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DESIGN AND IMPLEMENTATION OF BUS ALERT SYSTEM FOR VISUALLY IMPAIRED BASED ON GPS TECHNOLOGY

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Abstract

The major challenge to any visually impaired person is to identify and avoid obstacles and to adapt themselves to the surrounding environment. Some of the conventional methods used by the visually impaired/challenged people to reach their destination are by using talking sign, guide cans, etc. The motivation behind this project is that buses are vital in enabling blind people to participate fully in society, access to facilities and services. Generally, journey in a bus is a safe and comfort factor but navigation in outdoor environments is highly difficult for those who have congenital blindness or blindness from a very young age.

Keywords : PIC Microcontroller, GPS, Bluetooth, Voice Synthesizer, Ultrasonic sensor, RFM Transceiver.

1. INTRODUCTION

The Idea behind this paper is to develop a protocol especially for visual impaired person to access public transport. This proposed system consists of bus unit and blind unit. The bus unit which is placed in bus consists of microcontroller, GPS module, and RFM transceiver and voice synthesizer. The blind unit as a handy device for blind people consists of microcontroller, Bluetooth, ultrasonic sensor and GPS module. Visually Impaired Person **(VIP)** sends the queries regarding the bus route to the handy device via Bluetooth. The handy device communicates with the particular bus unit through RFM. And the bus unit sends the bus location to the handy device of blind people through RFM transceiver. The handy device receives this data from the bus unit and transmits it to the user's android mobile through Bluetooth. From this, the user can easily identify the bus location and arrival of particular bus. Once the VIP steps into the bus, it is difficult to get down from the bus after the stop had arrived. For this, Voice Synthesizer is used, it is used to tell the exact bus location and bus stop through speaker using GPS module. Using this VIP can know the bus stop and get down (Step out) freely from the bus after the bus stop has arrived. Handy device also consists of ultrasonic sensor; it is used to detect the nearby obstacle for the blind people. The voice synthesizer is used to deliver the audio output. so blind people easy to identify the exact location. Hence, we need to make their lives more comfortable by

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introducing a system that helps them enjoy transportation services independently and freely like ordinary people, without relying on others. Thus to help the visually impaired people and to make them to gain confidence to move around freely is to make use of GPS technology.

2. PROPOSED SYSTEM

BLIND UNIT:

The proposed system is especially developed for the blind people to access public transport. This proposed system consists of bus unit and blind unit. The bus unit which is placed in the bus consists of microcontroller, GPS module, RFM transceiver and voice synthesizer. The blind unit has a handy device for blind people which comprises of a microcontroller, Bluetooth, ultrasonic sensor and GPS module. It is difficult for VIP to know the bus stop; hence voice synthesizer is used to tell the exact bus location through GPS. Using this GPS Information, they can step in and get down (step out) easily from the bus. Handy device also consists of ultrasonic sensor; it is used to detect the nearby obstacle for the blind people.

