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Bus Information Alert System for Navigation of Blind People

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ABSTRACT

In our real life, we see visually impaired peoples in various perspectives. They are challenging many difficulties, such as identifying and blocking obstacles and to adapting environment around them. In some of the existing methods, some visual disability people are using talking signs, guides, echolocations, etc. to reach their chosen destination. We proposed one new design in this paper, to overcome those problems. This design implemented with the aid of wireless networks (WSN). Our main aim is to provide security and guidance to the people with the visual disabilities. According to this proposed idea, one RFID device should be held stationary at the bus stop wherever the people with visual defects are waiting for buses. This device does recognize by other units on each bus. Visually disabled people who provided with RFID tags are given their existence near the bus stop by using an RFID tag. The information about the visually impaired that is understood by the RFID reader is sent to the Web server with the help of NodeMCU (Wi-Fi module). The signals generated by the MSP430G2553 microcontroller and these signals transmitted to the bus unit through an RF transceiver. A Text to Speech device is using to convert the bus routes into an audio output. This is notified to him or her with the cooperation of the Text to Speech device. The bus routes information from the buses is transmitted through an RF transceiver in the bus to the RF transceiver at the bus stop. And the announcements about the bus routes information is made through the loudspeaker. According to the choice of the visually disabled individual, they can select to aboard a particular route bus. The secondary intention of this project is to support senior citizen & illiterate people for independent navigation in public transport.

Keywords : MSP430G2553, RFID Reader, NodeMCU, LCD Display, Text 2 Speech.

I. INTRODUCTION

Arduino In an unknown atmosphere, navigation and orientation are traditional challenges. Orientation can be expressed as the probability of detecting specific destinations and of building paths to them. This means an ability to improve and to secure the data of one's location in space with respect to the landmark in the neighbouring conditions and with regard to the particular target. Navigation directions extend the adjustment problems by the obstacle recognition and avoidance. The knowledge of impediments is carried into consideration for building new layouts and planning. The couple elements in individual wayfinding are climate detection and evasion of impediments. There are various means of transportation like the bus, the metros, the tramways, and much other public transportation, generally, the normal people face many days to day problems in public transportation than a huge inquest in case of visually disabled. According to the latest surveys of the WHO, approximately the 285 million personalities visually defected people in worldwide; from which 39 million peoples are blind. The difficulties encountered by the blind people are really

complicated and dangerous particularly when they want to travel on the public transportations. Understanding traffic signals and street symbols be a difficult task for all visually disabled peoples [5]. There is the various organization like helping hands that have come forward to help the visually impaired community. It provided an important form of assistance through a mobility instructor [6]. When a blind person has come to a new area, it is important that they are shown how to get around by a trained and knowledgeable instructor.

