1. INTRODUCTION

1.1 Introduction

In this world Mobile Phones and the related technologies are becoming more and more prevalent. Various technical areas in the field of telecommunication and Embedded Systems are becoming omnipresent in the people. The use of cell phones has rapidly increased over the last decade and a half. Up gradation in the networking technologies has encouraged the development and growth of very dense networks. Now-a-days the general mass prefer communicating while on the move therefore landlines usage has been drastically reduced.

Notice boards are one of the widely used ones ranging from primary schools to major organizations to convey message at large. A lot of paper is been used and which is later wasted by the organizations. This in turn leads to a lot of deforestation thus leading to global warming. Small innovative steps in making use of technology for regular purposes would have an adverse effect on the environment issues which we are presently concerned about. The main aim is to design a SMS driven automatic display Board which can replace the currently used programmable electronic display and conventional notice boards.

It is proposed to design to receive message in display toolkit which can be used from an authorized mobile phone or computer. The whole process can be described from the transmitter and receiver section. The WI-FI/BLUETOOTH module receives a message from the authorized mobile phone or computer and the message is extracted by the microcontroller from the WI-FI/BLUETOOTH module and is displayed on the DOT MATRIX DISPLAY (DMD) Board. Serial to parallel communication is used for the entire process from Bluetooth module to Microcontroller and from microcontroller to the matrix display.

This proposed system has many upcoming applications in educational institutions and organizations, crime prevention, traffic management, railways, advertisements etc. Been user friendly, long range and faster means of conveying information are major bolsters for this application. By using this proposed methodology we can enhance the security system and also make awareness of the emergency situations and avoid many dangers.

2. LITERATURE SURVEY

In normal scenario we spend lot of resources like paper, manpower &printer ink and the most important time. Separate individual is requiring for taking care of notices. Using wireless network following exist systems are as follows –

2.1 Wireless electronics notice board using Bluetooth- Bluetooth is open wireless protocol for exchanging data over short distances from fixed and mobile devices, creating personal area network (PANs). It was originally conceived as a wireless alternative to RS232 data cables. It can connect several devices, overcoming problems of synchronization.

2.2 Wireless electronic notice board using Zigbee - This notice board is developed by using zigbee. In this model the transmitter module will be interfacing computer via serial interface to the zigbee module. The receiver module placed at the remote end consists of zigbee module which is interfaced with microcontroller for displaying the message on LCD. The power consumption of zigbee is less them Wi- Fi. But its range is limited.

2.3 DTMF based smart notice board - In this system the mobile phone technology i.e. Dual tone multifrequency (DTMF) & GSM are used. The DTMF module is put together functionally with microcontroller & LCD modules to complete the task of automatically &providing mobile control to the notice board. The DTMF is connected to mobile phone which is used to receive the calls from the all phone & facility who wish to update/change the notices. During the ongoing call a DTMF tone is generated which is decoded into its equivalent binary by the decoder. This binary equivalent of tone is then sent to the microcontroller which is preprogrammed to take a decision for any given input. Any mobile which will act to the mobile attached to the board will act as remote device. So the new updates can display automatically & speedily. But the circuit of this system is too complicated.

2.4 Notice board using GSM - It presents a SMS based notice board incorporating the widely used GSM to facilitate the communication of displaying message on notice board using user's mobile phone. Its operation is based on microcontroller ATMEGA32 program in assembly language. A SIM300 GSM modem with a SIM card is attached to the parts of the microcontroller with the help of AT commands .When the user sends a SMS via a registered number from his mobile phone, it is received by SIM300 GSM modem at receivers end .SIM300 is duly interfaced through a level shift ICMAX 232 to the microcontrol3ler. The message is thus fetched into microcontroller. It is further display on electronic notice board which equipped with LCD display interfaced to microprocessor powered by a regulated power supply from main supply of 230 VOLTS AC.

2.5 WI-FI Based Notification System- In this system IEEE 802.11 protocol i.e. WI-FI. Also microcontroller, VGA module, RTC (real time clock), Graphic LCD is used in this system. In this system when authorized user sends a message from this system it will be received by WI-FI receiver .For this purpose RN chip is being used. The received data will be decoded by chip and connected to PIC microcontroller using SPI protocol .It uses RTC which will fetch the current time and day by interfacing the microcontroller with a RTC. After knowing the day and time, the respective details of the notice will be display on the LCD .But the WI-FI chip can cover the distance up to 400 meters.

3. BLOCK DIAGRAM

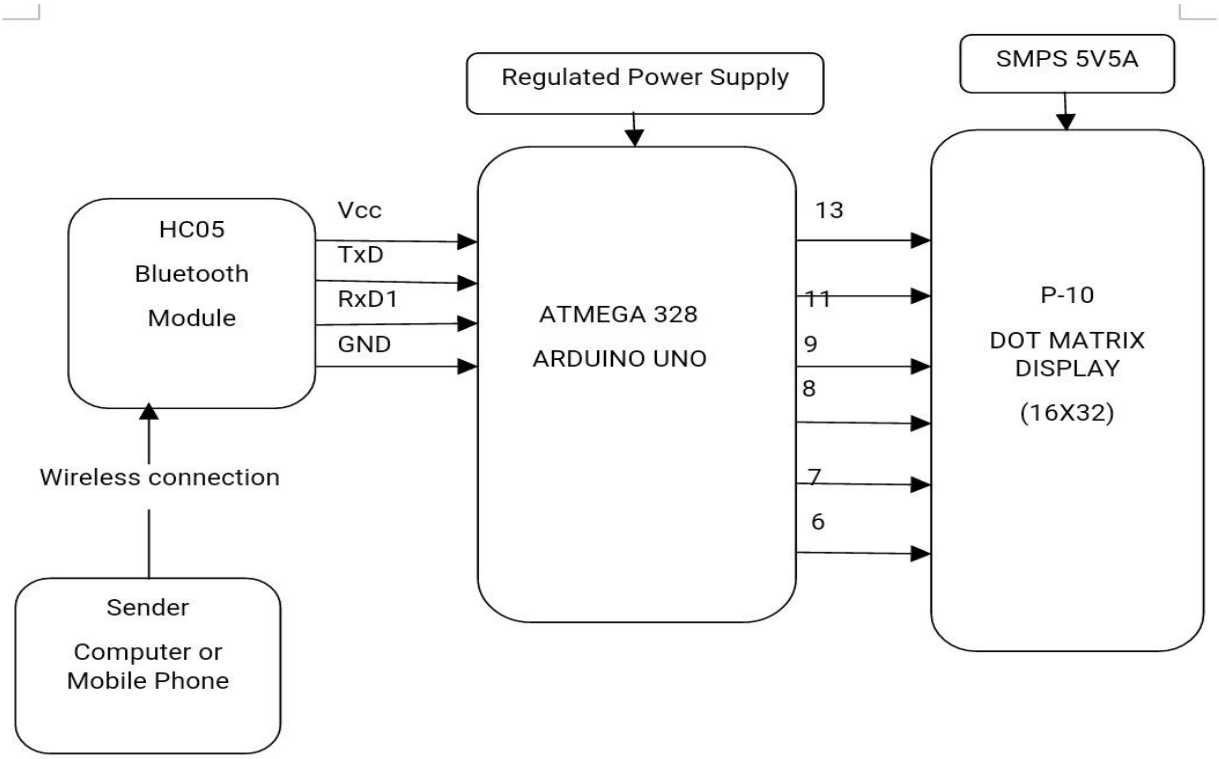

Fig.1 Block Diag. Of Wireless Digital Notice Board Using Arduino

6, 7 = PD7= AIN1 (Analog Comparator Negative Input)

8 = PB0= ICP1/CLK0 (Timer/counter 1 input capture pin or the divided system clock can be output on the PB0 pin)

9= PB1= OC1A (Timer/counter 1 output compare Match A output)

11=PB3=MOSI/OC2A(Master output slave input When controller acts as slave, the data is received by this pin Serial Peripheral Interface(SPI)for programming or Timer/counter 2 output compare Match output.)

13=PB5=SCK ((SPI Bus Serial Clock). This is the clock shared between this controller and other system for accurate data transfer).

