strange device connects to the module, the system is protected.

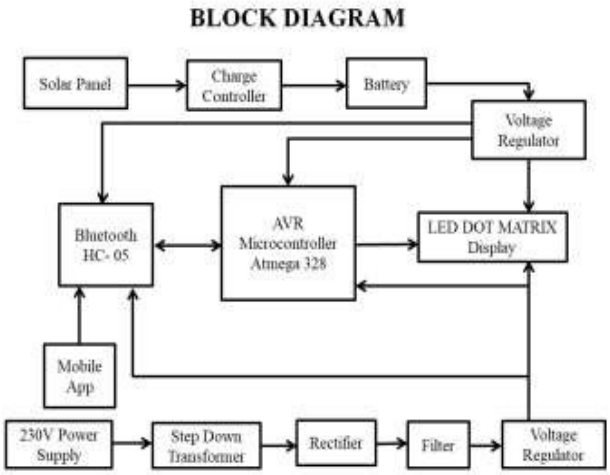

Figure 1:- Block diagram

There are two ways to supply power in this project. The first method involves using a standard 230V AC main, while a second method involves using solar power.
While providing 230V AC power, we must first use a simple step-down (230/12V) converter to convert 230AC into 12AC. Second, the rectifier circuit receives the output of this transformer and changes the AC supply into a DC supply. The waves in the output voltage are present in the DC rectifier circuit's output. The usage of a 2200uF, 25V capacitor filters out these waves. The voltage regulator IC 7805 is then given the capacitor's pure DC output, and it regulates the output voltage to 5V, which we subsequently used in our system.
Battery storage will be used when solar energy is used to provide power. In this case, we need a charge controller that restricts the rate at which electrical current is added to or subtracted from an electric battery, prevents overcharging, and possibly also guards against overvoltage, which can reduce battery performance or lifespan and possibly even present a safety risk battery energy that is in the form of direct current. We utilised a voltage regulator because the microcontroller needs a 5V DC power source. For communication between the user and the display, we employed a Bluetooth device. The message is then sent via cell phone, where Bluetooth will then receive it and send it to the microcontroller. Also, a software programme used by the microcontroller translates this message into a pre-defined language.

3.1 Components and Description

A. Solar Panel

Photovoltaic is derived from the terms "photo," which stands for "light," and "volt," which stands for "voltage." Silicon, the same element that makes up sand, is the component of solar cells. The second most prevalent material on earth is silicon. Sunlight is used by photovoltaic solar panels as a source of energy to produce direct current (dc) power. An electric current begins to flow as a result of the action of the electrons.

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A photovoltaic module is a bundle of PV solar cells that are joined together and have different voltages and wattages. PV systems that produce and supply solar electricity for use in commercial and residential applications are made up of PV modules. Our project uses a mono-crystalline solar panel. Silicon wafers are used to construct these types of displays. To create them, wafers are put together in columns and rows to make a rectangle that is then covered with glass and framed together. Solar cells in these kinds of panels are sliced from a single, pure silicon crystal. The used panel has ratings of 18W, 21V, and milliampere current. The advantages of these panels are requiring less space for installation, higher efficiency of 19% than other panels to maximise the energy bill saving.

B. LED Display

One of the primary screen displays that are utilised in commerce is the LED display. The main benefit of LED displays is their efficiency and low energy consumption, which is essential for devices like tablets and cell phones. An LED display is made up of many LED panels, each of which is made up of multiple LEDs (As shown in figure 2). Compared to alternative light-emitting sources, LEDs have a number of advantages. LEDs not only use less power but also generate light with increased brilliance and intensity. The vacuum fluorescent display used in various consumer gadgets is not the same as an LED display. The 1664-bit dot matrix P10 type LED display used in this project runs on 5 volts.

Figure 2:- LED Display

C. AVR Microcontroller ATmega328

The Mega AVR series of Atmel's AVR Microcontrollers includes the Atmega 328, a single-chip microcontroller (As shown in figure 3). It is an AVR upgraded RISC (Reduced Instruction Set Computer) low power CMOS (Complimented Metal Oxide Semiconductor) 8-bit microcontroller. It is a microcontroller with 28 pins that offers excellent performance and is quicker. The Atmega 328 offers 23 journal-purpose I/O lines, 32KB of in-system programmable flash memory with read-while-right functionality, 1KB of EEPROM (Erasable Programmable Read Only Memory), 2KB of SRAM, and 1KB of EEPROM. The predefined message is converted into code language by this microcontroller.

