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DIGI BUSTICKET

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Abstract:

Wireless Sensor Networks is used to monitor physical and environmental conditions, originated from military and heavy industrial applications. Module is developed for bus transportation to utilize digital money for transaction. Each individual will have their own RFID tag which is known as Public Transportation Card (PTC). RFID reader is fitted at the entry door of the bus which reads the PTC of a passenger and allows him in, only if his card has a sufficient balance to travel. Using GPS the bus location is tracked and the current stop name is displayed on the RFID reader module. In the exit door, the same module is fitted inside the bus and the same process is repeated following this, the ticket cost is deducted from their PTC. These two modules interact with each other using ZIGBEE technology in which the first module sends the location where the passenger hired the bus to the second module and from that it calculates the distance and the money from the card is withdrawn. If the travelling charge exceeds the balance then the excess amount goes as negative balance in their card. This technology prevents man power and automatizes the ticket fare collection.

Index Terms—ZIGBEE, RFID (Tag and Reader), GPS antenna, LPC2148 Micro controller.

INTRODUCTION

n recent years, Wireless sensor networks is one of the most popular and active research areas in networking and communication field. The technology is composed with unlimited potential for multiple applications that are been implemented based on wireless sensor networks (WSNs). Application areas include environmental, military, telecommunication, transportation, entertainment, crisis management, health, retail services and smart homes. The wireless technology deployed for a particular sensor network depends on the type of application. Common wireless technologies include Infrared, Bluetooth, WiFi, WiMax, ZigBee etc. Our paper surveys about ZigBee technology as a Wireless Sensor Network with emphasis on its working with the RFID, Microcontroller and GPS. With the help of these technologies the following concept is implemented. Digibusticket is nothing but digital money transaction for bus ticket's fare. This idea is mainly developed to promote Digital India campaign where it is ensured that all public services are available online. This module is developed under the domain of wireless sensor technology which includes RFID and ZIGBEE technology. Though RFID technology has been evolving since decades in the form of identity card

validation and as a pass in the metro train, we are introducing a new form of RFID where it is used for the online money transaction. In metro trains, RFID tag is given as an exchange for the currencies while in our concept RFID tag is capable of holding digital money and transacting it. ZIGBEE technology is used for the intercommunication of two RFID modules to store the data of a tag in the database at entry side and to retrieve it at the exit side. The recharge of the card is made through the android application which will be created specifically.

RELATED WORKS

ZIGBEE TECHNOLOGY

Zigbee is considered as the most widely used standard transceiver in Wireless sensor Networks. ZigBee over IEEE 802.15.4 defines specifications for low data rate WPAN (LR-WPAN) to support low power monitoring and controlling devices. The ZigBee with unique features including low cost, easy implementation, reliable, low power, and high security is used for multiple purposes. This paper describes about a Zigbee wireless standard, IEEE 802.15.4specification, ZigBee, characteristics and the module which is implemented. As said before, the ZigBee based technology systems have become very popular because of its low cost and low power consumption.

Some of the characteristics of ZigBee include:

- Global operation in the 2.4GHz frequency band according to IEEE 802.15.4.
- Regional operation varies as 915 MHz and 868 MHz
- Frequency agile solution operating over 16 channels in the 2.4 GHz frequency.
- Devices incorporating zigbee have power saving mechanisms
- Applications are confirmed using discovery mechanisms.
- Paring Mechanism with full application confirmation.
- It is used in various fields like multiple star topology and inter-personal area network (PAN) communication

B. RFID TECHNOLOGY

Many organizations have started to implement a new developing technology known as Radio frequency identification in order to satisfy the needs of the organization. Radio frequency identification (RFID) is not a new technology because it has come into existence during the early 1900's and was utilized during World War II. It comprises of only few components in the Radio frequency identification. The RFID tag consists of an antenna, integrated circuit, and a reader that gathers information from the tag and a database system that is used to store the information gained through interrogating the RFID tag. From the application, the identification tag may be active or passive. Active tags in addition to the circuit and antenna, the tag have a battery which powers the circuit and allows the tag to send information that will be taken by a reader. Passive tags gather information and store power from the reader through the