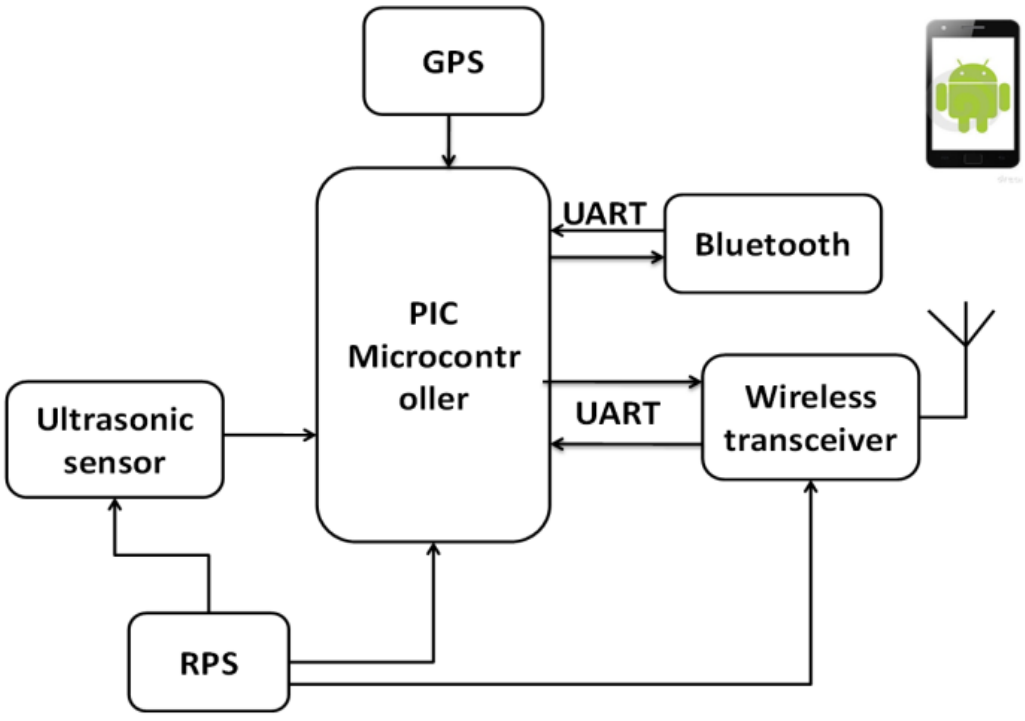

Fig.1.Block diagram of Blind Unit

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BUS UNIT:-

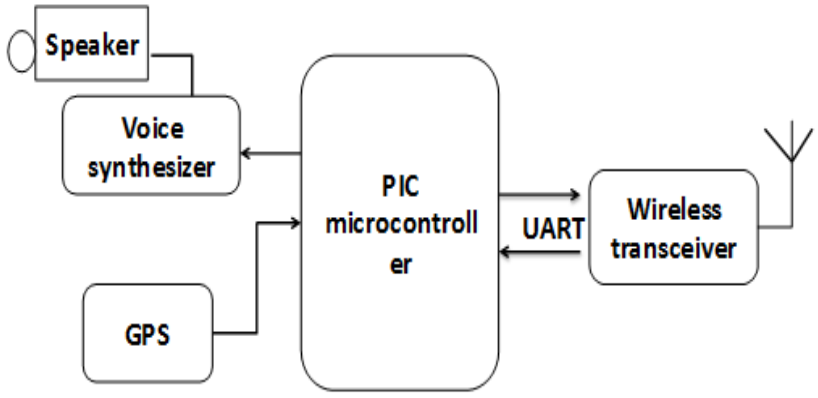

Fig.2. Block diagram of Bus Unit

3. HARDWARE IMPLEMENTATION

A. PIC MICROCONTROLLER

Peripheral Interface Controller (PIC) was originally designed by General Instruments. In the late 1970s, GI introduced PIC 1650 and 1655 – RISC with 30 instructions. PIC was sold to Microchip Features: low-cost, self-contained, 8-bit, Harvard structure, pipelined, RISC, single accumulator, with fixed reset and interrupt vectors

B. ULTRASONIC SENSOR

The Fundamental of Ultrasonic Sensor, Ultrasonic ranging and detecting devices uses high-frequency sound waves to detect the presence of an object and its range. The systems either measures the echo reflection of the sound from objects or detects the interruption of the sound beam as the objects pass between the transmitter and receiver.

C. BLUETOOTH

Bluetooth is a wireless technology standard for exchanging data over short distances. Bluetooth uses a radio technology called frequency hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands in the range 2400 -2483.5 MHz This range is in the globally unlicensed Industrial, Scientific and Medical (ISM) 2.4 GHz short range radio frequency band.

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D.GLOBAL POSITIONING SYSTEM (GPS)

The Global Positioning System (GPS) is a satellite based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location. GPS is used in a variety of ways such as, To determine position locations; for example, If you need to radio a helicopter pilot the coordinates of your position is located so that the pilot can pick you up.