4. CIRCUIT DIAGRAM:

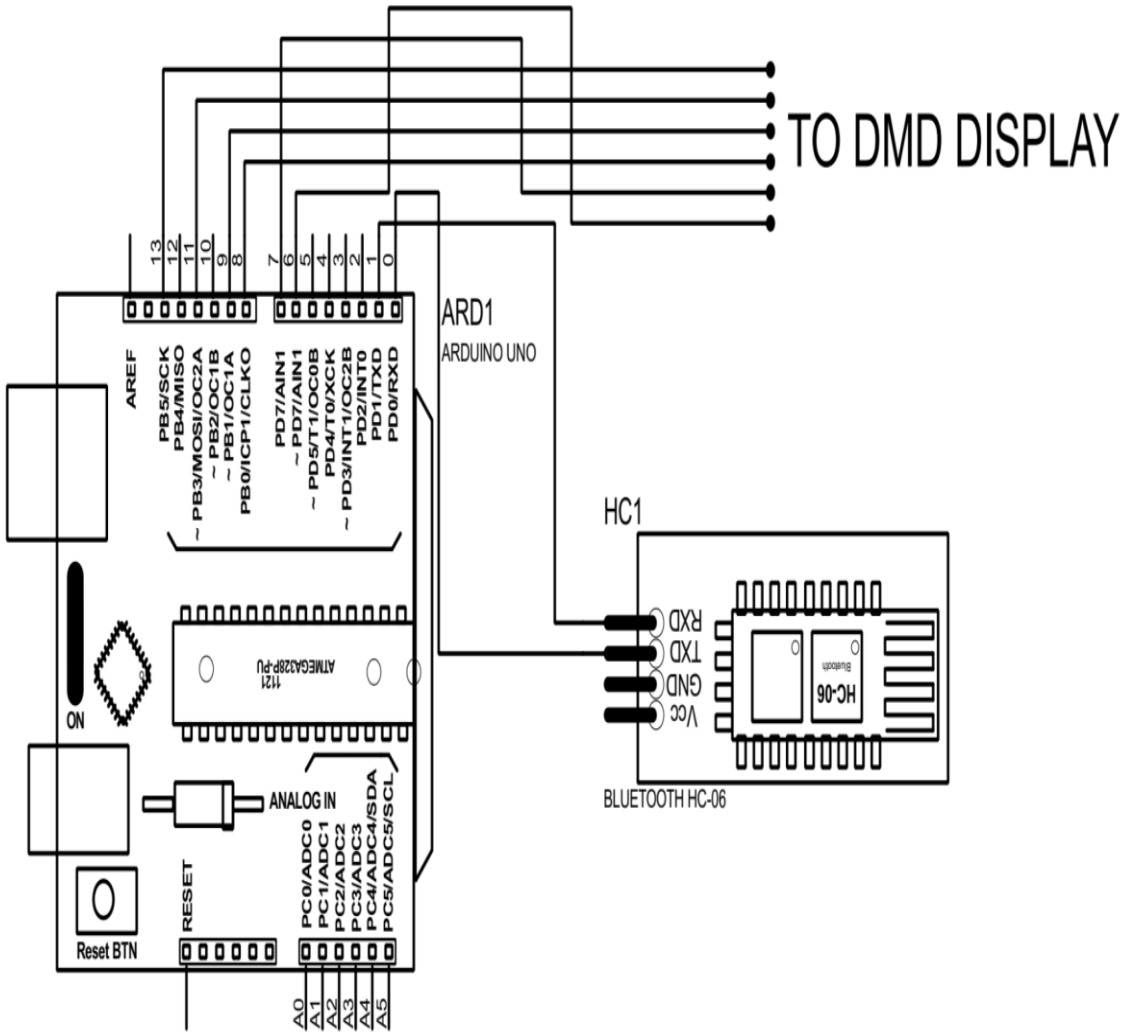

Fig. 2. Circuit Diagram

5. METHODOLOGY

Function of each block:

Basically there are 6 blocks; named as:

5.1 P-10 wireless Dot Matrix Display (DMD).
5.2 Arduino Uno Atmega 328
5.3 Bluetooth Module –HC05
5.4 Switched Mode Power Supply (SMPS)
5.5 Regulated power supply
5.6 Sender (computer/cell phone).

5.1 Dot Matrix Display:

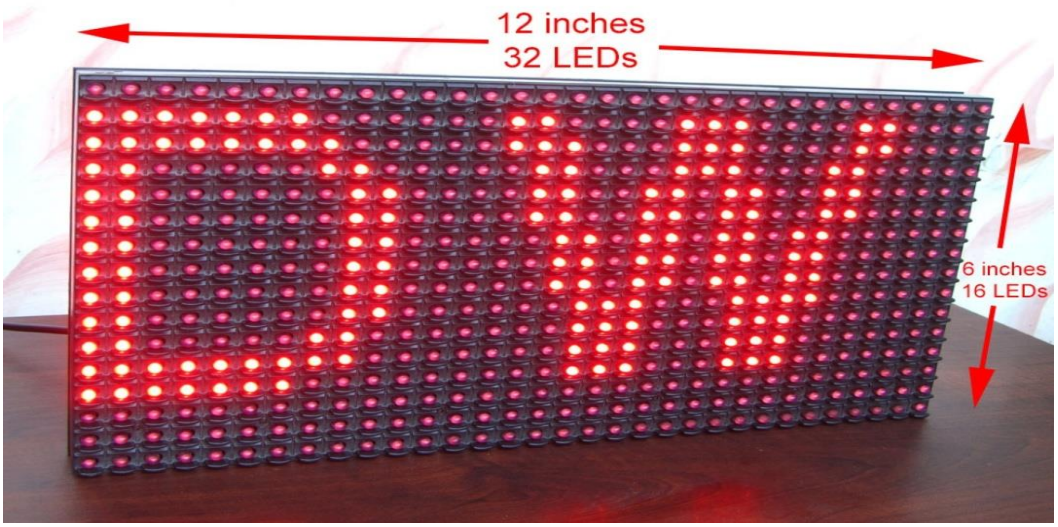

Fig.3. Dot Matrix Display

The DMD is a 512 pixel single color LED display arranged in 32x16 layout, a 16 pin (2x8) IDC Connector is used to interface with Arduino. The P-10 single color is a high brightness, low power consumption, long life time display module. Designed for semi-outdoor use. DMD display is uses the principle of Electroluminescence. It is the property by the virtual of which a semiconductor emits photons or quantum of light energy when supplied with electricity.

5.1.1 Features:

1. ¼ duty scan drive.
2. IP65 Waterproof
3. 1W pixel configuration
4. High Viewing Angle
5. High constant ratio with a perfect cover
6. 5v 1.5 ampere DC
7. Operating temperature -20^0 to $+50^0$C

5.1.2 Electrical and software Characteristics:

Table 1: Screen Characteristics

Code	Color	PixeLPitch	Density	Brightness	LED Pixel Size	Drive Mode	Size(mm)
2120	Red	10mm	36x16	2500mcd	512	¼ Scan	32x16
2121	Yellow	10mm	36x16	5000mcd	512	¼ Scan	32x16
2122	Blue	10mm	36x16	2500mcd	512	¼ Scan	32x16
2123	Green	10mm	36x16	9000mcd	512	¼ Scan	32x16
2124	White	10mm	36x16	8500mcd	512	¼ Scan	32x16

Table 2: Electrical Characteristics

Code	Color	Current (max)	Voltage (max)	Average Power	Power (max)
2120	Red	4A	5V	8W-10W	20W
2121	Yellow	4A	5V	8W-10W	20W
2122	Blue	4A	5V	8W-10W	20W
2123	Green	4A	5V	8W-10W	20W
2124	White	4A	5V	8W-10W	20W

This module LED display panel can be used to make any kind of large outdoor LED display panels by arranging modules in horizontal and vertical manner. One panel has a width of 12 inches and height of 6 inches. Display has a resolution of 32x16 pixels thus there are total 512 LEDs. It has good quality plastic cabinet that makes it suitable for outdoor use. The module has whole control circuit built in and has a simple interface requiring only seven line connections with controller board. Can be easily interfaced with low cost MCUs like AVR ATmega 328.

5.1.3 Working Principle:

Controlling large amount of LED with limited control lines uses two principles or techniques

1. Serial to parallel conversion
2. Persistence of vision

To convert serial data coming from MCU a shift register is used. In these modules **75HC595**IC is used. This IC is a 8 bit serial in parallel out IC.

It has main four lines for interface.

