



COACH POSITION DISPLAY BOARD

Arya R¹, Ramesh C R²

Student¹, Assistant Professor²

aryarajula96@gmail.com¹, ramesh.c.r@vidyaacademy.ac.in²

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. In our day to day life we use many such appliances at homes, office and public places for our comfort and convenience. The use of Embedded system in communication has given rise to many interesting applications. One of such application is the coach position display. Making LED displays and signage is a complete industry in itself serving all sorts of clients like banks, railway stations, factories, airport and more. In earlier days display units were made using individual LEDs carefully placed and soldered to make matrix of display. But this task was very mundane and slight misplacement of LED gave a ugly look to the board and chances of failure were also high. But now a days ready made panels are available that has 512 LEDs arranged in a rectangle of 32x16 matrix. They are low cost and easily available. So the aim of the project is to display coach position of trains that has stop at pudukkad railway station using bluetooth technology.

Index Terms: Bluetooth Technology, Embedded System, LED Display,

1. INTRODUCTION

The display system is aimed at displaying the coach position in railway stations before the arrival of trains. Being a P10 based LED system it can also be used by the passengers to identify their coaches even from a farther distance. This system is now operated with the help of a android app named Arduino blue tooth control. Now it provides an easier way for station masters to type the coach position in the app/PC screen from a distance of 10m.

II. COMPONENT OVERVIEW

A. Microcontroller

Coach position display board uses ATMEGA328P microcontroller which is the controller in Arduino UNO R3. It is a 40 pin IC. It is an 8-bit microcontroller with 8KB on chip flash memory, 1KB internal SRAM, 512 bytes EEPROM, 23 I/O line from 3 ports and 2 external interrupt sources.

B. LED Display

An LED display is a flat panel display, which uses an array of light-emitting diodes as pixels for a video display. Their brightness allow them to be used outdoors. The display consists of dot matrix of lights arranged in a rectangular configuratrion. We use P10 LED display which has a resolution of 16x32 pixel and input voltage of 5V which drives a current of upto 4A. In this project, we use 6 such displays. It is very user friendly and flexible.

C. SMPS

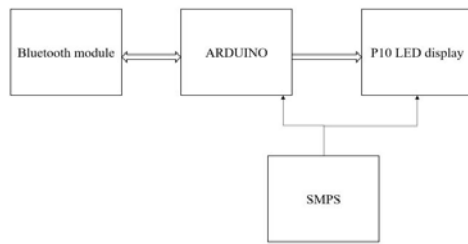
SMPS stands for switched mode power supply. It is an electronic power supply that uses a switching regulator to convert electrical power efficiently. In this project, we use 5V, 20A power supply.

Bluetooth module

HC-05 module is an easy to use bluetooth SPP module designed for transparent wireless serial connection setup. It can be used in master/slave configuration. It is a great solution for wireless communication.

III. DESIGN OVERVIEW

As explained in the introduction, the realization of complete potential of the display boards and wireless medium in information transfer is the major issue that the following thesis of the following project deal with.



As we seen in the above figure there are 2 interfaces between bluetooth module and arduino and between arduino and display. The complexity of coding substantially increases, but once programmed the module works at its robust best since it is a embedded system and not a general purpose computer. The design procedure involves identifying and assembling all the required hardware and ensuring fail safe interfacing between all the components.

IV. HARDWARE OVERVIEW

A. ARDUINO

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as opensource hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself (DIY) kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated

development environment (IDE) based on the Processing language project.

A1. ATmega328

ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

B. P10 LED Display

P10 LED panels are pre-made pixel panels with a 10mm pixel spacing, which is what the 10 in P10 indicates. There are also P6, P16, P20, P25, P40, etc, but it is the P10 that is usually used for Christmas displays. The P10 panels daisy chain from 1 to the next via a 16 way IDC cable. They are powered by a figure 8 cable running 5V DC.

B1. 74HC595

Shift Registers take a signal from one wire and output that information to many different pins. In this case, there is one data wire that takes in the data and 8 pins that are controlled depending on what data has been received. To make things better, there is an outpin for each shift register that can be connected to the input pin of another shift register. This is called cascading and makes the expansion potential an almost unlimited prospect. Shift registers have 4 control pins:

1)Latch - This pin tells the shift register when it is time to switch to newly entered data

2)Data - The 1's and 0's telling the shift register what pins to activate are received on this pin.

3)Clock - This is a pulse sent from the microcontroller that tells the shift register to take a data reading and move to the next step in the communication process

4)Enable Output - This is an on/off switch, High=On, Low=Off.

C. SMPS

| | |
|---------------------|---|
| Output Type | DC single output |
| Protections | Overload, Shortcircuit, EMI filter for ripple rejection |
| Output Voltage | Fixed, 5V DC |
| Output Current | Maximum 20A |
| Output Power | 0-100W |
| Input Voltage | 110-240V AC |
| Switching frequency | 50-60Hz |
| Housing material | Metal alloy |
| Waterproof | NO |
| Cooling method | Air cooled |
| Applications | LED sign board. P10, P5 based LED sign board display, LED strips, RGB LE WS2812B etc. |
| Testing | Tested for full load before sending |
| Weight | 530 grams approx |

D. Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project, etc

V. SOFTWARE WORKING PROTOTYPE MODEL

Initially the display displays "WELCOME TO PUDUKAD RAILWAY STATION". As the station master interrupts the product to display the coach position through android app/the connected PC a message will be displayed in the app/PC screen - "Press any key to continue". Now the master gets the provision to enter the platform number, train number and the coaches position details. On confirming the data

entry, the same will be displayed continuously until a future manual reset of the system. On manual reset, the system again goes to Step 1.

VI. CONCLUSION

User friendly, Low cost. Easy for the passengers to view the coach position from far distance. Easy for station master for displaying coach position.

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