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GPS bus tracking and announcement system

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Abstract: The GPS bus tracking and announcement system is an informative system present in both in the bus and the bus stop. It is designed for passengers travelling in the bus to know the details about the next coming stop and who are waiting in stop, regarding the nearing bus. This ensures that the passengers get enough time to get ready and also they won't miss the right station. The existing system provides such facilities using the RFID technology which can be utilized only in the trains. But to implement it in the bus it would be more complicated and tedious as there are more stops, when compared to train. The proposed system overcomes these problems with a simple and effective architecture with GPS technology. The system consists of a GPS device that continuously monitors the location of the moving bus and using the GPS data from the device the voice data and a display of stop details is generated to be presented in the bus and subsequent display in the stop about the nearing bus.

Key words: GPS, RFID

1. Introduction

Public transport is an important mode of transport for all common people. Most people make use of public transportation because of its affordable charges. People waste time in transportation for the bus arrival. Also, people should have the knowledge where the bus is located currently and the minimum time taken to reach bus station. The facilities given to people by transport system are most important. The motivation of this project is to provide a good travelling experience to the passengers, who were unaware of the route in a new city or incapable of knowing the stop(such as blind, sleeping people) using a GPS(Global Positioning System) based announcement system with a loud speaker and display unit. The information of the bus status can be provided to the passengers via a display unit in the bus stops, so they can get ready to catch the bus. GPS is a fast-developing, technologically sophisticated area, with budding uses in various industries. The best common civilian applications to date have been land, and marine navigation, fleet tracking and geographical. The currently available announcement system is for the trains which uses radio frequency identification tags. Though it is an effective and useful system, it cannot be employed in bus transport because of the presence of many stops. The GPS Bus Tracking and Announcement System will provide a more accurate and simple system, which can be installed in all buses. The passengers can travel throughout the journey without any fear of losing their stops, thus improving the

travelling experience with an informative system. Also the passengers who are waiting for a bus to come can be ready to get aboard the bus. Thus the development of this system will be very useful in the public bus transport.

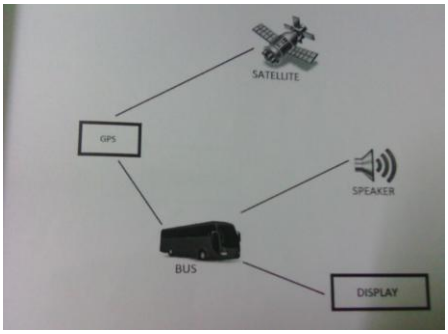
The importance of the project implementation is the accurate monitoring of movement and location of bus is possible as it can inform the Passengers before the stop arrives. The GPS module used in this system provides very accurate readings, so that the development of an effective transport system is possible. The message must be passed to display unit in bus when the movement of the bus reaches near the stop. This functionality can both display the stop and alert with the audio unit.It has less hardware design complexities and provides a cost effective design that can be implemented in real time, thus making the public more aware during their travel.

2.Proposed system

Architecture:

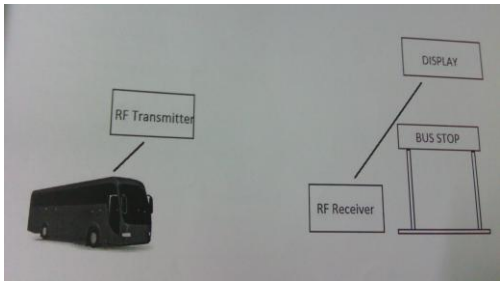
The major components present in the system are a GPS module, an Arduino microcontroller, Sound IC and loud speaker, LCD displays, RF Transmitter, Receiver.

There are two modules present in the system, which are an On-bus unit and Off-bus unit. The first module will be setup inside the bus, so it will be in movement and continuously tracks the location of the bus using the GPS and the arduino will take care of the coordinates in terms of latitude and longitude and eventually sending signals to the LCD, sound and RF units.