1. Shift clock
2. Store clock
3. Data

To shift 8 bit of data to it, the first bit of data (i.e. bit 0) is put on DATA line. For example if this bit is 0 then DATA line pulled LOW or if this bit is 1 then DATA line is made high, and them made low. This transfers the bit on data line to the IC from the MCU. In the Same way all 8bit are transferred to the IC. In the display panel, 16 such shift registers are cascaded. So you need to transfer 8x16=128 bits to control 128 LEDs

In this display we only show ¼ of the total image in one frame, next frame show other ¼ image. In the same way 4 frames are required to show complete image. These sub frames are switched at such fast speed that human eyes sees complete picture.

As you can see in the image below, 16 lines of the display are divided into four group 1 then after 3 more lines the 5^{th} line is again group 1. So 512/4=128 LEDs, that is why we need to transfer 128 bits of control these 128 LEDs.

Table 3: Function of 4 Groups

1	Group 1
2	Group 2
3	Group 3
4	Group 4
5	Group 1
6	Group 2
7	Group 3
8	Group 4
9	Group 1
10	Group 2
11	Group 3
12	Group 4
13	Group 1
14	Group 2
15	Group 3
16	Group 4

There are two lines named as A and B on the panel connecter. The logic level on these pins decides which group is selected . Only the LEDs on the selected line glow according to the 128 bits of data received from the MCU.

Table 4:Group Selection

A	B	**Group Selected**
0	0	1
0	1	2
1	0	3
1	1	4

So if you select group 1 by setting A=0 and B=0 following lines are selected 1,5,9and 13. So the data that you will send using serial interface will be shown on these LEDs. Then you quickly need to switch the group to 2 and transfer data for those lines. In the same way tansfer data to the lines belonging to group 3 and 4. This will make the whole picture of the frame.But this switching should be so fast that human eye cannot see it, Normally 400Hz switching frequency is best. As it will make you able to 100 complete frames per second.

5.1.4 Technical Drawing :

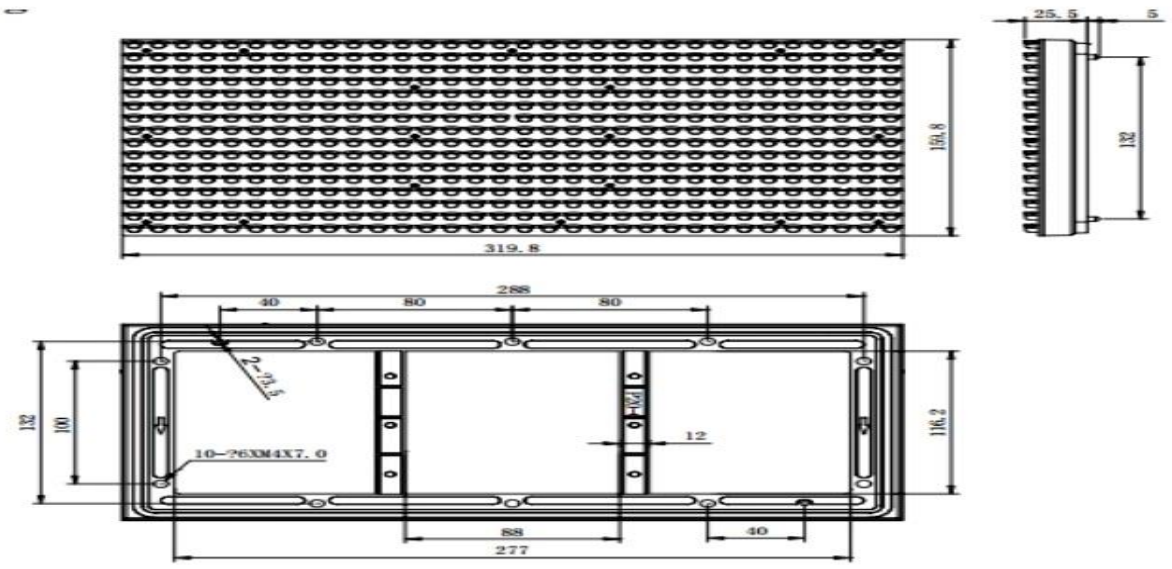

Fig. 4. Technical Drawing of DMD

5.1.5 Pinout:

1. **OE**=Enable/Disable All the LED's on the DMD
2. **A**=Pins select which ¼ of the DMD is selected
3. **B**=Pins select which ¼ of the DMD is selected
4. **C**=Pins select which ¼ of the DMD is selected(Not in use)
5. **D**=Pins select which ¼ of the DMD is selected (Not in use)
6. **CLK**=Used to clock each pixel into the DMD shift registers
7. **SCLK**=Latches the current content of the DMD shift registers
8. **R**=The raw pixel data stream (NB:R stands for RED. You might notice an unused G pin which is for Green on a HUB12 connector)