II. RELATED WORK

Some of the traditional methods like long cane were utilized by the blind peoples as a primitive mode of recognizing impediments, furthered the large cane with electronic travel aids such as laser cane and ultrasonic impediments avoider was also practiced. Although even with this device the visually impaired has the lack of freedom to travel without assistance and for efficient navigation through an unfamiliar environment relies on information that goes beyond the sensing range of this devices. The visually disabled might also use guide dogs. It was established in mid-90 in response to need of service dogs to help disabled servicemen that went blind during WWII [4]. As this all assistance mode for visually impaired had some limitation, so the GPS enable mobility system which was used to reach specific destination were important to the traveller as well as the visually impaired also. Although it provides an indication about orientation it still possesses many disadvantages like unfavourable weather and skyscraper can both interfere with the signal reception, another disadvantage as it is working on battery power, as using a battery make the GPS portable the battery can fail without any warning. The biggest drawback of the GPS based navigation system is it cannot alert the visually impaired about a drop-off on the sidewalk or a rise in elevation of the ground. So, the visually impaired pedestrian cannot use the GPS based system to identify normal obstacles that may be ahead or decide whether it is safe to cross the street or not and another major drawback is that the GPS system is not reliable in several parts of the world where the blind as to travel. The solution to this GPS problem is a navigation system for visually impaired based on ZIGBEE module. The ZIGBEE based navigation system has many advantages like the range of ZIGBEE based navigation system is 200-400 meter. In real case scenario, it will add a benefit to the project based on ZIGBEE technology as the bus could be stopped at any location where the visually impaired has to aboard a bus, but if the other point of view is taken into consideration it will be very difficult to manage because of some obvious reasons [2]. The visually impaired has to carry a ZigBee mobile unit in this method, as this unit has certain physical dimensions and weight which make this unit difficult and troublesome to carry for visually impaired. As in this system, a microphone/earphone is required to be carried by the visually impaired which provides details of routes, bus number, and location but this may lead to ear damage of the visually impaired [4]. In India, Pune was the first city to do experiment with Bus Rapid Transit System (BRT). PMPML (Pune Mahanagar Parivahan Mahamandal Ltd.) started playing pilot routes in December 2006. Rainbow Bus Rapid Transits system now operates in Pune and Pimpri-Chinchwad. It consists of more features like tickets at bus stops, level boarding, automatic doors opening, security and traffic management and information of bus arrivals are displayed on screens at the bus stops. Display screens and audio announcements in buses give information about the next bus stop. But there is no alert system for blind persons [1].

To overcome the drawbacks of the conventional and existing navigation system for visually impaired for public transport, we have proposed a system based on RFID technology [7]. According to the project idea proposed by us, an RF unit was placed at the bus stop where the visually impaired were waiting

which is identified by another RF unit in the bus. Implementing a Radio Frequency Identification (RFID) tags is a new means of giving information about the location to the users particularly visually impaired. This RFID tags can be embedded anywhere without any energy source due to its passive communication circuit. The tags store information about the location and provide it to any reader that is with a radius of about 10-15 meters for UHF RFID system. RFID has an advantage as it is cost effective and feasible but it is more suitable for indoor communication. When the blind enters into the bus stop, an input is given about his/her presence at the bus stop using an RFID tag. The RFID reader circuit is accompanied by MSP430 which will generate the signals and send it to the MSP430 microcontroller in the bus via an RF module. When the bus reaches near to the bus stop, the LED is turned ON in the bus indicating there is a blind person is waiting at the bus stop. The bus driver specifies the bus route using switches which are informed to the bus stop unit using an RF transceiver. The voice synthesizer will convert the bus route into audio output. The blind gets the notification about the bus he/she want to aboard with the aid of voice synthesizer. The transceiver at the bus stop will receive the bus routes sent by the RF transceiver in the bus and the bus routes are announced to the blind through a speaker. This system overcomes all the drawbacks of the existing system and it has added many advantages like switching facility for notifying the routes, cost-effective, convenient for the visually impaired. And the purpose of the project proposed to reduce the difficulties faced by visually impaired is fulfilled.

A. BLOCK DIAGRAMS

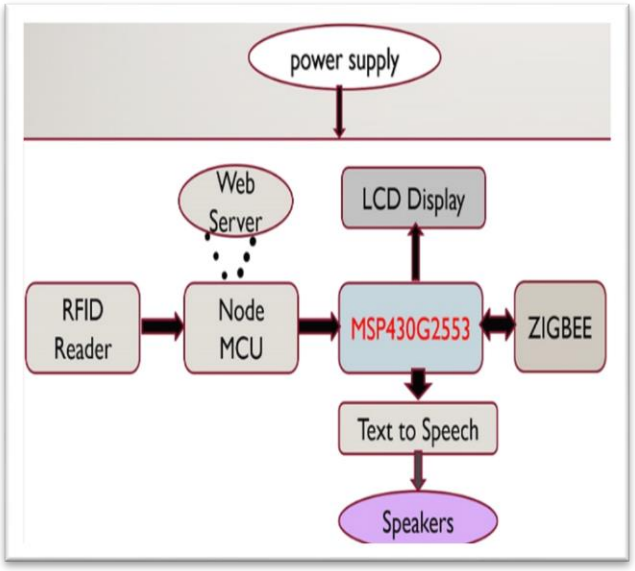


Figure 1 : Block diagram of bus stop unit.

