International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-4,April 2016
ISSN: 2395-3470
www.ijseas.com

Smart Bus Tracker

K.V. Nagalakshmi[1] , Monisha M[2], Puja Kaul[2], Sumaya Bhat[2], Revathy C Kattepur[2], Sneha Sara Jacob[3]

Associate Professor, Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru, Karnataka, India[1]

Students, Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru, Karnataka, India[2]

Assistant Professor, Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru, Karnataka, India[3]

Abstract

In the paper we discuss the implementation of a Smart Bus Tracker which aims at reducing waiting time for the right bus for the commuters. The tracker will be able to dynamically indicate the location of the bus. Additionally, this also aims at providing a special application for the blind that can give audio announcement to the blind passenger upon request for the location of a particular bus. The existing GPS based systems are not only costly but also consume enormous power. The RFID Smart Bus System provides an excellent alternative to the existing GPS based systems. The exiting bus stops and certain hotspots along roadside are fitted with the RFID tags and the buses are provided with RFID reader. Besides, both the bus and the bus stop have a GSM module which helps in communication between the two. This way, whenever the bus passes by the bus station or a hotspot, an announcement about the location will be made in the bus. A message will be sent to all those who have registered for alerts about the bus location. Also at the bus stop, am announcement will be made regarding the particular bus whose number is entered by the blind in the kiosk. The system contains a transmitter module emulating the bus which has an ARM microcontroller that communicates with the RFID reader and detects the tag, thus identifying the bus stop. The transmitter communicates via GSM with the receiver module emulating the station.

Keywords: *Smart bus Tracker, FID, ARM microcontroller, RFID reader.*

1. Introduction

In most of our cities the commonly used mode of public transportation is roadways this is quite evident by the manifold increase in number of vehicles on our roads, especially buses. Indisputably buses run by local governments provide convenient. Most affordable and reasonably safe commute considering the fact that a majority of working women feel that city buses provide them the best mode of transportation.

1.1 Need for RFID

RFID tags and readers are inexpensive. Vital information regarding the current location of the desired bus to be boarded will be informed to the commuter at the bus station.

Features of RFID

- No interference from the presence of multiple tags
- Continuous dynamic updating in the central bus station
- Audio announcement of the current location at both the bus and the bus station
- In RFID system, an item is tagged with a tiny silicon chip and an antenna; the chip plus antenna (together called a “tag”) can then be scanned by mobile or stationary readers, using radio waves (RF). The chip can be encoded with a unique identifier, allowing tagged items to be individually identified by a reader (the “ID”)

Radio-Frequency Identification (RFID) Working

RFID systems consist of three components in two combinations; a transceiver (transmitter/receiver) and antenna are usually combined as an RFID reader. A transponder (transmitter/responder) and antenna are combined to make an RFID tag.

Based on operating frequency, three frequency ranges are generally distinguished for RFID systems, low intermediate (medium) and high.

Advantages of using RFID

- RFID tags can be combined with sensors
- Reduces inventory control and provisioning costs
- Easy to operate
- Low power consumption
- Real time authentication system
- Vehicle parking information through SMS

Limitations

While GPS uses radio waves to transmit data, it does so using, the global positioning system of 24 satellites, as opposed to specialized scanners here on the ground. Radio waves sent out from this system of satellites transmit their time and orbital data to the receivers can then triangulate their position relative to the satellites, and thus on the Earth's surface.

GPS thus is best suited for tracking anywhere in the world-but because of the sheer distance of the satellites, the signal is weaker, and is easier to jam, or even just not get a signal. Civilian models particularly are not as accurate in certain situation as one might like, for instance at the bottom of a canyon or indoors.

Emergency homing beacons, car trackers or navigational devices tend to be the most well-known civilian uses, which don't require accuracy within a few inches, but happen on a large scale, where on other infrastructure such as RFID or radio towers are set up. GPS is, by definition, global, and so the sort tracking it is best at are on the scales of tens or hundreds of miles.

2. Proposed Solution

Vital information regarding the current location of the desired bus to the boarded will be informed to the commuter at the bus station.

2.1 RFID Reader Requirements

A reader has a field (a distance range) within which it can query via radio waves for whatever tags maybe present. The reader follows a protocol that intended to enable it to avoid duplicate reads but capture all tags present within its range. . The EPC and ISO have standardized the first two layers of the communication protocol stack between the readers and the tags. These two layers include the local wireless communication that occurs between a reader and the tags within its read field. The first layer standard is the physical, which describes the specific radio frequencies and the weather tags and reader are communicating in half or full duplex mode. The second layer, referred to as the data link layer, has been standardized on a spotted Aloha scheme.