use of a capacitor located in the circuit.This circuit then consumes the energy which has been collected to transmit information about the tag to the reader. Passive tags which are low cost are predominantly used form of identification tag. In the architectural design process it is important to decide the component; either active or passive tags must be used. While developing a RFID system, the architectural design is mandatory This system will be evaluated on the basis of how well it tracks objects. In the article of Jiann-Liang Chen, Ming-Chiao Chen, Chien-Wu Chen, and Yao-Chung Chang about architecture design and performance evaluation of RFID object tracking systems, they discussed the development of an RFID/IP gateway that uses the Object Naming Service (ONS) protocol to increase the efficiency of the performance of an RFID network (Chen, Chen et al. 2007). According to Solanas and Domingo-Ferrer, it is important to design a network that has the ability to scale in size and maintain data privacy (Solanas, Domingo-Ferrer et al. 2007). Therefore to test the scalability of private network, a quantitative analysis on a cell based network simulation was carried on and the results were accounted for different conditions usually three. Autonomous RFID systems have been developed to meet application requirements such as reading the tags from greater distance as possible (Jedermann, Behrens et al. 2006). Developing RFID technology to support data privacy and the utilization of secret-key, public-key, symmetric and asymmetric cryptographic algorithms to protect the data transmitted via the id tag during interrogation by the reader is critical to the protection and integrity of the system (Robshaw 2006). The deployment of RFID systems are also designed for unique situations are interoperable with other new technologies such as global positioning satellite technology.

C. GPS ANTENNA

Over the last five years Global Positioning Systems (GPS) principles and concepts have changed the style of field working. There are two principal reasons for using GPS in the field; the first one is navigation and the other is determining co-ordinates for points in the GIS.Different types of GPS available have different methods for using them.. These differences give accuracy ranging from several centimeters to tens of meters. The appropriate use of GPS for various expeditions and teams should not always be concerned with obtaining the most accurate sets with the most features if this is not appropriate for their studies. An informed decision cannot be made without a thorough understanding of all the aspects of GPS so this chapter describes as much relevant GPS information as possible. Some of the techniques will be too involved for smaller expeditions and expeditions should select the most practical and appropriate methodologies. Expeditions should not select expensive, time consuming and difficult to use navigation solutions if they are not required. Although there is always a push towards more accurate and precise methods, they should not be used if not required.

2.4.1 GPS and field navigation

Navigation is vital to the safety of any field expedition. When combined with the necessity of fixing a location's co-

ordinates for scientific research, the need for accurate, rapid and cost-effective navigation tools becomes paramount. Increasingly GPS receivers are becoming a standard – some would say essential – item of expedition equipment. Determining the co-ordinates of a point in the field can be achieved in a number of ways. The most common traditional approach involves triangulation with a map and magnetic compass. Triangulation is often very accurate but relies on accurate maps and navigable objects. The Ordnance Survey of Great Britain produces very reliable maps The result is that any triangulation achieved is relative to the map, which may in fact be quite inaccurate. Lines on navigation charts have accuracy on paper of ±1.5 mm. On a 1:10,000 chart that could be an error of 75 m. In addition, when drafting, the tools used may introduce additional errors. Triangulation is also time consuming and of limited use outside of areas of human influence i.e. those areas with manmade objects surveyed to an acceptable accuracy. Other methods have been employed to determine location but they are either difficult in the field or rely on expensive equipment, examples include sextants for astronomical positioning and various types of theodolites for astronomical triangulation. There has for some time been a move to establish Global Navigation Systems (GNS) that are quick, cost effective and reliable. GPS has been the most successful of these systems.

2.4.2 GPS functions

GPS use satellite data to calculate an accurate position on the earth. These calculations can relate the user's position to almost any map projection within mille-seconds. All GPS work in a similar manner but they often look very different and have different software. The most significant difference between GPS receivers is the number of satellites they can simultaneously communicate with. Most receivers are described as 12 channels meaning they can communicate with 12 satellites. Older models may be 8 or even 5 channels with more modern receivers capable of communicating with 14 – 20. Given the current (2005) makeup of the GPS satellite's constellation 12 channels is more than adequate.

