Rear Windshield LED Display using Arduino

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Abstract— The objective of this project is to design an Android based LED matrix display system using Arduino Nano. The system is controlled by Arduino Nano. The system uses an Android Application to display the required content on the LED matrix display. The LED matrix will receive an input in the form of text or voice from the android device via Bluetooth module and Arduino uno. Both Bluetooth module and LED matrix are interfaced with the Arduino hence limiting the cost to a minimum. The input to the LED is in the form of text or voice. The LED matrix can be used to convey such messages for safety purposes or information display. By using the mobile app, it is possible to give indication to the preceding driver whose car is behind so there'll be no miscommunication. It will also be very useful in rainy season and fog for lane changing purpose.
Keywords: Arduino, LED, Display

I. INTRODUCTION

Here we propose an Android based LED matrix system embedded with Arduino Nano. The system uses an Android Application to display the required content on the LED matrix display. The input to the LED is in the form of text or voice.

As we advance in this digital age, digital display boards are replacing the traditional ones. Most of the organizations are switching to digital display boards and this project provides the facility of wireless communication for real time changes to be made to the data being displayed on the LED matrix.

This project has various applications. LED displays are used in:
1) Billboards
2) Rear Windshield Display
3) Railway, Bus Stations, Airports
4) Public transport vehicles for travel information etc.

Our project uses two 8x8 LED matrix combined together to form a 16x8 LED display. The size of the board may be increased as per requirement by adding more units of the 8x8 LED matrix.

These display units are capable of displaying messages of any kind, including alphanumeric characters , symbols etc., in rolling formats. The system uses LEDs of red color, the reason behind it being that red color has the maximum wavelength. The program that controls the system is burnt onto the Arduino. LEDs have many advantages over the conventional light bulbs such as low power consumption and longer life.

II. SYSTEM IMPLEMENTATION

This system is divided into three parts, first is message transmission section which is cellular mobile with android app, second is the reception section which is the Bluetooth module interfaced with the Arduino and third is the displaying section. In the transmission section the input is sent from the android application in text or voice form to the Bluetooth module in the reception section. The software used to develop the android application is MIT app inventor. The message is sent by Bluetooth in the form of ASCII codes. At the receiver end Bluetooth module receives ASCII codes from the transmitter and forwards them to the Arduino for further processing. Arduino sends the data to the LED matrix through SPI protocol and the LED matrix displays this message in rolling format.
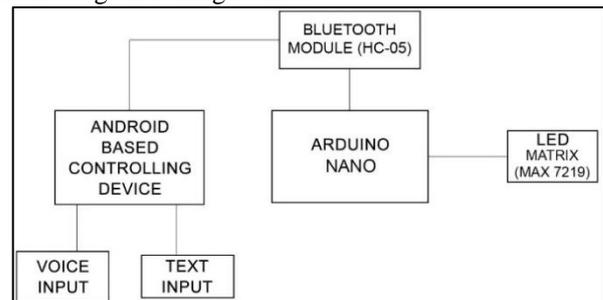

Fig. 1: Block Diagram

III. HARDWARE DESCRIPTION

A. Power Supply

A 12-volt, 5A power adapter is used to establish power connection. It provides the required 12-volt to the components by transforming 230V AC to 12V DC.

Fig. 2: Power Supply

B. Bluetooth (HC-05) Module

− This module is used to establish wireless connection between the android phone and the Arduino nano.
− It comes with a maximum range of 10 m.
− It operates on a 2.45 GHZ frequency band and the transfer rate of data is 1 Mbps.
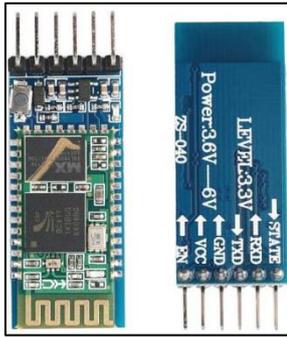
Fig. 3: Bluetooth Module

C. Arduino Nano

The Arduino Nano is based on AT mega 328p and is designed to act as controller for various electronics devices as it uses its own set of library functions and protocols.