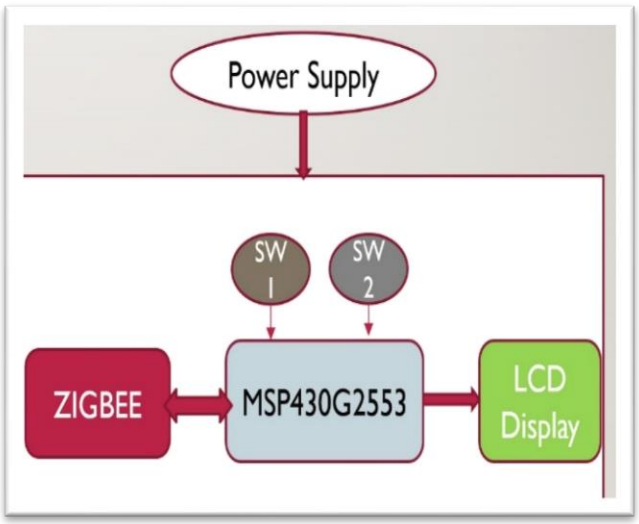


Figure 2 : Block diagram of bus unit.

B. CIRCUIT SCHEMETIC DIAGRAMS

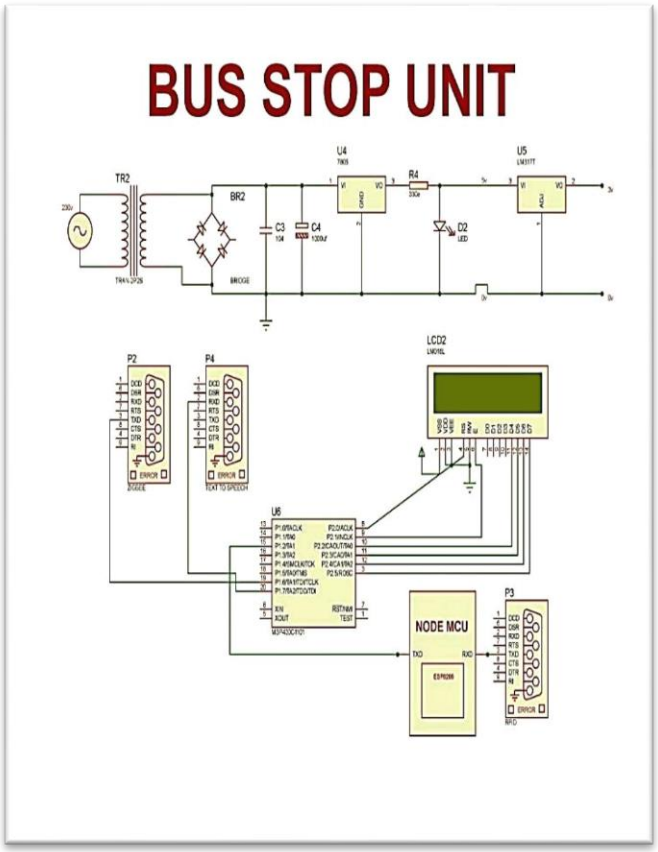


Figure 3 : Circuit Schematic of Bus Stop Unit.