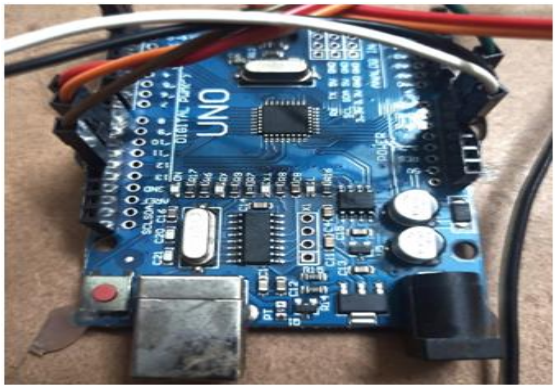

Figure 3:- AVR Microcontroller ATmega328

D. Bluetooth Module

The most widely used module on the Indian market and one that is frequently employed in embedded projects, the Bluetooth module HC 05, is utilised in this project (As shown in figure 4). The HC 05 Bluetooth modules are inexpensive, simple to use, and may connect via the serial UART interface to microcontrollers, Rasberry Pi computers, and Arduino boards. The Bluetooth serial port protocol makes it relatively simple to set up and use a wireless connection. The Bluetooth module for the serial port is a highly qualified Bluetooth device with a V2.0+Enhanced Data Rate of 3Mbps. The baseband and 2.4GHz radio transceiver are fully integrated within the modulator. The CSR Bluetooth 04-extrenal single chip Bluetooth system is used by these serial port Bluetooth modules, together with CMOS technology and the Adaptive Frequency Hopping Functionality. This Bluetooth module has a footprint that measures just 12.7mm by 27mm. As a result, it will benefit the design and development process as a whole.

Figure 4:- Bluetooth Module

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E. Charge Controller

Electric current added to or pulled from electric batteries is controlled by a charge controller. It guards against overvoltage, which could endanger safety and impair battery performance or lifespan, as well as overcharging. Depending on the battery technology, it may also prevent a battery from being totally discharged ("deep discharged") and perform controlled discharges to preserve battery life. A stand-alone device or control circuitry built inside a battery pack, battery-powered item, or battery charger may all be referred to as a "charge controller" or "charge regulator" in this context. Charge controllers use linear voltage regulators. A linear voltage regulator is the LM317. Up to 36 volts and 1.5 amps originating from a solar panel can be controlled. The output of the LM317 is controlled by a potentiometer.

F. Voltage Regulator

The three-terminal positive regulators of the LM78XX/LM78XXA family are helpful in a variety of applications due to its TO-220/D-PAK packaging and a multitude of set output voltages (As shown in figure 5). Internal current limiting, thermal shutdown, and safe working area protection make each variety virtually unbreakable. When adequate heat sinking is provided, they can provide output current of more over 1A. Although they were designed to create constant voltages, these gadgets can produce variable voltages and currents when combined with other parts.