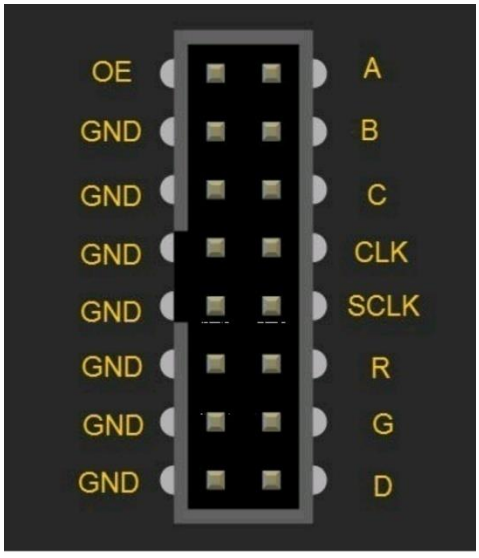

Fig. 5.Pinout

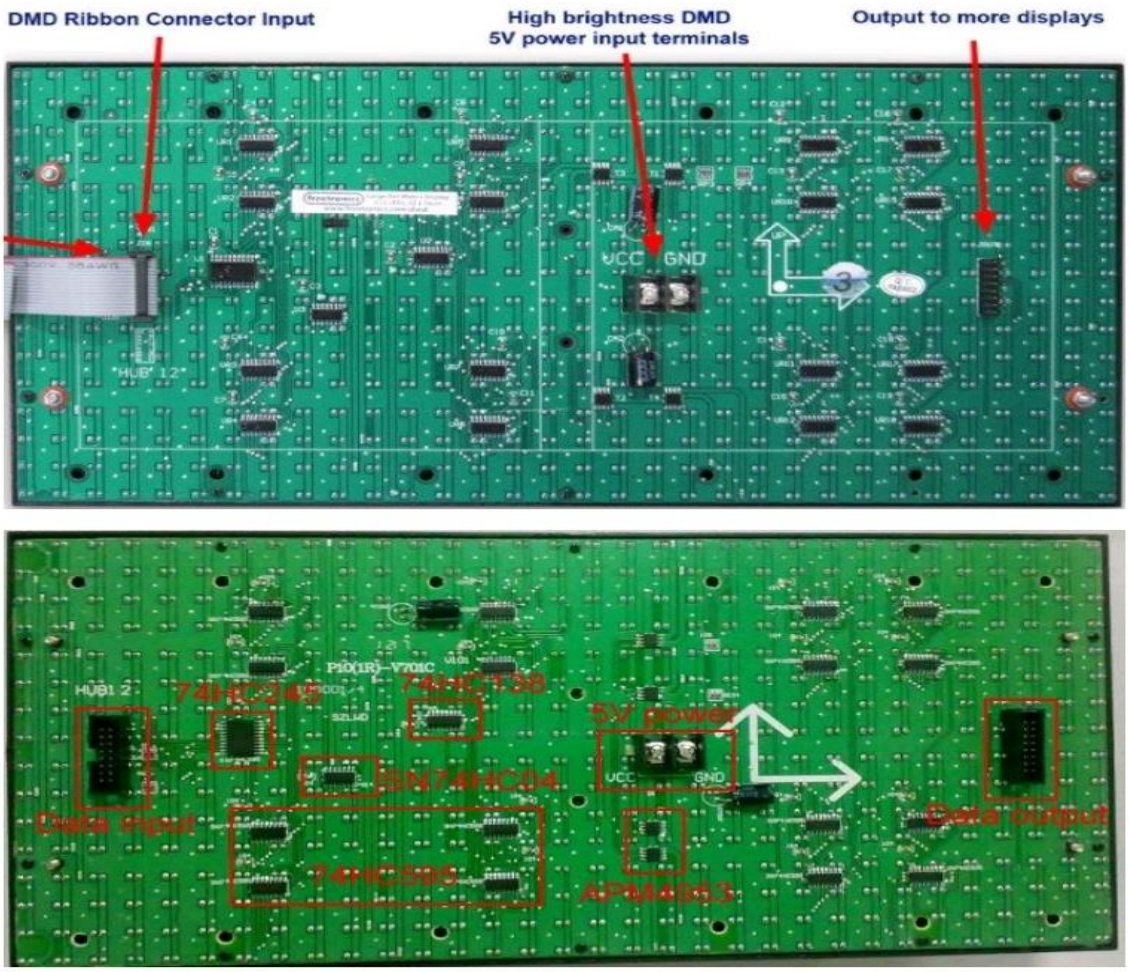

Fig. 6. Back Sided View of DMD

5.2 Arduino Uno Atmega328:

Arduino Uno is microcontroller board based on the ATmega 328 (Datasheet). It has 14 digital inputs/outputs pins (of which 6can be used as PWM outputs),6analog inputs , a 16MHZ ceramic resonator , USB connection , a power jack , an ICSP header and a reset button , simply connect it to a computer with USB cable or power it with a AC to DC adaptor or battery to get started . For interfacing of Arduino UNO and DMD hook up cables are used.

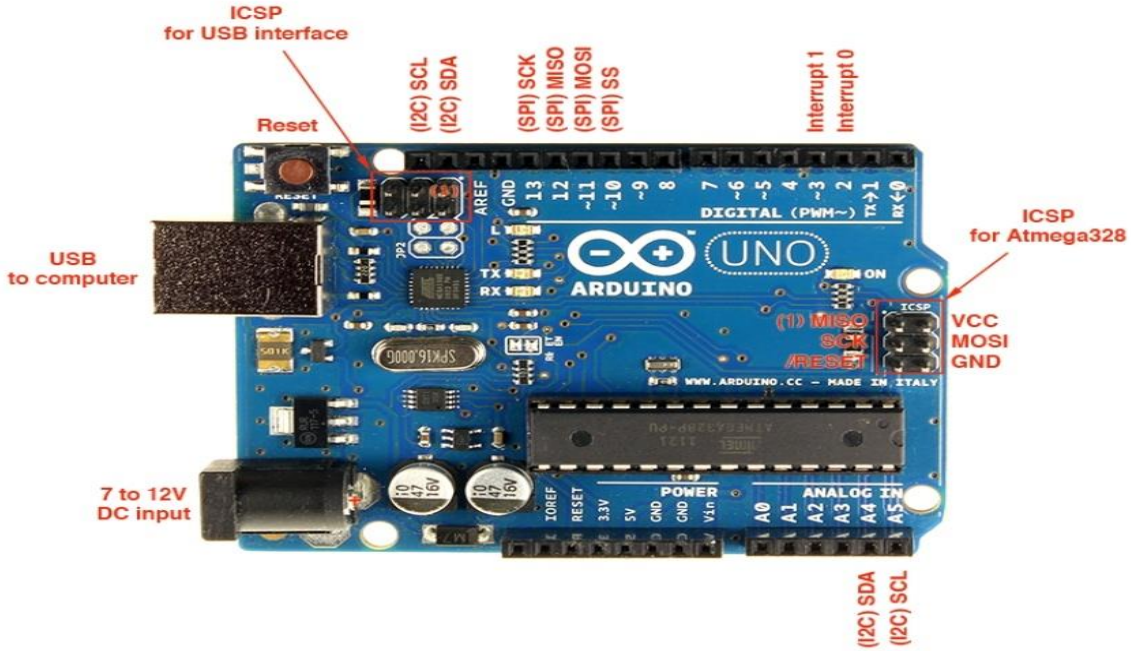

Fig. 7. Arduino Uno Board

5.2.1 Features:

1. Operating voltage of 5V
2. Maximum supply voltage 6 to 20V
3. Digital I/O pins 14 of which 6 provide PWM output
4. DC current per I/O pin 40mA
5. Flash memory 32KB of which 0.5KB is used by Boot loader
6. SRAM (Static Random Access)2KB , EEPROM(Electrically Erasable Programmable Read Only Memory) 1KB
7. Clock speed 16MHZ
8. Can be powered via the USB connection or with an external power supply

5.2.2 For interfacing following pins are used:

1. **PD0**= RxD (Data input pin for USART)
2. **PD1**= TxD (Data output pin for USART)
3. **PD2**= INT0(External Interrupt Source 0)
4. **PD3**=INT1/OC2B(External Interrupt Source 1or PWM-Timer/Counter 2 output compare Match B output)
5. **PD4**=T0/XCK(Timer 0 External Clock Input or USART External clock I/O)
6. **PD5**=T1/OCOB(Timer 1 External Counter Input or PWM-Timer/Counter 0 output compare Match b output)
7. **PD7**=AIN1(Analog comparator Negative Input)
8. **PB0**=ICP1/CLK0(Timer/counter 1 input capture pin or The divided system clock can be output on the PB0 pin)
9. **PB1**=OC1A(Timer/counter 1 output compare Match A output)
10. **PB3**=MOSI/OC2A(Master output slave input When controller acts as slave, the data is received by this pin Serial Peripheral Interface(SPI)for programming or Timer/counter 2 output compare Match output.)
11. **PB5**=SCK ((SPI Bus Serial Clock) This is the clock shared between this controller and other system for accurate data transfer.)

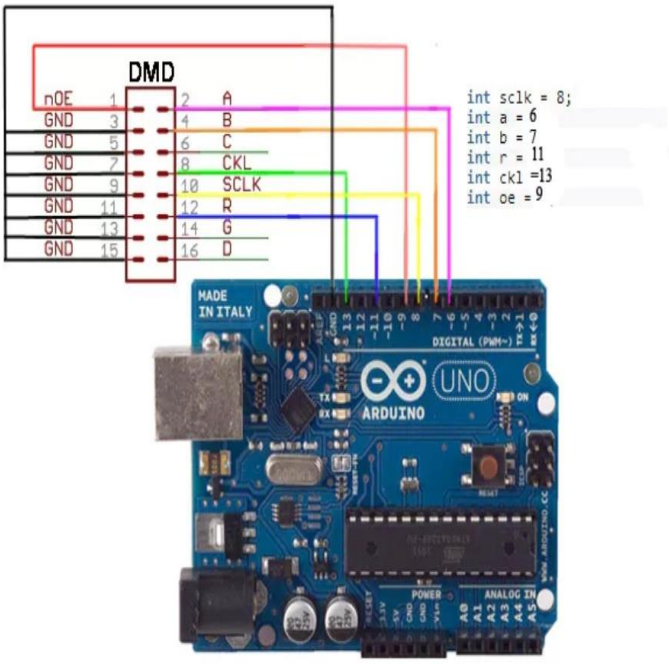

Fig. 8. Connection Between DMD & Arduino Uno Board

Main Difference between AVR, ARM, 8051, Microcontrollers

Table 5: Difference

	8051	PIC	AVR	ARM
Bus width	8-bit for standard core	8/16/32-bit	8/32-bit	32-bit mostly also available in 64-bit
Communication Protocols	UART, USART,SPI,I2C	PIC, UART, USART, LIN, CAN, Ethernet, SPI, I2S	UART, USART, SPI, I2C, (special purpose AVR support CAN, USB, Ethernet)	UART, USART, LIN, I2C, SPI, CAN, USB, Ethernet, I2S, DSP, SAI (serial audio interface), IrDA
Speed	12 Clock/instruction cycle	4 Clock/instruction cycle	1 clock/ instruction cycle	1 clock/ instruction cycle
Memory	ROM, SRAM, FLASH	SRAM, FLASH	Flash, SRAM, EEPROM	Flash, SDRAM, EEPROM
ISA	CLSC	Some feature of RISC	RISC	RISC
Memory Architecture	Von Neumann architecture	Harvard architecture	Modified	Modified Harvard architecture
Power Consumption	Average	Low	Low	Low
Families	8051 variants	PIC16,PIC17, PIC18, PIC24, PIC32	Tiny, Atmega, Xmega, special purpose AVR	ARMv4,5,6,7 and series
Community	Vast	Very Good	Very Good	Vast
Manufacturer	NXP, Atmel, Silicon Labs, Dallas, Cyprus, Infineon, etc.	Microchip Average	Atmel	Apple, Nvidia, Qualcomm, Samsung Electronics, and TI etc.
Cost (as compared to features provide)	Very Low	Average	Average	Low
Other Feature	Known for its Standard	Cheap	Cheap, effective	High speed operation Vast
Popular Microcontrollers	AT89C51, P89v51, etc.	PIC18fXX8, PIC16f88X, PIC32MXX	Atmega8, 16, 32, Arduino Community	LPC2148, ARM Cortex-M0 to ARM Cortex-M7, etc.