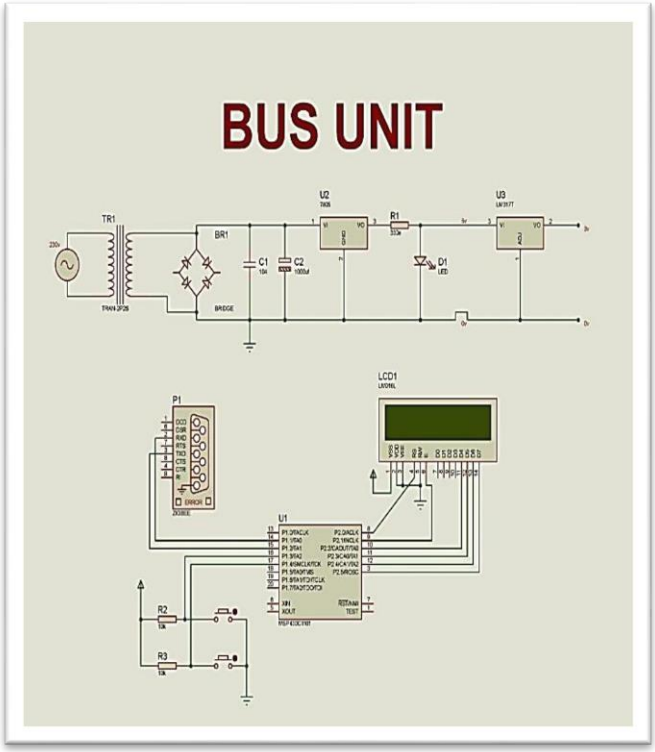


Figure 4 : Circuit schematic of bus unit.

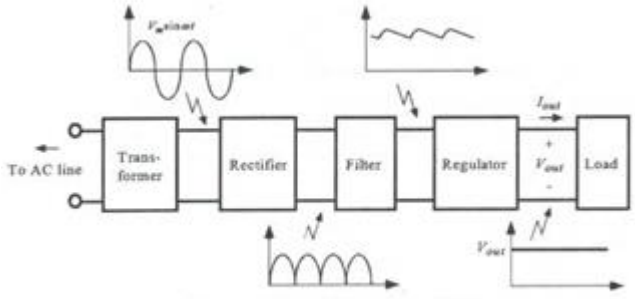
III. WORKING PRINCIPLE

When the blind peoples are at the bus station, he or she gives the information about their existence in the bus station by an RFID tag. An RF unit is stationary at the bus station where the blind people are waiting, and this unit is identified by the RF unit on the bus. The reader circuit recognizes the RFID tags possessed by the blind people. The MSP430 is accompanied with an RFID reader circuit which receives the signals. The signals are farther sent via the RF module to the bus system by MSP430 microcontroller. The switches are used by the bus driver to announce the bus routes and these routes are given to the bus station unit via an RF transceiver. These bus routes are transformed into audio signals using a Text to Speech device. The required bus that the blind want to aboard is announced to him/her with the aid of Text to Speech device and speaker system. The RF transceiver on the bus transfers the bus route to the RF transceiver at the bus station, then the bus routes

will be announced by the speaker and blind person will choose whether to aboard the bus according to his/her significant route to be travel. And we add a LDR sensor to the bus stop unit in this project it gives less resistance in high light intensity and high resistance in low light intensity. It gives high resistance in dark or night and low resistance in day or light.

IV. POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating DC voltage. So, in order to get a pure DC voltage, the output voltage from the rectifier is fed to a filter to remove any AC components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.



Components of a regulated power supply

V. MSO430G2553 MICROCONTROLLER

MSP430G2553 is a low power Microcontroller released by Texas Instruments in the late 1990s. It is a 16-bit RISC based mixed signal processor with a set of intelligent peripherals like I/O, Timers, ADC, DAC, flexible clock and USCI. MSP430G2553 has 2 ports (P1 and P2), each port has up to eight I/O pins (P1.0—P1.7, P2.0-P2.5). Every I/O pin is individually configurable for input or output direction, and each I/O line can be individually read or written to. Independently programmable individual I/O's, Any combination of input or output, Individually configurable P1 and P2 interrupts, Independent input and output data registers, Individually configurable pullup or pulldown resistors, Direction Registers PxDIR (P1DIR=0x01), Input Register PxIN, Output Registers PxOUT.

The MSP430 CPU has a 16-bit RISC architecture. And 16-bit data bus and 16-bit address bus, 7 addressing modes, reduced instructions set with only 27instructions, 64 K memory with Flash ROM and RAM. The CPU of MSP 430 includes a 16-bit ALU and a set of 16 Registers R0 –R15.In these registers Four are special Purpose and 12 are general purpose registers. All the registers can be addressed in the same way.