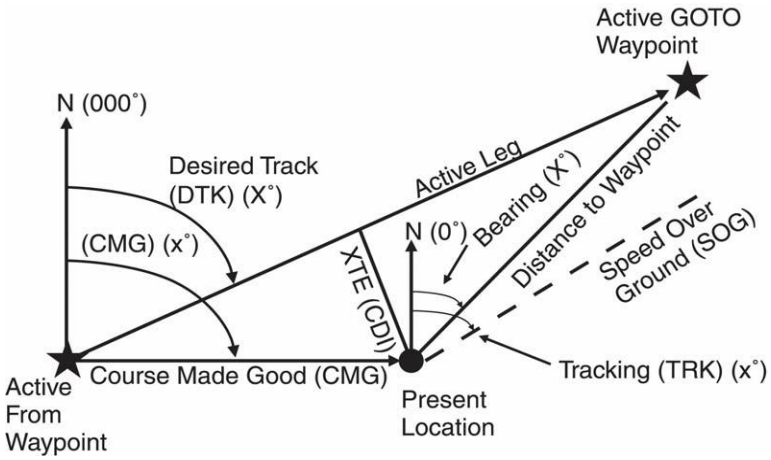

Fig.3. GPS Navigation Terminology

The basis of the GPS is a constellation of satellites that are continuously orbiting the earth. These satellites, which are equipped with atomic clocks, transmit radio signals that contain their exact location, time, and other information. The radio signals from the satellites, which are monitored and corrected by control stations, are picked up by the GPS receiver. A GPS receiver needs only three satellites to plot a rough, 2D position, which will not be very accurate. Ideally, four or more satellites are needed to plot a 3D position, which is much more accurate.

E. REGULATED POWER SUPPLY

Almost all electronic devices used in electronic circuits need a dc source of power to operate. The source of dc power is used to establish the dc operating points (Q-points) for the passive and active electronic devices incorporated in the system. The dc power supply is typically connected to each and every stage in an electronic system. It means that the single requirement, common to all phases of electronics is needed for supplying dc power.

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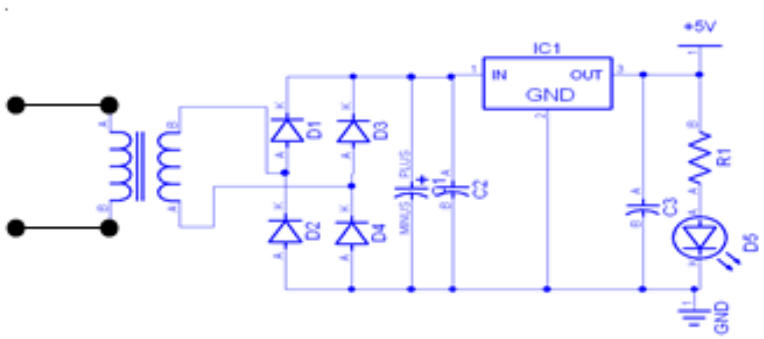

Fig.4. Regulated power supply circuit

For portable low-power systems batteries may be used, but their operating period is limited. Thus for long time operation frequent recharging or replacement of batteries become much costlier and complicated. More frequently, however, electronic equipment is energized by a power supply, derived from the standard industrial or domestic ac supply by transformation, rectification, and filtering.(The combination of a transformer, a rectifier and a filter constitutes an ordinary dc power supply, also called an unregulated power supply).

F.APR33A3 VOICE RECOGNISER

The APR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The APR33A series C2.0 is specially designed for simple key trigger through which an user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switching. It is suitable in a simple interface or needs to limit the length of single message, e.g. toys, leave messaging system, answering machine etc.

Fig.5. Pin configuration for APR33a3

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G..RFM75

RFM75 is a GFSK transceiver operating in the world wide ISM frequency band at 2400-2483.5 MHz. Burst mode transmission and up to 2Mbps air data rate make them suitable for applications requiring ultra-low power consumption. The embedded packet processing engines enable their full operation with a very simple MCU as a radio system. Auto re-transmission and auto acknowledge give reliable link without any MCU interference. RFM75 operates in TDD mode, either as a transmitter or as a receiver. The RF channel frequency determines the center of the channel used by RFM75.