5.3 Bluetooth- HCO5 Module:

Fig.9. Bluetooth Technology

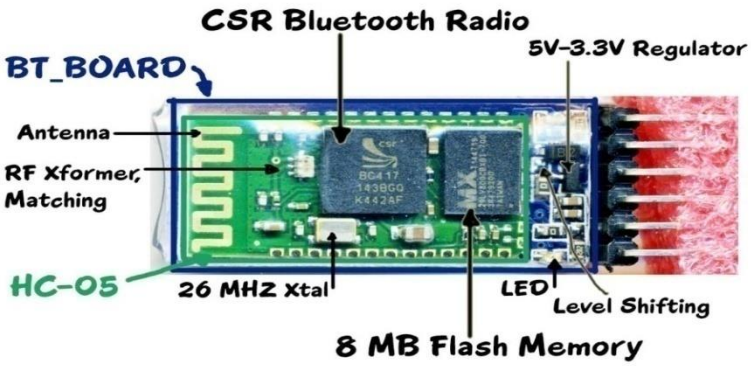

Fig.10. Bluetooth ModuleHC05

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength **UHF** (Ultra High Frequency) radio waves in the **ISM** (Industrial, Scientific and Medical) radio band from **2.4 to 2.485 GHZ**) from fixed and mobile devices and building personal area networks (PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. Range is approximately **10 Meters** (30 feet). These modules are based on the **Cambridge Silicon Radio**(CSR) **BC417 2.4GHZ Bluetooth Radio Chip** This is a complex chip which uses an external 8Mbit flash memory .These low cost Bluetooth Sub-Module work well with Arduino and other Microcomputers . HC05 is a more capable module that can be set to be either Master or Slave. It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). The HC-05 module includes the Radio and Memory chips, 26MHz crystal, antenna and RF (Radio frequency) matching network.

HCO5 module has two modes,

1. **Data mode**: Exchange of data between devices.
2. **Command mode**: It uses AT commands which are used to change setting of HCO5. To send these commands to module serial (USART) port is used.
   When we want to change setting of HCO5 Bluetooth module like change password for connection, baud rate, Bluetooth device's name etc.

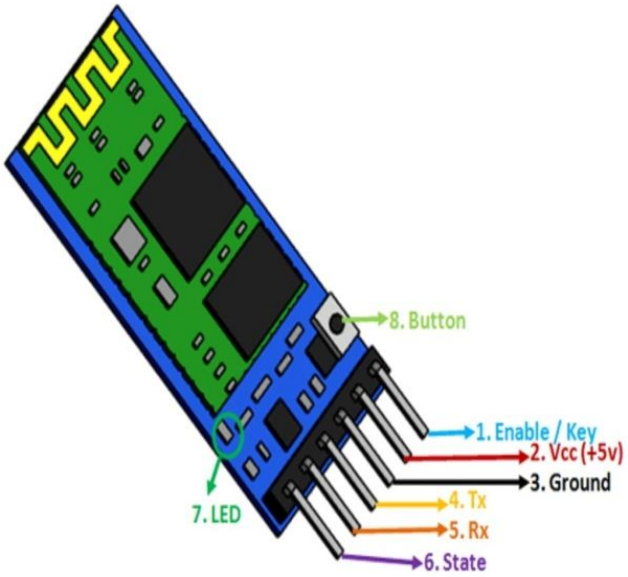

Fig. 11 Pinout

To do this, HC05 Bluetooth module has AT commands.
To use HC05 Bluetooth module in AT command mode, connect "Key" pin to High (VCC).
Default Baud rate of HC05 in command mode is 38400bps.
To send AT commands, we have to connect HC05 Bluetooth module to the PC via serial to USB converter and transmit AT command through serial terminal of PC.

5.3.1 Pin Description:

1. **Key/EN:** It is used to bring Bluetooth module in AT command mode. If Key/EN pin is set to High, then this module will work in command mode. Otherwise by default it is in data mode. The default baud rate of HC05 in command mode is 38400bps and 9600 in data mode.
2. **VCC:** Connect 5V or 3.3V to this pin.
3. **GND:** Ground pin of module.
4. **TxD:** Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TxD pin). It is directly connected to Rx pin of Arduino.

5. **RxD:** Receive data serially (received data will be transmitted wirelessly by Bluetooth module).It is recommended to use a voltage divider.
6. **State:** It tells whether module is connected or not. It is connected to the Arduino Input.
7. **LED:** Indicate the status of Module.1. Blink once in 2 sec: module has entered command mode.2. Repeated blinking: waiting for connection in data mode.3.Blinks twice in 1 sec: Connection successful in data mode.
8. **Button:** Used to control the key/enable pin to toggle between data mode and command mode

5.3.2 HC-05 Default Settings:

1. Default Bluetooth name : "HC-05"
2. Default password : 1234 or 0000
3. Default communication : slave
4. Default mode : Data mode
5. Default firmware : LINVOR

5.3.3 Technical Specification:

1. Serial Bluetooth module for Arduino and other microcontrollers.
2. Operating voltage : 4V to 6V (Typically +5V)
3. Operating Current : 30mA
4. Range : <100m (10m)
5. Works with serial communication (USART) and TTL compatible
6. Uses Frequency- Hopping Spread spectrum (FHSS)
7. Can operate in Master, Slave or Master/slave mode
8. Can be easily interface with Laptop or Mobile phones with Bluetooth
9. Supported baud rate : 9600,19200,38400,57600,115200

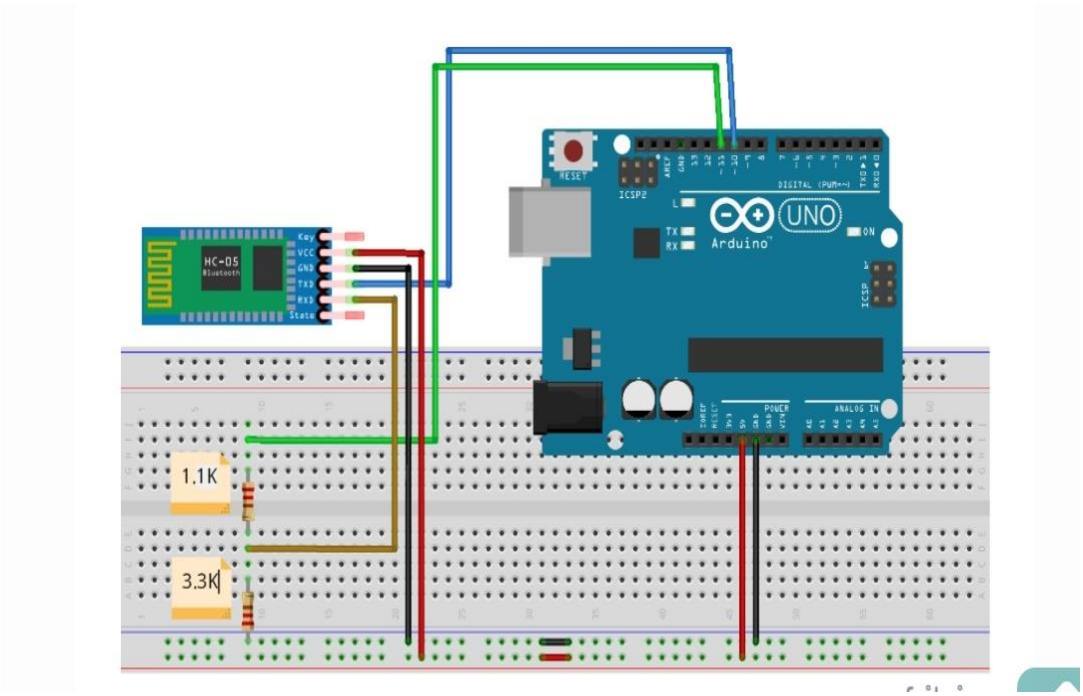

Fig.12. Connection between HC05 and Arduino UNO:

Table 6: Differences

	ZigBee™ 802.15.4	Bluetooth™ 802.15.1	Wi-Fi™ 802.11b	GPRS/GSM 1XRTT/CDMA
Application Focus	Monitoring & Control	Cable Replacement	Web, Video, Email	WAN, Voice/Data
System Resource	4KB-32KB	250KB+	1MB+	16MB+
Battery Life (days)	100-1000+	1-7	.1-5	1-7
Nodes Per Network	255/65K+	7	30	1,000
Bandwidth (kbps)	20-250	720	11,000+	64-128
Range (meters)	1-75+	1-10+	1-100	1,000+
Key Attributes	Reliable, Low Power, Cost Effective	Cost, Convenience	Speed, Flexibility	Reach, Quality

5.4 Switched- Mode Power Supply:

A Switched mode power supply (SMPS) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads, such as personal computer, while converting voltage and current characteristics.