2.4.3 How GPS works

GPS signal does not contain positional data. The calculated position based on range-finding triangulation is reported by the receiver on the ground. GPS positioning is deducted by measuring the time taken by a signal to reach a receiver. In the Global Positioning System, the satellite transmits a one's or a zero's in a complex string of digits that appears randomly. Actually this code is not random and it repeats every 266 days. The receiver knows that the part of the signal received from the satellite will matches exactly with a portion and it generated a set number of seconds ago. When the receiver signal has determined this time, the distance to the satellite can be calculated using simple trigonometry form where: Distance to the satellite = speed x (tr - tto) (where speed is c, the speed of light, in a vacuum (299792.5 x 10^3 ms-1). tto is the time at the origin and tr is the time at the receiver). The DoD maintains very accurate data on the satellites and their positions are known at the rate of high level of precision. A simple operation allows the distance satellite to be calculated accurately. If the distance to three satellites is founded then there is only one point of view at which the user was standing.

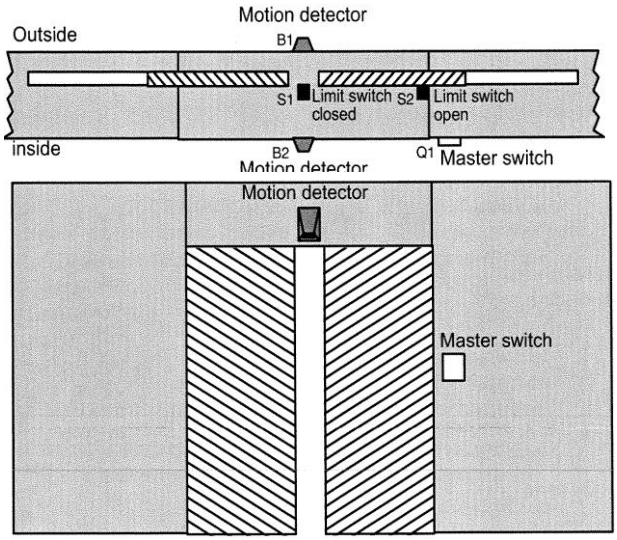
EXISTING SYSTEM

A. AUTOMATIC DOOR

The automatic door control systems can be find at the entrance of supermarkets, public buildings, banks, hospitals etc.

I. Requirements of an automatic door

- When a person goes near the door, it must open automatically.
- The door must remain opened until the doorway is cleared.
- When the doorway is cleared, the door must close automatically with a short delay of time.



The door is usually run by a motor and that is equipped with a slip coupling process. This prevents people from being squeezed in and injured. The master switch is used to connect the control system to the mains.

The Smart Bus System

The smart bus system (AVL - Automatic Vehicle Location Communication System) is a GPS (Global Positioning System) based management process and communication system.LTC first emerging AVL (sign post) technology in the mid-1990s. In 2008, the technology was significantly upgraded and updatedly moving from sign post technology to GPS based technology.

Features of the updated system include:

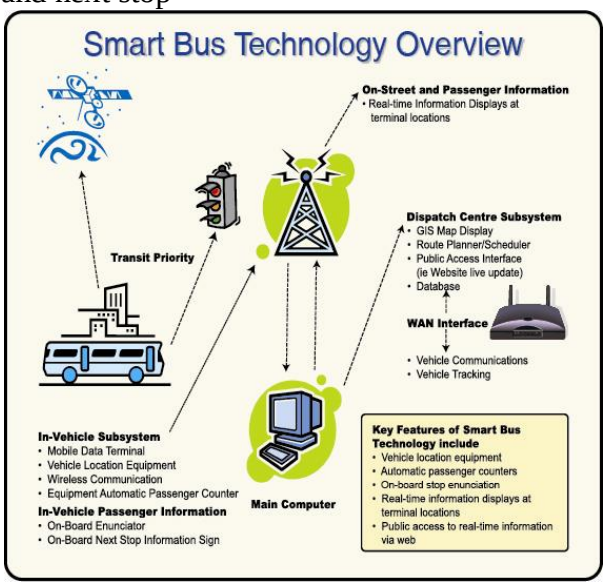
- Automatic "in-vehicle" visual displays system for finding the next stop locations
- Automatic "in-vehicle" audio announcements for the next stop locations
- Automatic external audio announcements for the route name, direction and destination of the area.
- Real time service information is featuring nowdays.
- Automatic on-street information signs with real time information for next buses (10 strategic locations)
- Interactive, telephone voice response (IVR) with real time information for next buses and travel planning
- Real time schedule information via LTC's website (WebWatch)
- Tracking of in-service buses along routes via GPS providing a more accurate tracking of bus locations
- Automatic passenger counters (currently on 80 of 192 buses and all new vehicles will be equipped with the counters) supporting better service planning
- Traffic signal priority allowing the bus (based on schedule adherence) to interface with the City's traffic light system