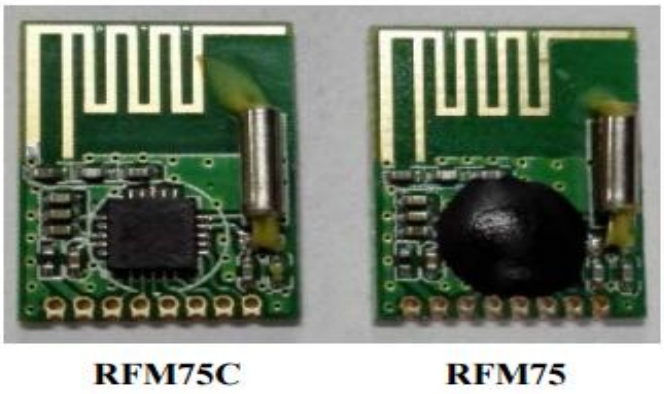

Fig.6. RFM Transmitter & Receiver

4. SIMULATION RESULT

Circuit Diagram

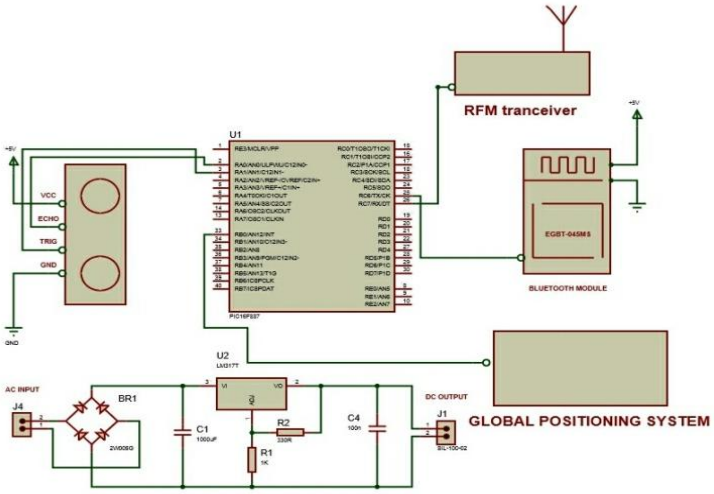

Fig.7. Circuit diagram of Blind Unit

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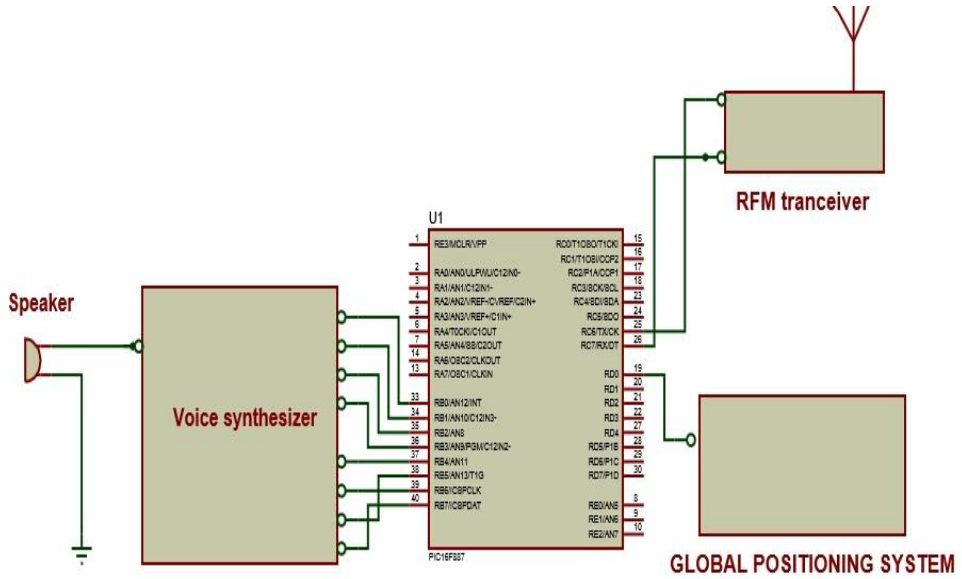