1. On-bus unit

The Off-bus unit will be present in the bus stop, so it is a stationary unit will be waiting for RF transmitter to send the frequency. If the range of RF transmitter comes closer to that of the receiver, then it will display the coming of the bus.



2. Off-bus unit

Hardware requirement:

Arduino board:

The Arduino UNO ,a microcontroller board based on the Atmega328 having 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It was connected with a computer via USB cable or power AC-DC adaptor to work

LCD display:

The Liquid Crystal Display used is a HD44780 which is 16x2. Which means it can display 16 characters and there are 2 such lines. Each character is displayed in 5x7 pixel matrix..

GPS module:

The sky lab SKG13C is a fully GPS device section that features great sensitivity, ultralow power and lesser form factor. The GPS signal is given to the antenna input of section, and fully sequential information with location, speed and time information is showed at the sequential interface with NMEA rules or custom rules. This is centered on the great performance features of the MediaTek 3329 single-chip architectures, its -165Bm tracing sensitivity spreads arranging coverage into area

like urban canyons and dense foliage atmosphere where the GPS was not thinkable previously.

A serial port is used to feed the signals from the GPS then can pass through the arduino for processing

RF transmitter and encoder:

The WS 02 Tx–ASK is a 4 pin, ASK hybrid sending section. WS 02 Tx–ASK is intended by the Saw Resonator, with an operative less price, minimum scope, and modest-to-use for manipulative.

The HT12E Encoders are a sequence of CMOS LSIs for remote governing system uses. They are skillful of encoding data which entails of N address bits and 12N information bits. Each address/information input can be fixed to one of the two logic state.

RF reciever and encoder:

The WS 02 Rx–ASK is a 8 pin, ASK hybrid receiver section. An effective less price result for using at 315/433.92 MHz. The circuit outline of WS 02 Tx –ASK is L/C

The HT12D Decoder is organized to offer 8 address bits and 4 information bits, and HT12F is used to decode 12 bits of address information

Software needed:

Arduino APIs platform:

Active development of the Arduino software is hosted by github. The open source Arduino atmosphere create it simple to write code and upload it to the i/o board it runs on windows, mac os x, and linux. The atmosphere is written in java and centered on handling avrgcc and different open source software.

Embedded C Language:

Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection.And then we can write a program for Arduino board by using C language execute it and then output will be displayed.

Performance Requirements:

For GPS module, the power supply must be a regulated power and the given voltage VCC would be 3.0V to 4.2V range, current is not less than 100mA.In circumstance of a power disaster on pin VCC, real time clock and holdup RAM are provided through pin V_BCKP. This facilitates the SKG13C GPS receiver to improve from power disaster with either a hot start or a warm start.

The SKG13C GPS receiver is planned for supporting the active antenna or passive antenna linked with pin RF_IN. the increase active antenna would be not extra than 25dB. The maximum noise figure would be not extra than 1.5dB and the output impedance is at 50 Ohm.

For the RF Transmitter and Receiver module, the power supply can be 3 to 12V and the output power is 4 to 16dBm. The encoder HT12E and decoder HT12D IC has an operating voltage of 2.4V~12V.

Safety Requirements:

For the proper working of the system, the GPS module must operate in the power voltage given in the specification. Stress beyond the limits might affect equipment reliability or basis stable destruction to the equipment. The section is electrostatic sensitive equipment (ESD) and can be broken with ESD or spike voltage. Though it has made in ESD safety circuitry at digital I/O, please carry with safe to escape stable malfunction or performance degradation.

Similarly the radio frequency transmitter and receiver should also operate in the specified voltage range.

Security Requirements:

Embedded equipment is most different from normal PCs. They are static purpose equipment planned explicitly to accomplish a specific work. As a product, normal PC safety results would not solve the experiments of embedded equipment. In detail, given the specific nature of embedded scheme, PC safety answers would not even run on maximum embedded equipment. The tasks for embedded equipment safety contains,

Dangerous functionality: Embedded equipment governs transportation infrastructure, the efficacy grids, communication schemes and several other abilities current people trusts upon. Disturbance of these abilities might have catastrophic moments.