Because the same application can be "plugged" into different readers for accessing the same tag, a common interface can provide:

1. Consistent application interface for RFID operations
   - Increased operation efficiency.
   - Reduce operation errors.
   - Reduce training costs.
2. Reduce software development and maintenance costs.

The RFID reader supports both TTL and USB interface. Each interface is software-selectable and only one host interface is active at a time. The host interface is selected based on the power-up default value and can be changed at run time using the host interface type system parameter.

2.2 Working of the transmitter

- Power supply is provided to the board which in turn powers up the Arm Microcontroller and its interfaces to it, such as the LCD Display. A Plus Module, GSM Modem, RF ID card reader
- The Modem when initialized sends a message to the Arm microcontroller.
- The LCD display, displays that the modem has been initialized and the "welcome" message follows.
- The RF ID card read by the reader.
- The message is transferred to the Arm microcontroller.

- The message is mapped to the database to extract the appropriate location name expected to be reached next.
- The location name will be displayed on the LCD display.
- And announced through the A Plus module.
- The audio announcement us made five times, assuming by then the predicted location is reached.
- At this point, the location name is communicated to the GSM Modem.
- The Modem communicates to the central server.
- And to the subscribers registered for the service.

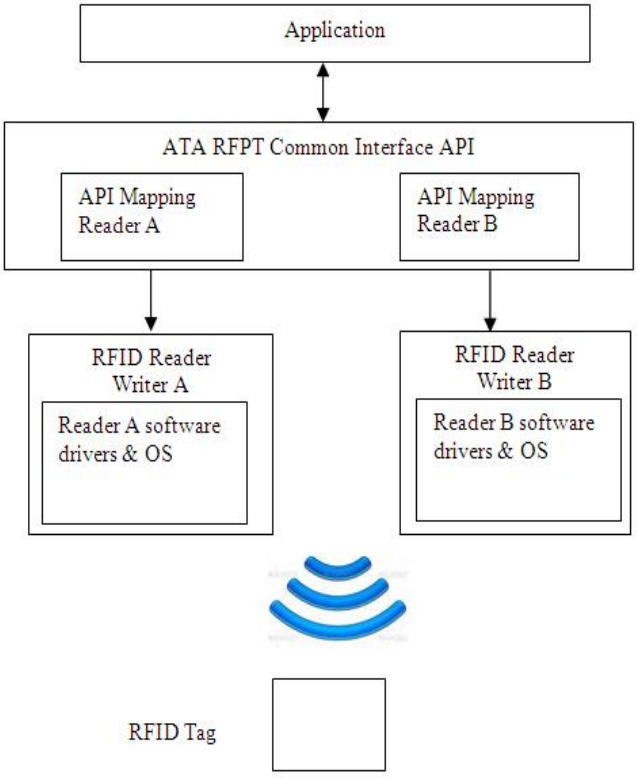

Fig. 1 Communication Protocol

2.3 Working of the receiver

- Power supply is provided to the board which in turn powers up the 8051 microcontroller and its interfaces to it, such as the LCD display, GSM modem.
- The modem when initialized sends a message to the 8051 microcontroller.
- The LCD display, displays that the modem has been initialized and Waiting for the bus stop update" message follows.
- Message is expected to be received at receiver GSM modem.
- This is sent to the PC through the serial port.
- The GUI application is accessed.
- The user is expected to enter the COM port to be accesses for the application.
- Failing to enter the correct port causes the application to wait till the correct port is selected.
- The user is also expected to enter the desired bus number.
- If the bus number entered is in appropriate, a message is displayed and an announcement (particularly for the blind) is made to indicate that the number entered is incorrect.
- Assuming the correct port is selected and the right bus number is entered, the message received is mapped again to a database and current location of the bus is deciphered.
- This information is displayed on a GUI and is also announced on the speakers for the needy.