Unlike a linear power supply, the pass transistor of a switching- mode supply continually switches between low dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. Ideally, a switched-mode power supply dissipates no power.

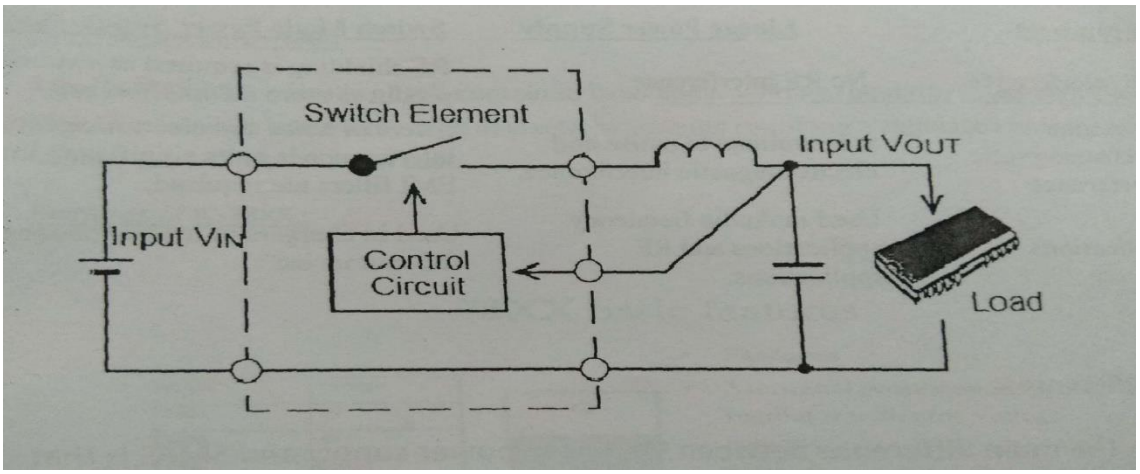

Fig.13 Block Diag. Of SMPS

A Switching regulator is a voltage regulator that uses a switching element to transform the incoming power supply into a pulsed voltage, which is then smoothed using capacitors, inductors and other elements. Power is supplied from input to output by turning on a switch until the desire voltage is reached. Once the output voltage reaches the predetermined value the switch element is turned off and no input power is consumed. Repeating this operation at high speed make it possible to supply voltage efficiently with less heat generation.

5.4.1 Features:

1. Input Power Source – AC 100-120 volts or 200-240 volts(both options)
2. Output voltage 5V DC
3. Output current 5A
4. Power 20 watts
5. 1year warranty
6. Weight 0.3kg
7. Working temperature -10^{o}C ~+50^{o}C
8. Efficiency 70%
9. Housing Material : Metal case / Aluminum base
10. Storage Temperature : -20 to 60^{0}C
11. Color : Silver
12. Size : 8.5x5.7x3.8 cm
13. Safety design with shortage protection, Overload protection and auto voltage switching
14. LED indicator for power on

Fig. 14. SMPS

5.5 Regulated Power Supply:

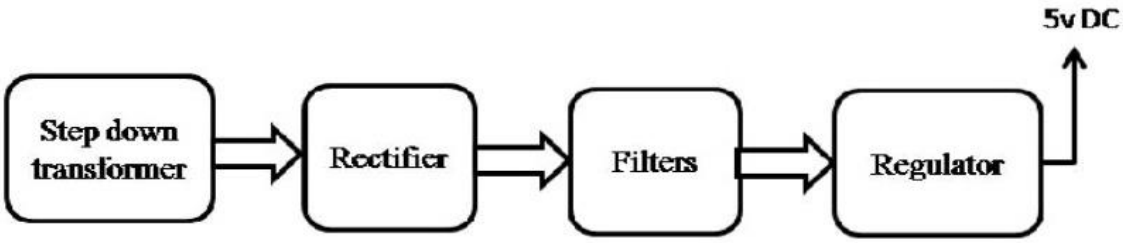

Fig.15. Block diag. of Regulated Power Supply

5.5.1 Blocks of Regulated Power Supply

5.5.1.1 Step down transformer:

When AC is applied to the primary winding of the transformer it can either be stepped down or up depending on the value of DC needed. In our circuit the transformer of 230V/15-0-15V is used to perform the step down operation where a 230V AC appears as 15V AC across the secondary winding. One alteration of input causes the top of the transformer to be positive and bottom negative. Apart from stepping down AC voltages, it gives isolation between the power source and power supply circuitries.

5.5.1.2 Rectifier:

In power supply unit, rectification is normally achieved using a solid state diode. Diode has the property that will let the electron flow easily in one direction at proper biasing condition. As AC is applied to the diode, electrons only when the anode is positive and cathode is negative. Reversing the polarity of voltage will not permit electron flow. A bridge rectifier of four diodes (4xIN4007) is used to achieve full wave rectification. Two diodes will conduct during the positive half cycle and other two will conduct during the negative half cycle. The DC voltage appearing across the output terminals of the bridge rectifier will be somewhat less than 90% of the applied RMS value. Normally one alteration of the input voltage

will reverse the polarities. Opposite ends of the transformer will therefore always be 180^0degree out of phase with each other. For positive cycle, two diodes are connected to the positive voltage at the top winding and only one diode conducts. At the same time one of the other two diodes conducts for the negative voltage that is applied from the bottom winding due to the forward bias for that diode. In this circuit due to positive half cycle D1 and D2 will conduct to give 10.8V pulsating DC. The DC output has a ripple frequency of 100Hz. Since each alteration produces a resulting output pulse, frequency =2x50Hz. The output obtained is not pure DC and therefore filtration has to be done.

5.5.1.3 Filtering Unit:

Filter circuits which usually capacitor acting as a surge arrester always follow the rectifier unit. This capacitor is also called as a decoupling capacitor or a bypassing capacitor, is used not only to 'short' the ripple with frequency of 120Hz to ground but also to leave the frequency of the DC to appear at the output. A load resistor is connected so that a reference to the ground is maintained. Here one pair of capacitor and resistor (C1, R1) is for bypassing ripples and other (C2, R2) is used as a low pass filter, i.e. it passes only low frequency signals and bypasses high frequency signals. The load resistor should be 1% to 2.5% of the load.

5.5.1.4 Voltage Regulator:

The voltage regulator plays an important role in any power supply unit. The primary purpose of the regulator is to aid the rectifier and filter circuit in providing a constant DC voltage to the device. Power supplies without regulators have inherent problem of changing DC voltage value due to variations in the load or due to fluctuations in the AC linear voltage. With a regulator connected to the DC output, the voltage can be maintained within a close tolerant region of the desired output. IC7812 and 7805 is used for providing +12V and +5V supply.

We Can Use Adaptor Which Makes The Overall System High Efficient And Less Bulky.

Fig. 16. Adaptor

9V 1A Power Adapter

This 9V 1A Power Adapter is a high quality power supply manufactured specifically for electronics. These are switch mode power supplies which means the output is regulated to 9V and the capable output current is much higher (1000mA). These will power most projects require more than 1000mA of current.

Features:

- Color: Black
- Input: 100~240V, 50/60Hz
- Output: 9V, 1A
- Works with most devices that use a 9V adaptor and less than 1A of power
- 2-flat-pin plug
- Connector size: 5.5 x 2.1mm
- Cable Length: 100cm
- Dimensions: 7.4 x 2.7 x 4 cm
- Weight: 71 gm

5.6 Sender

Sender:

The wireless digital Notice Board uses the mobile phone or computer to send the Notice.