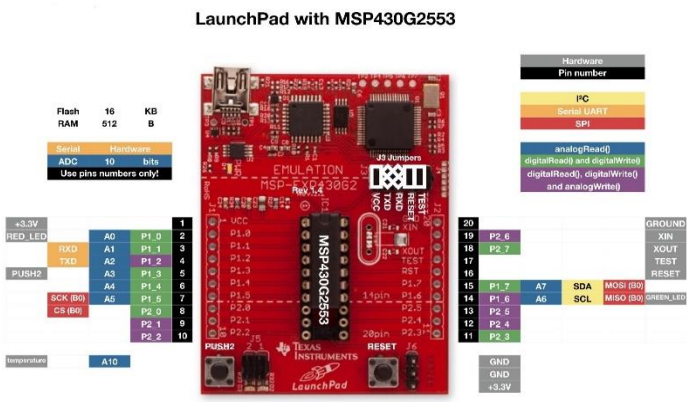


Figure 5 : MSP430G2553 Microcontroller

NodeMCU

The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. The NodeMcu is an open-source firmware and development kit. It provides unsurpassed ability to embed WIFI capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement. ESP8266EX offers a complete and self-contained WIFI networking solution; it can be used to host the application or to offload WIFI networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to

improve the performance of the system in such applications. Alternately, serving as a WIFI adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface).

Figure 6 : ESP8266mod (NodeMCU).

LCD display

LCD stands for Liquid Crystal Display. It can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own.

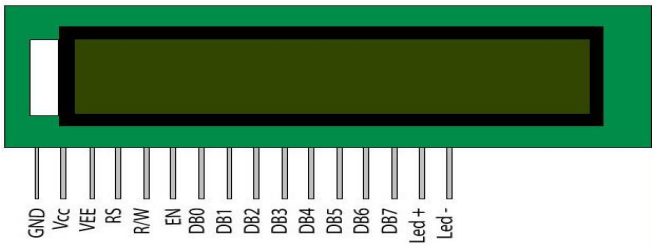


Figure 7 : LCD display

RFID READER AND RFID TAGS

Radio-Frequency identification (RFID) is the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked. There are two types of RFID tags: passive tags and active tags (battery powered). A passive RFID tag will use the interrogator's radio wave energy to relay its stored information back to the interrogator. A battery powered RFID tag is embedded with a small battery that powers the relay of information. Active tag has its own power source and allows the user to erase and update the data inside the tag.

Figure 8 : RFID reader circuit.

VI.TEXT TO SPEECH DEVICE

There is no limitation to words it can speak as it's based on fundamentals of phonemes of English. If you give any text input it gives voice output. Incoming serial data at 5V or 3V level. If your data source is microcontroller, then you can connect its TXD pin to RX-IN of the board directly. Maximum string it can accept is 256 characters at a time. Once it's done speaking you can send another string. You can monitor its TX-OUT pin for hash # character to see when it has completed the talking and then you can send another string.

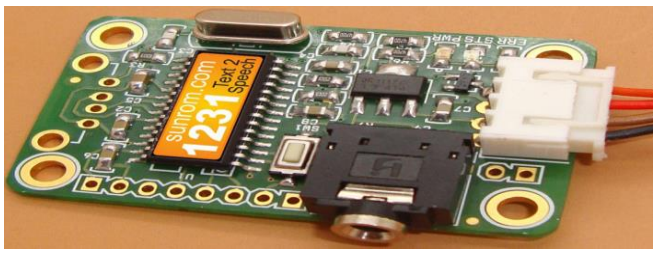


Figure 9 : Text to Speech device.