Fig.8. Circuit diagram of Bus Unit

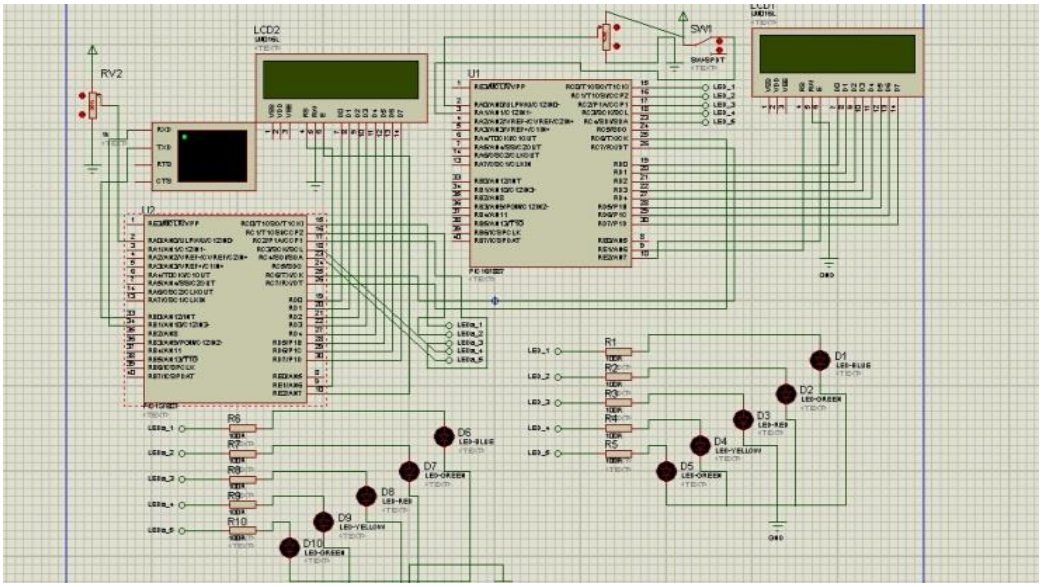

Fig.9. Simulation Circuit

In this Simulation circuit, There exists two units namely, bus unit and blind unit connected to a PIC Micro-controller.

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Bus Input

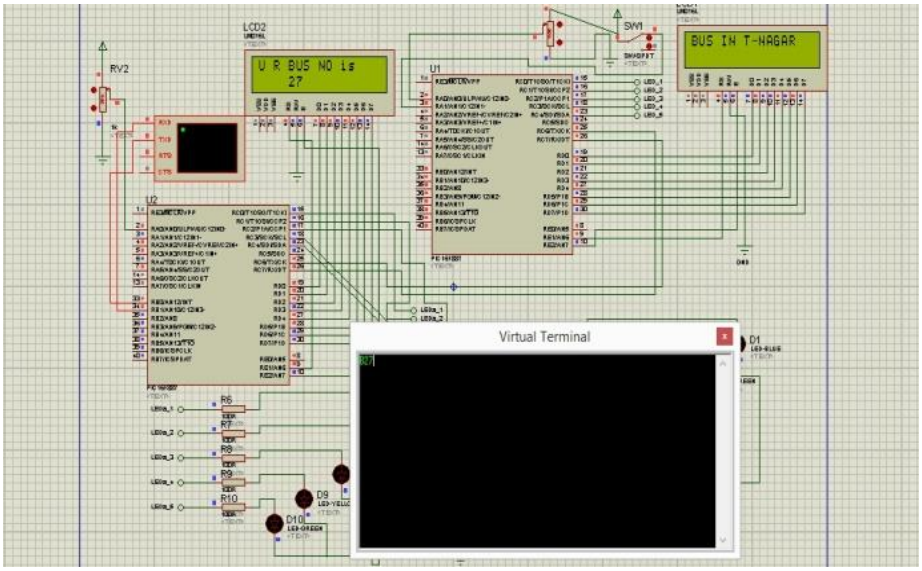

Fig.10. Bus Input

The visually impaired person sends their queries regarding the bus location through his handy device.