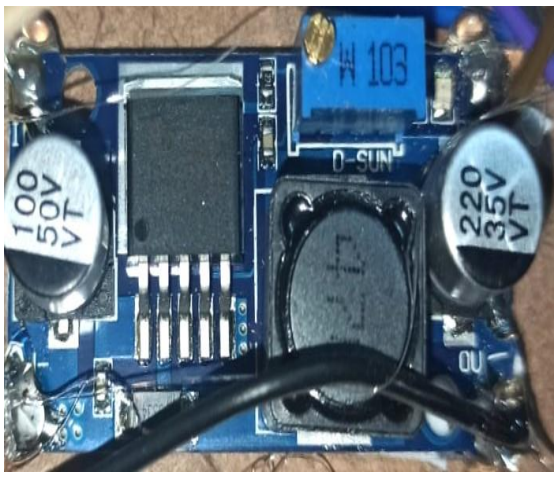

Figure 5:- Voltage Regulator

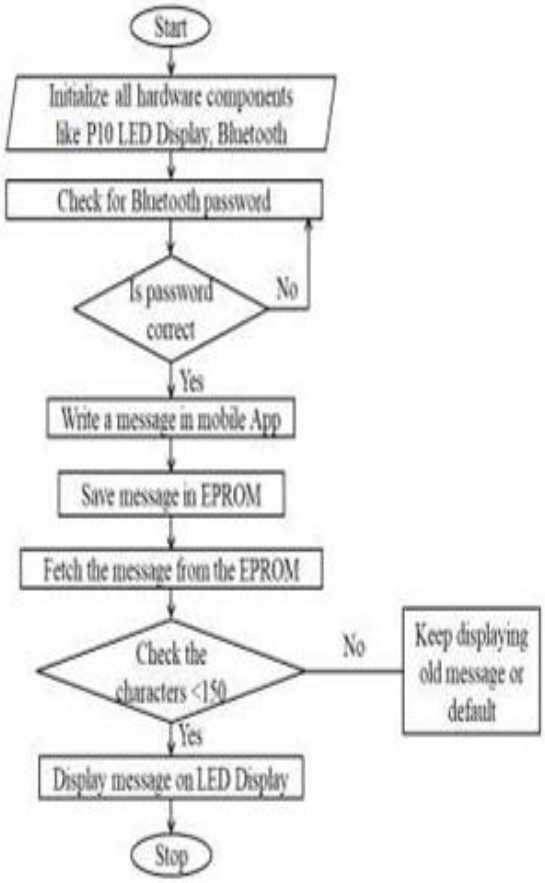

Figure 6:- flowchart

IV. APPLICATIONS

- Campus display systems are used at universities and colleges to continuously display day-to-day information.
- It is also used in offices, train stations, and other establishments.
- For crime prevention, a display board placed on the highway will provide advice on public safety and accident avoidance.
- The Bluetooth system allows for flexible flash news or announcement presentation.

V. 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

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V1. RESULT

Now our world is currently evolving towards digitalization, thus if we want to make changes to the system that was previously in place, we must do so using new methods (As shown in figurer 7 & 8). Long-distance data transmission via wireless technologies is quick. Time, cable costs, and system size are all reduced. Security can be added using an authentication system that uses a username and password. Prior to this, a blackboard-based notice board was utilised.

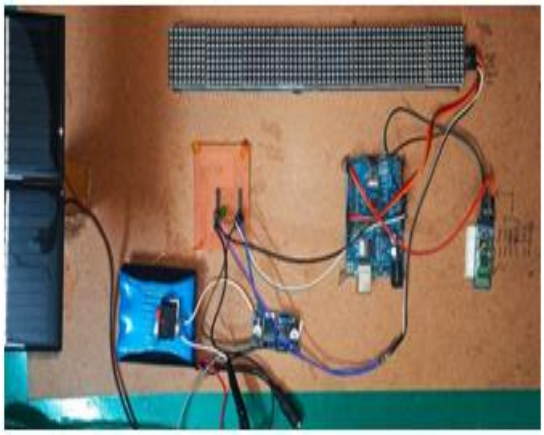

Figure 7:- Output

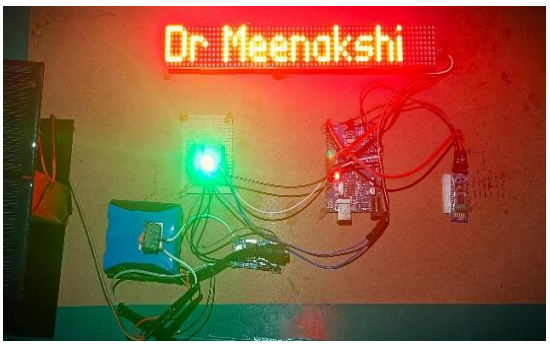

Figure 8:- Output

VII. CONCLUSION

One of the main mass media communication tools is the display board. This project can be modified to include local language. Graphics and other decoding methods can be used to accomplish this. We also understand that this project helps the environment by saving time and energy. As we can instantly distribute knowledge to a huge number of individuals, printing and photocopying costs are also lowered. So, we may draw the conclusion that this project is simply the beginning of an idea to take communication using Bluetooth Module to a new level.

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