VII. LDR LIGHT SENSOR

The working principle of LDR is that it offers less resistance in high light intensity and high resistance

in low light intensity. And relay provides isolation between the controller and the device because as we know devices may work on AC as well as on DC but they receive signals from microcontroller which works on DC hence we require a relay to bridge the gap. The relay is extremely useful when you need to control a large amount of current or voltage with the small electrical signal.

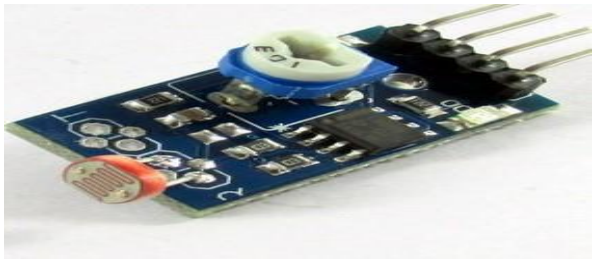


Figure 10 : LDR Light sensor module.

VIII. FLOW CHARTS

A. BUS STOP UNIT

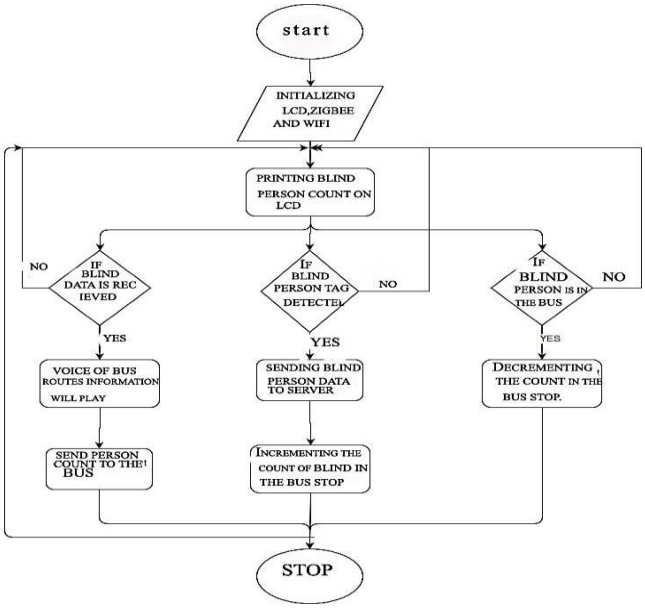


Figure 11a : flow chart for bus seop unit.

B. BUS UNIT

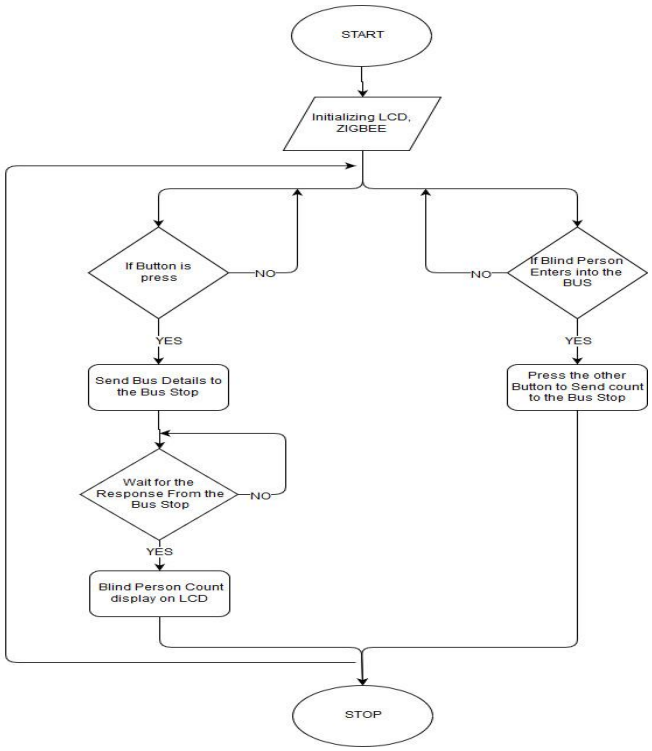


Figure 11b. flow chart of bus unit.