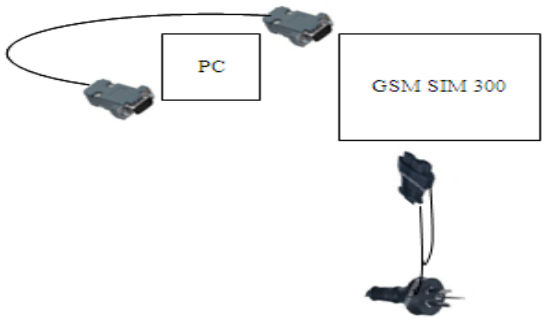

Fig. 2 Circuit diagram of Transmitter side

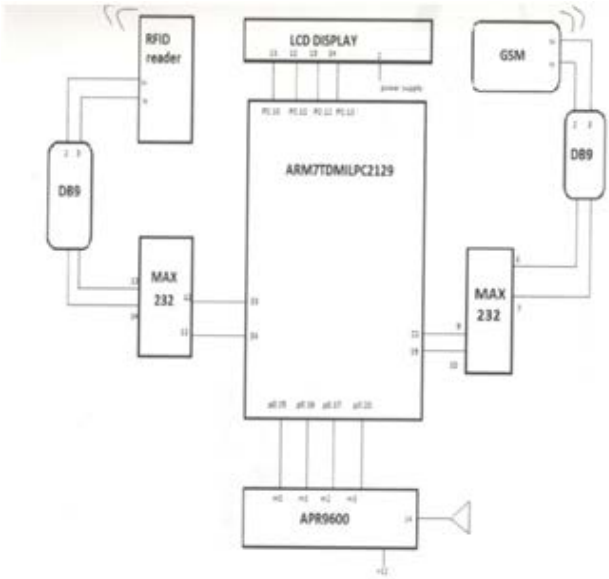

Fig. 3 Circuit diagram of Receiver side

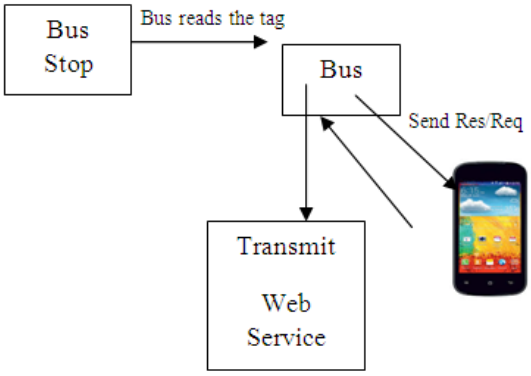

Fig. 4 Proposed solution

3. Applications

SMS alerts

As part of the implementation at the receiver, we have also included SMS alerts in our project. This will be an added advantage to the general public. The dynamic location of the bus can be known on the go provided the customer has subscribed for these SMS alerts. Whenever the RFID reader on the bus reads the tag implanted at certain location, the GSM module on the bus sends this information not only to the GSM module at the bus stop but also to the cell phones of all the commuters who have subscribed to SMS alert service. This helps the commuter to decide whether to wait at the bus stop or not thus saving time which is one of the main objectives of our project. In our project, we are emulating only one bus thus the SMS alerts contain just the information regarding the current location of the bus. We can very well, include other details such as the estimated arrival time of the bus etc.

An application for the blind

As an extended version of the above scenario, we have combined both display and audio announcement (especially for the blind) at the receiver. This has been implemented using visual C# application. This application includes a GUI which when invoked allows the blind to enter the bus number (whose location is to be found) using the numeric keypad on the kiosk (PC is our prototype)

4. Conclusion

It uses Reverse RFID technology which in all aspects is better than the existing technologies. A few years down the line, the limitations of RFID can be easily overcome using various technologies along with it like web API's, Zigbee, Xbee etc. The system reduces the cost considerably and provides the same service with more accuracy.

In conclusion, an earnest effect has been put forth to come up with an efficient bus tracking system using RFID to provide passengers a time saving system and hence minimizing their efforts. It is believed the system that has been developed has a vast potential for large scale practical application to cover a medium sized city.

4.1 Future Prospects

- Smart Card reader at the bus can be used to issue tickets.
- The SMS alert can be made smarter by providing a database of different buses that can take you to the desired location and compare their waiting period duration of journey and the routes expected to be taken.

- The central bus stand which is emulated by a PC in our project can be used as a prototype for building all the smart bus stops.

References

[1] Information for the RFID: www.rf-id.com.

[2] Vendor for GSM and Audio announcement module: www.nskelectronics.com

[3] NextBus, NextBus Homepage [Online].

[4] Vendor for ARM LPC2129: http//www.knowxindia.com/

[5] http//robokits.co.in