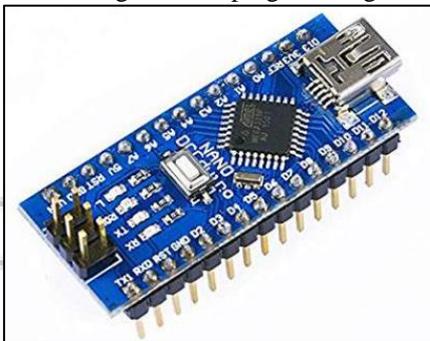We can also programme the Arduino according to our requirement using Arduino programming IDE.

Fig. 4: Arduino Nano

D. LED Matrix Module

We have used LED matrix module for displaying the message signal. The arrangement of the LED matrix is 16 X 8 so the message displayed is visible clearly through a long distance.
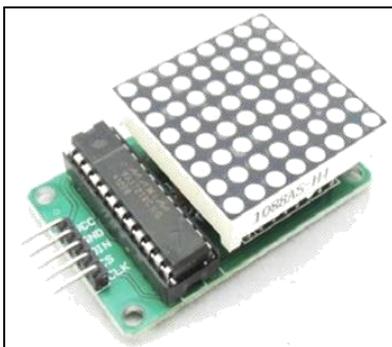

Fig. 5: 8x8 LED Matrix Module

E. SPI Protocol

The SPI protocol driver is used to send data from the Arduino to the peripheral device (here the LED matrix). The data transmission is at the rate of approximately 1 MBPS.

IV. SOFTWARE DESCRIPTION

A. Arduino IDE

The Arduino integrated development environment (IDE) is an application software through which we can write programming code for Arduino Nano.

It provides us with a dynamic option to change and modify the code according to our need.

B. MIT App Inventor

MIT app inventor is a web service which was used to create our android APK. It is currently being managed by Massachusetts Institute of Technology.

It provides us an interactive way to manage and create android applications.

C. Android APK

The app contains basic predefined buttons for communication purpose and two input field's one for the text input and one for voice input. Both the inputs are very quickly sent through Bluetooth module and received at the other end.
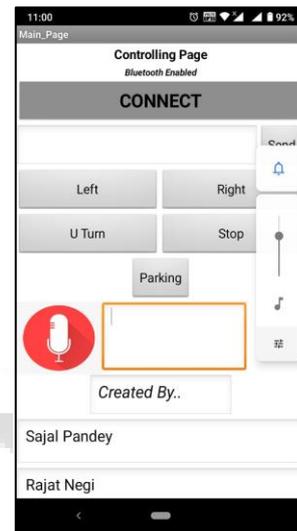

Fig. 6: Layout

V. RESULT

Bluetooth technology usage and the app development have been used in this device and through that an interactive communication display is made through which communication can be done in real time. It will increase car safety function and prevents accident and can also be useful for entertainment purpose and advertisement.
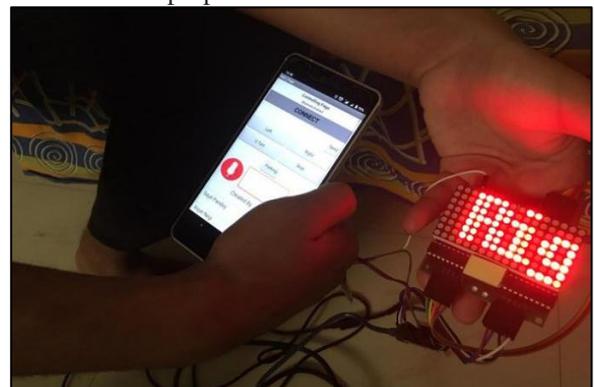

Fig. 7: LED Matrix Display Board with Input "Right" given From the Android Application

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