IX. ADVANTAGES AND APPLICATIONS

A. ADVANTAGES

- This total design is very cost effective.
- This system providing security to the blind persons.
- It is a low power source platform.
- This is convenient and useful to all the users.
- All the modules used in this design are so easy to handle.

B. APPLICATIONS

- Easy navigation to the blind people
- Independent navigation to the visually impaired, senior citizen and illiterate people
- Public transport system.
- Automatic light control using LDR sensor.

X. RESULTS

This project "Bus Information Alert System for Navigation of Blind People" is successfully implemented and verified in the real environment.

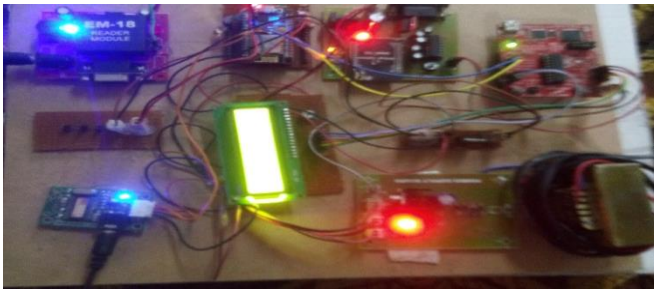


Figure 12a: Bus stop Unit

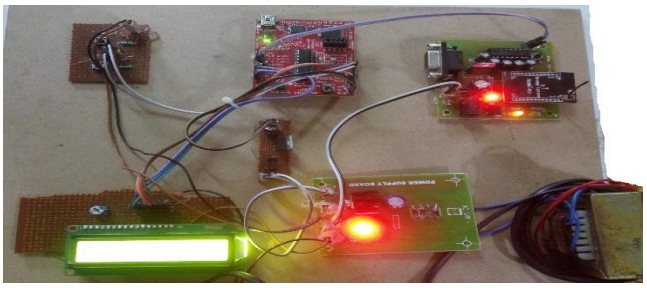


Figure 12b: Bus Unit.

Figure 12c: LCD Display.

Figure 12d: LCD shows persons count

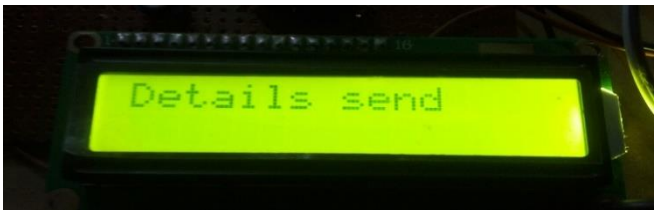


Figure 12e: Data sending from Bus Unit.

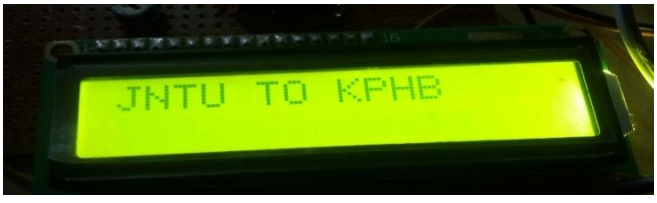


Figure 12f: Bus routes information.

XI. CONCLUSION

This project "Bus Information Alert System for Navigation of Blind People" is implemented and verified successfully. The blind person gives his or her presence at the bus stop by using an RFID tag, the Tag information read by the RFID reader. Msp430 microcontroller collects that information and sends to the web server with the help of NodeMCU WIFI module. LCD display in bus stop shows the blind person count, this count decrement when the blind person enters into the desired bus. When the bus reaches near to the bus stop bus driver sends routes information to the bus stop by using a switch on the bus. Text to Speech device converts that routes information into the audio output. That audio output announces to the blind people through the loudspeaker. Finally, blind people choose the desired bus. So the goal of the proposed system is to help the blind for easy navigation, is fulfilled. In this project we are implemented another application is an automatic light control using Light Dependent Resistor (LDR) and Relay.

XII. REFERENCES

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