- Establishes the Bluetooth connection between sender and Bluetooth module.
- Send the data or notice
- Disconnect after Notice displayed.

Communication between Arduino UNO and PC via Bluetooth

To communicate between Arduino UNO and PC through Bluetooth, please follow below steps.

Step 1

Turn on Arduino UNO which with completed installation of sample hardware and source code.

Step 2

Go to [desktop] open [Bluetooth Places]

Step 3

Go to [Right bottom corner at desktop] right click [Bluetooth Icon]

 Select [Turn on Bluetooth]

Step 4

After turn on Bluetooth device on PC site,

Go to [Right bottom corner at desktop] Right click [Bluetooth Icon]

 Select [Display Classic View]

Step 5

Double Click [Center Ball of Bluetooth software] to search surrounding available Bluetooth device.

The HC-05 Bluetooth Module will be found and shown on the display.

Step 6

Select the HC-05 Bluetooth Module on the display and double click the Serial Port Icon to connect.

Step 7

Key in default passwords: 1234 on [Passkey] to connect HC-05 Bluetooth Module.

After key in correct passkey, the window will show which serial COM is connected to HC-05 Bluetooth Module. In this example, “COM8” was connected.

Step 8

To write data to Arduino UNO via HC-05 Bluetooth Module, open software “Mybotic Serial Com Tool”. This software can be getting at here.

Step 9

1. Select the correct Serial Com (in this example, “COM8” is the correct Serial Com).

2. Select Baud Rate as 9600 (default in communication mode). 3. Click “Open”.

It will shows “COM open successfully” if open successful.

Step 10

Now you may send whatever you want to Arduino UNO by

1. Writing data on text box and then

2. Click write.

In Arduino site, the data was received and display on LCD.

6. FLOW CHART

The flowchart given below represents the working of the system:

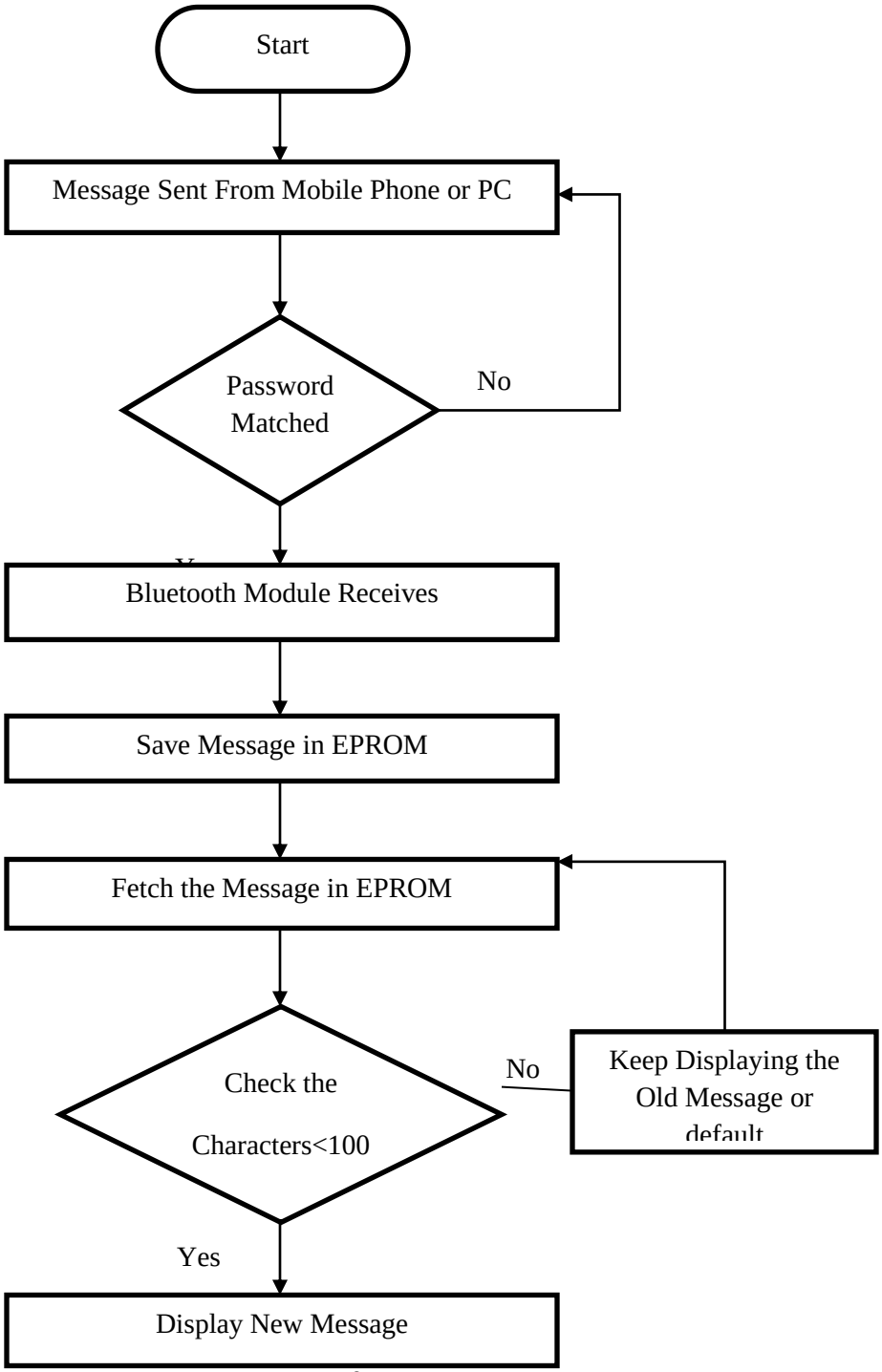

Fig. 17. Flow of Working

7. PROGRAMMING

```
----------
 - Download the DMD library here: https://github.com/freetronics/DMD
 - Place the DMD library folder into the "arduino/libraries/" folder of your Arduino installation.
 - Get the TimerOne library from here: http://code.google.com/p/arduino-timerone/downloads/list
   or download the local copy from the DMD library page (which may be older but was /*
used for this creation)
   and place the TimerOne library folder into the "arduino/libraries/" folder of your Arduino
installation.
 - Restart the IDE.

*/

#include <SPI.h>            //SPI.h must be included as DMD is written by                SPI (the IDE
complains otherwise)
#include <DMD.h>
#include <TimerOne.h>
#include "SystemFont5x7.h"
#include "Arial_black_16.h"

//Fire up the DMD library as dmd
#define DISPLAYS_ACROSS 4
#define DISPLAYS_DOWN 1
DMD dmd(DISPLAYS_ACROSS, DISPLAYS_DOWN);
//number max of characters in your message
#define max_char 100
char message[max_char];    // stores you message
//char mess[max_char];
char r_char;              // reads each character
byte index = 0;           // defines the position into your array
int i;
char greeting[] = "Government Polytechnic, Aurangabad";
/*-----------------------------------------------------------------------------
  Interrupt handler for Timer1 (TimerOne) driven DMD refresh scanning, this gets
  called at the period set in Timer1.initialize();
-----------------------------------------------------------------------------*/
void ScanDMD()
{
  dmd.scanDisplayBySPI();
}

void setup(void)
{

   //initialize TimerOne's interrupt/CPU usage used to scan and refresh the display
```

```
  Timer1.initialize( 5000 );          //period in microseconds to call ScanDMD. Anything longer than
5000 (5s) and you can see flicker.
  Timer1.attachInterrupt( ScanDMD );   //attach the Timer1 interrupt to ScanDMD which goes to
dmd.scanDisplayBySPI()

  //clear/init the DMD pixels held in RAM
  dmd.clearScreen( true );   //true is normal (all pixels off), false is negative (all pixels on)
  Serial.begin(9600);
strcpy(message,greeting);
}
void loop(void)
{
  //check if serial is avaible an before reading a new message delete's the old message

  if(Serial.available())
  {
      for(i=0; i<99; i++){
          message[i] = '\0';
      }
      //resests the index
      index=0;
   }

   //while is reading the message
   while(Serial.available() > 0){
     //the message can have up to 100 characters
     dmd.clearScreen( true );
     if(index < (max_char-1))
     {
        r_char = Serial.read();      // Reads a character
        message[index] = r_char;     // Stores the character in message array
        index++;                     // Increment position
       // message[index] = '\0';       // Delete the last position

     }
  }

 //prepares the display to print our message
  dmd.selectFont(Arial_Black_16);
  //displays the message
  dmd.drawMarquee(message ,max_char,(32*DISPLAYS_ACROSS)-1 ,0);
  long start=millis();
  long timer=start;
  boolean ret=false;
  while(!ret)
  {
    if ((timer+30) < millis()) {
      ret=dmd.stepMarquee(-1,0);
      timer=millis();
```

```
    }
  }
}
```

8. DESIGNING PROCESS OF A PCB

Depend on printed circuit board manufacturer, there are numerous ways available for designing PCBs. This circuit board design can be manufactured as bulk using several machines in PCB fabrication industries including drilling, punching, plating and final fabrication processes that are performed through highly automated machines. Laser drilling with CNC machines, automatic plating machines, strip etching machines, and use of optical inspection equipments, flying probe testers for electrical testing of printed circuit board process result in high-quality PCBs (with a greater production yield).