SIMULATION OUTPUT

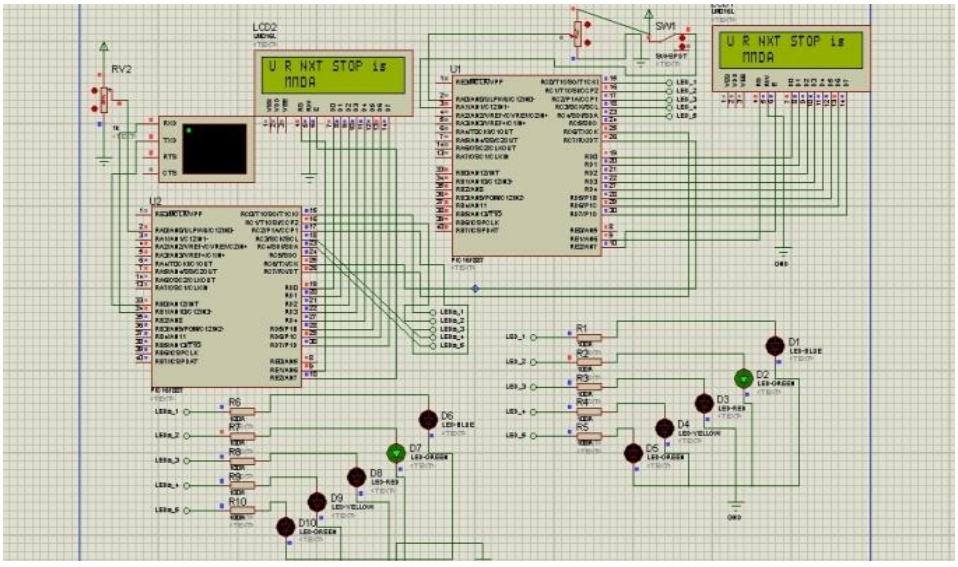

Fig.11. Simulation Output

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The input given to the handy device is transferred to the bus unit via RFM transceiver. And GPS provides the exact location of the bus to the Visually Impaired Person.

5. HARDWARE RESULT:

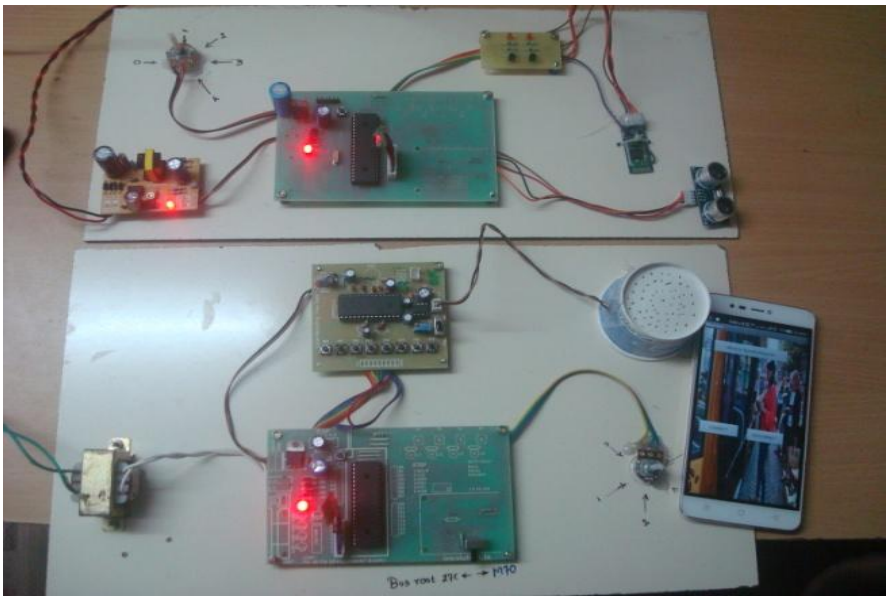

Fig.12. Hardware setup

CONCLUSION:

With this proposed scheme, a visually impaired person can successfully travel from his/her location to his desired destination using this system. Global Positioning System (GPS) module helps in tracking the person at each and every time instance. The passenger bus alert system does not only restrict to Blind people, it can also be used by the normal people for getting the bus details to reach their destination. Hence, this tends to be a very convenient device which to be used by blind people. Hence it becomes a modern mode of support the visually impaired persons throughout the world

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