The Business Case for Smart Bus

The development of the smart bus system is consistent with the direction of LTC's in Long Term Growth Strategy and Business Plan. The $6.5 million cost of the system was fully funded by the provincial and federal governments.

Smart bus technology is critical to building an effective and efficient transit system. The technology supports improved customer service and service delivery through:

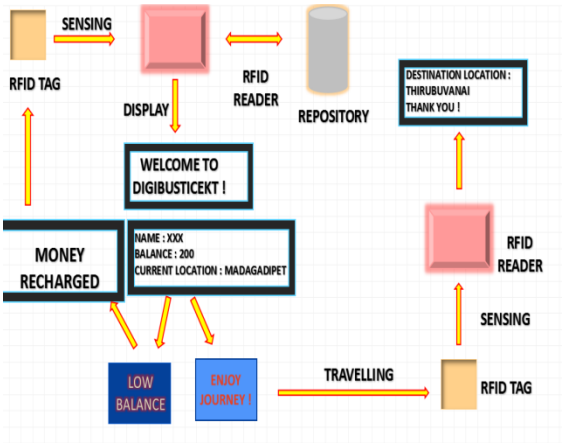
- Enhanced monitoring/management of "on-street service" – i.e. service issues, schedule performance etc.
- Supporting improved service to the customer
- Better (current and timely) service planning data – i.e. passenger loads and schedule performance etc.
- Use of traffic signal priority supporting improved system efficiency which is critical to London's
  Bus Rapid Transit strategy
- Customer access to real time service (schedule) information via IVR (accessed 0.4 million times per year), Web Watch (website accessed 5.2 million times per year)
- In-vehicle communication to passengers of route identification, direction and next stop



PROPOSED WORK

Digibusticket is nothing but digital money transaction for bus ticket's fare. This idea is mainly developed to promote Digital India campaign where it is ensured that all public services are available online. This module is developed under the domain of wireless sensor technology which includes RFID and ZIGBEE technology. Though RFID technology has been evolving since decades in the form of identity card validation and as a pass in the metro train, we are introducing a new form of RFID where it is used for the online money transaction. In metro trains, RFID tag is given as an exchange for the currencies while in our concept RFID tag is capable of holding digital money and transacting it. ZIGBEE technology is used for the intercommunication of two RFID modules to store the data of a tag in the database at entry side and to retrieve it at the exit side. The recharge of the card is made through the android application which will be created specifically.

PROPOSED SYSTEM ARCHITECTURE



SCREENSHOTS

RFID READER AT BOARDING SIDE

RFID READER DEBOARDING SIDE

OVERVIEW

CONCLUSION

Nowadays all services e.g., Ordering food, shopping, recharging, metro trains etc., are digitalized then why not Bus ticket fare collection. All aspects of our life are getting automated and digitalized in order to make India as developed country from developing country. This transformation in bus transportation also avoids issues in balance of payments between the conductor and the passenger, illegal boarding of bus which may cause accidents and ticketless travel. After implementing this concept we can promote digital money for bus fare instead of currencies. Hereby, manual work would be avoided since the payment for ticket fare is digitalized. This system also allows people to access advanced technologies that are not covered in existing system. Prevents footboard accidents. Manpower will be reduced. Even though the existing solution is available in metro trains, we need some person to collect the ticket fare for the opted stop and then to give the tag as a replacement, but in our concept the transaction is fully automated and only the digital money is used.

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