Replication: Once planned and made, embedded equipment are mass formed. There may be thousands to millions of alike equipment. If a hacker is capable to form a effective attack against one of these equipment, the attack can be fake across all equipment.

Deployed outside of enterprise security perimeter: The GPS system is mobile or arranged in the field. As a effect, these equipment might be straightly linked to any other system to track a specified bus.

Module Description:

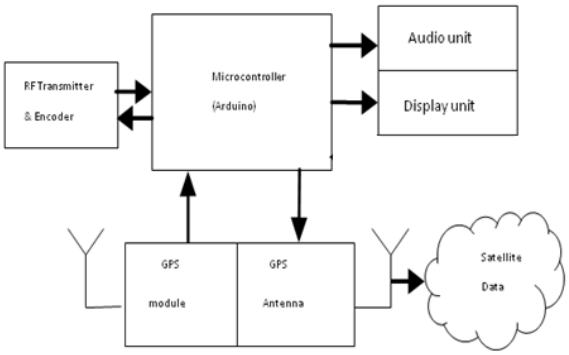
The GPS based bus tracking and announcement system consists of the two modules, On-Bus unit and Off-Bus unit

- **ON-BUS UNIT:**

In the first module, Arduino board will be programmed on serial port connected with the GPS receiver using the Arduino APIs and it will be soldered to loud speaker and its IC, the LCD display, RF Transmitter, RF encoder and a battery with the unit.

The latitudes and longitudes of around 3 stops will be programmed in the microcontroller, so if the GPS receiver comes near the stop it will send message to loud speaker and the on board display to announce the passenger. The actual GPS coordinates of all the position within the city bus facility zone are previously kept in the memory of the bus component. When GPS section scans the satellite and identifies the real time coordinates formerly this coordinates are relating with pre stored coordinates of the respective bus stop.

The sound recording IC is used to program the voice data to announce through a speaker. The RF transmitter with its decoder will sends signals to the receiver.



3. Arduino board

- **OFF-BUS UNIT***:*

In this second module, AVR Microcontroller will be programmed with ISP software and boot loader is installed via the AVR Dude. The AVR microcontroller will be soldered with a LCD display, RF Decoder, a battery and a RF receiver.

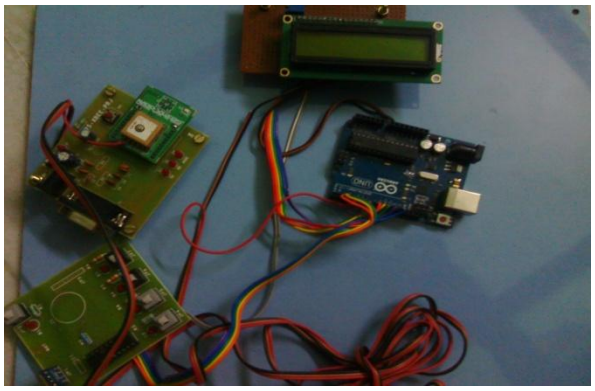
When the encoded RF frequencies from the transmitter, reaches the RF receiver it decodes the frequency and sends message to the LCD Display unit that the bus will be arriving soon.

Operation Methodology:

The GPS Bus Tracking and Announcement System provides precise and accurate system to be installed in the bus transport which encompasses two units, which is to be installed in the bus itself and bus stop respectively.