Step1: Design the PCB circuit with a Software

Draw the schematic circuit diagram with the PCB layout software such as CAD software, Eagle and Multisim software. This type of PCB design software contains a library of components that can be used to build the circuit. It is also possible to change the circuit design's position and then to modify according to your convenience and requirement. Here we have selected Eagle software to design the circuit and its procedure is as follows:

- Open the Eagle circuit board design software.
- A window with a menu bar appears.
- Click on the file menu.
- Select 'new design' from the drop-down menu.
- Click on the library menu.
- Select 'pick devices/symbol' from the drop-down menu.
- Select a relevant comment by double clicking on it, so that the component appears on the window.
- Add all the components and draw the circuit with proper connections as shown in the figure.
- Enter the rating of each component according to the requirement.
- Go to Command Toolbar and click Text editor varriages, click on the Varriages, and then close the window.
- Next, a black screen appears which is of the layout or the film diagram of the circuit as shown in the below figure, and save this as an image format.

Step2: Film generation

The film is generated from the finalized circuit board diagram of the PCB layout software which is send to the manufacturing unit where the negative image or mask is printed out on a plastic sheet.

Step3: Select Raw Material

The bulk of the printed circuit board is made with an unbreakable glass or fiberglass having copper foil bonded unto one or both the sides of the board. Thus, the PCBs made from unbreakable paper phenolic with a bonded copper foil are less expensive and are often used in household electrical devices. Mostly 0.059 industry standard thick, copper clad laminate, either single or double sided board is required. Panels may be sheared to contain May boards of different sizes.

Step4: Preparing Drill Holes

Machines and carbide drills are used to put holes on the printed circuit board. There are two types of machines available to drill the PCBs; they include hand machines and CNC machines. The hand machines require human intervention or effort to drill the holes, whereas CNC machines are computer-based machines that work-based on the machine timetables or programs that run both automatic as well as manually. The drilled pattern is stored in the computer like drill bit sizes, number of holes per panel, drilled stack, drilled time per load, etc. The PCB boards are placed into the CNC machine and the holes are drilled according to the determined pattern to place printed circuit board components.

Step5: Apply Image

The printed circuit layout can be printed in different ways on PCBs like manual pen, dry transfers, pen plotters and printers. The laser printers are a better way to print the layouts on printed circuit boards. The following steps are used to print the PCB layout through a laser printer:

1. Take a clean and neat copper paper and place it on the laser printer.
2. Next, store the designed layout film in the computer.
3. A laser printer prints the designed circuit layout on a copper paper whenever it gets a print command from the computer.

Step6: Stripping and Etching

This process involves removing the unwired copper on the PCBs by using different types of chemicals like ferric chloride, ammonium per-sulphate, etc. Make the solvent by mixing 1% of sodium hydroxide and 10 grams of sodium hydroxide pellets to one liter of water and mix it until everything is dissolved. Next, the PCB is put on a chemical bowl and cleaned up with a brush. during this process, if the PCB is still greasy, due to applied sunflower or seed oil, the developing process may take about 1 minute.

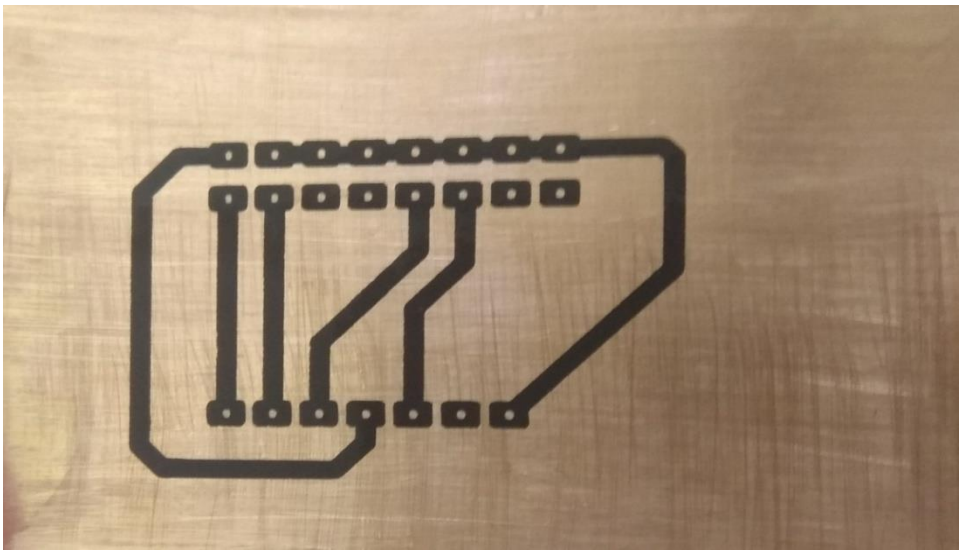

Fig. 18. PCB

9. CONCLUSION

The Arduino based notification system demonstrates the successful implementation of notice board. In our system authorize user can send the notice successfully.

9.1 Advantages:

1. Low Cost
   Bluetooth Module has low cost than GSM & Wi-Fi also DMD is cost efficient than LCD (Liquid Crystal Display). So this system is cost efficient.
2. Less Complex
   Interfacing is simple so this system is less complex than other system.
3. Flexible
   The system is much flexible.
4. Wireless System
   It is a wireless system as we are using Bluetooth module to conveyed data which is alternative to RS232 data cables.
5. Low power consumption.
   DMD and Arduino UNO requires 12V and 5V of power supply, respectively.
   So power consumption of this system is less.
6. Bluetooth has range better than Infrared Communication.
   The Bluetooth has a range of 10m which is sufficient for small distance communication.
7. Less interference compare to other wireless technologies.

9.2 Disadvantages:

1. This technology can be used only very shorter distance.

2. At a time only one message of any length can be display.

9.3 Applications:

There are many applications of electronic digital notice board as mentioned below:

1. International Airports:
    i. This system is used at Airports to display the notices regarding the flight timing or to show the local time.
    ii. Also, in trains and buses the information like platform number, ticket information is displayed in digital boards.

2. Educational Sectors:
    i. Use of this project can be for display notice regarding exams, results, annual functions or daily notices.
3. Shopping Complex:
    i. The big shops and shopping centers use digital display now.
4. Public Advertisements:
    i. In any Institution or organization or public places like bus stops, railway stations or parks.
5. Multiplex
6. Stock Exchanges
7. Industrial Sectors
8. Hospitals

9.4. Limitations

Restriction on Range:

As we are using Bluetooth we are restricted to access the project in between 10 meter distance from the Bluetooth module installed.

9.5. Future Scope

1. GSM :

   GSM used to facilitate the communication of displaying message on notice board using user's mobile phone. GSM modem with a SIM card is attached to the parts of the microcontroller.

2. Wi-Fi:
   In this system when authorized user sends a message from this system it will be received by WI-FI receiver .The WI-FI chip can cover the distance up to 400 meters.

3. Solar Based System :
   The system can be designed by using Solar panel to supply power to the system. Solar based system reduces the conventional use of energy so this system will be more efficient and convenient.

4. A2C Module :
   A2C Module supports the various Transitions, Graphics and Animations which makes the system more effective.
   Also we can display messages in various languages by using this module instead of using Arduino module.
   Whenever we used this module the system will be totally based upon Wi-Fi module instead of Bluetooth module.

10. PROJECT IMAGE:

Fig. 19. Project Image

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