On-Bus Unit:

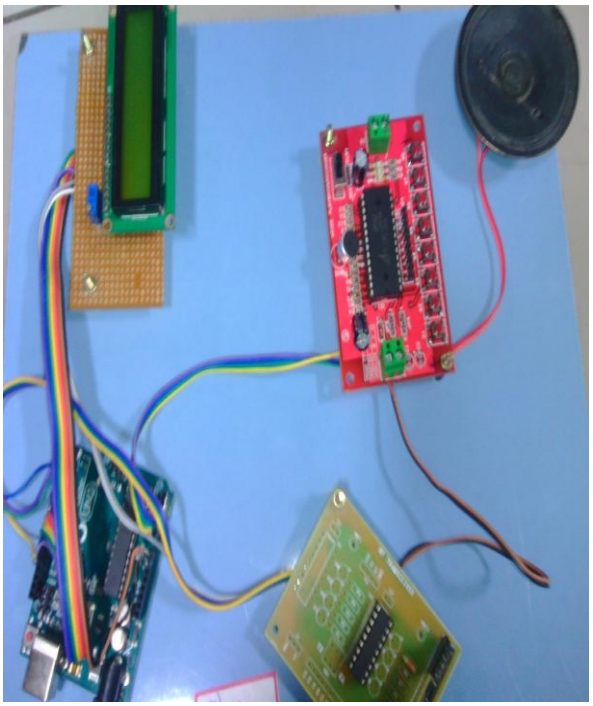
The On-Bus Unit are connected as below when the GPS device is turned on then it gives the position value in the LCD display which are programmed in Arduino and the controller compares the voice data which are stored in the IC and gives the vice output to the particular position.



A transmitter is used to transmit the output signals to the off-bus unit which has 8 pins data, A potentiometer is used to control the flow of fluctuations.

Off-Bus Unit:

The Off-Bus Unit contains controller where the LCD are mounted in it, A receiver is present to receive the output data transmitted from the On-Bus Unit at the same time whole circuit is connected to Controller.



Quick Start Instructions

Step by Step Example:

1. With the power button in the standby position, connect the GPS to the arduino outlet using the serial cord provided.
2. Push in the power button to turn on the GPS. It will perform some start up tests, by displaying "vehicle tracking" and then recall the coordinates after the warm start up.
3. Reset the arduino and check whether the GPS receives the signals which will be displayed in the LCD display present in the On-bus unit. If no data is displayed, then check whether the Antenna connected properly
4. Connect the Arduino output to the RF transmitter with a input cable to see that the output is indeed a 3.3 V.
5. Check the Tx and Rx which is blinking in response to the input
6. Now connect the sound recording IC to the speaker and play the pre- recorded voice inputs by pressing the appropriate buttons present in it.
7. If new voice inputs have to be given, then change the wire in the IC to the other data and start recording by pressing the buttons, for each low and high inputs. Thus the voice has been recording. It can be played by following step 6.
8. The LCD display that is connected to the microcontroller and checked for the proper working by giving sample inputs.
9. The LEDs present in the RF receiver should be all in High (On), so it can ensure the working of the module and it should turn off, and the display should show the variations in the signals from the receiver.
10. Now the setup is ready to be installed and to be used as the announcement and tracking system as specified in the requirements.

11. The On-bus unit is installed in the bus and all the latitude and longitude values of stops are noted and programmed. It is now ready.

Now move the bus and observe the changes in the display and sound unit. if a particular stop is reached it will be announced and displayed and simultaneously the "stop name" is displayed in the bus stop.

Conclusion:

The GPS centred transport scheme and public data scheme is having packed of options and extensive possibility in different type of areas mainly allied to day to day life. We have developed an efficient system for announcement and tracking of the bus, which has many applications in the bus transport. The GPS technology will become trivial in near future and can be used for even more applications.

The efficient and effective management of bus transport can be greatly facilitated with the use of tracking technology and benefits the public. Indeed bus-tracking technology using off the self equipment has become increasingly more affordable.

Future Scope:

The developed GPS bus tracking and announcement scheme is devising more opportunities and extensive scoping different type of areas mainly allied to day to day life.

It could be extended for the automatic opening and closing of the bus door, so it will be reduce the risk of travelling in foot board and dangerous journey.

Also the developed system can be altered to predict the estimated arrival time calculation, so it will be even more increase the travelling experience of the passenger.

For quicker reaction times for disaster reprieve, such as receiving efficient automobiles, ambulance to re-establish simple infrastructure abilities in severely pretentious region this scheme could be used.

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