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Applications of Intelligent Transportation Systems using RFID Systems

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Abstract—Intelligent transport systems vary in technologies applied, from basic management systems such as car navigation; traffic signal control systems; container management systems; variable message signs; automatic number plate recognition or speed cameras to monitor applications, such as security CCTV systems; and to more advanced applications that integrate live data and feedback from a number of other sources, such a sparking guidance and information systems; weather information; bridge de-icing systems; and the like. Additionally, predictive techniques are being developed to allow advanced modelling and comparison with historical baseline data. Some of these technologies are described in the following sections.

Keywords— RFID,ITS,APTS,Vehicle Positioning,Public Transportation, IEEE,

INTRODUCTION

A system architecture for ITS is an "overall framework for ITS that shows the major ITS components and their Interconnections". A very important part of the system architecture is the identification and description of the Interfaces between major ITS components. These interfaces allow the major components of an overall intelligent Transportation system to communicate with one another and to work together. Many important ITS standards are written to make these interfaces consistent. An ITS system architecture provides a framework for planning, defining, deploying, and integrating Intelligent Transportation systems.

An architecture defines:

- The user services that ITS systems and applications are expected to perform.
- The entities where these functions exist.
- Information flows and data flows that connect functions and entities

This may sound a little complicated, but informally an ITS system architecture describes what ITS does (the user Services), where this happens (entities), and what information moves between these components (flows).User ServicesUser services describe the activities that ITS systems and applications perform or support. Typical user services include providing traveler information, managing traffic, electronically collecting tolls, helping drivers perform better (especially in emergency situations), responding to traffic incidents, managing public and private vehicle fleets, etc.

OBJECTIVE AND SCOPE

Over the last couple of years, there has been significant increase in the interest in ITS research. The main objective of Intelligent Transportation systems is to provide solution to the current drawbacks in transportation systems, and to provide a reliable bus service network which will attract more people to use the same, reduce air pollution by motivating people to use public transport system,, it provides a lot of advantages with a modification to the current infrastructure and systems.

Core Objectives of ITS

- To Provide Alternate Solution For Current System
- Overview Of Future Technological Requirement
- To Improve Traffic Safety
- To Relieve Traffic Congestion
- To Improve Transportation Efficiency
- To Reduce Air Pollution

PROJECTDESCRIPTION

In the proposed system the Passive RFID tags are fitted on the roofs busses used for public transportation and the RFID readers/receivers are placed on each and every bus stops with the micro-controller unit which has unique bus stop identification number stored on the non-volatile memory, these receivers which are placed in bus stops are interconnected through wired LAN network with the use of routers to connect different nodes to the server, The Microcontroller module on each bus stops also have a ethernet data transmitter which converts the serial information from the controller to ethernet packets using telnet application.

The bus identification number through passive RFID tag are sent to a centralized server with the help ethernet network, The bus route information and the bus running information is estimated and stored in a database server where it can be linked with internet or an SMS server (short messaging service) Whenever the user needs the information on a particular route bus, he/she can send a short message to the server requesting the Particular Bus status or he/she can request the Busses running through that particular route or he/she can access the database information using internet. The distance between each bus stops are mapped in the server and the accordingly the distance and expected time is also sent along with the user request.

Block Diagram of the System:

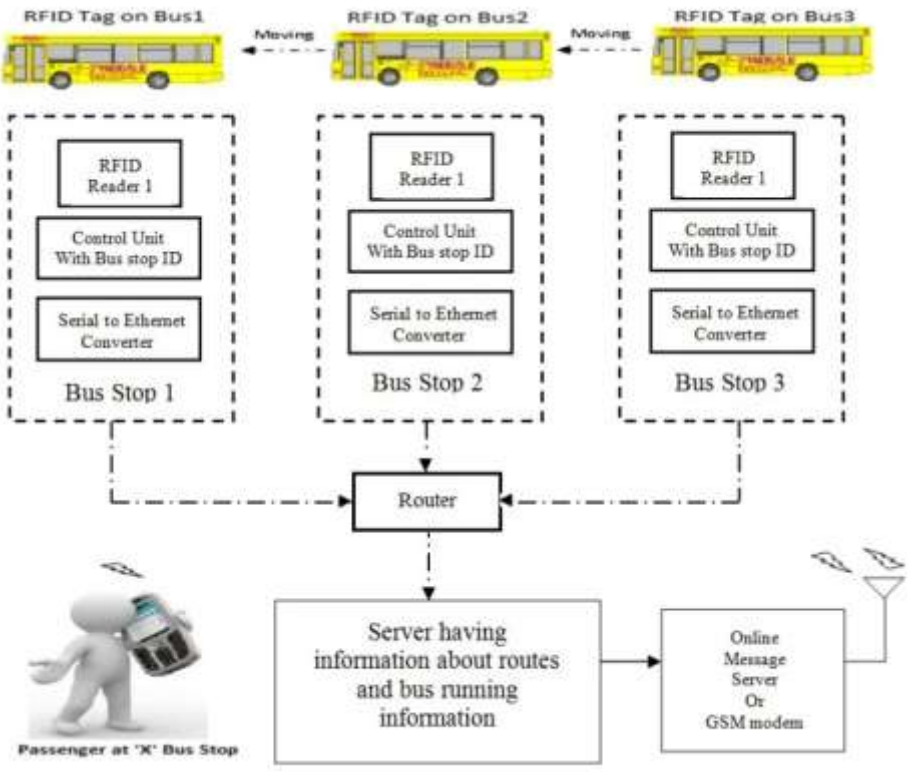

Figure 1: Block Diagram

MICROCONTROLLER

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory,programmable and input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as

well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

The Microcontroller used in the proposed system is general purpose PIC18F43K22 controller with two serial UART (Universal Asynchronous Receiver and Transmitter).The UART1 is connected to the RFID reader or receiver and the UART2 is connected to the Stellaris Serial to Ethernet converter. The Bus stop ID is saved in the NVM (Non Volatile Memory) of controller. The controller sends the bus stop ID on UART2 along with the received Tag information. The overall UART1 and UART2 communication is carried out at 115200 baud rate.

RFID TRANSPONDERS

A standard RFID based system consists of transponders (which are also referred to as tags), readers, radio frequency modules, antennas and host computers. The tags are small electronic devices that reflect and modify received continuous radio wave signals which are retrieved over the air by the reader. It is hard to sub divided the types of tags or systems into one or two categories. Tags can vary from being read only to read/write, and they can also be either active or passive. The RFID systems may vary with their transmission methods or the frequency they operate on. Whatever their configuration, their suitability for application to ITS is undeniable. The Reader may be fixed or movable. Fixed readers create a zone for the interrogation with the Tags fixed in the objects. This zone is tightly controlled within the range of the reader. The fixed reader identifies the movement of the Tags into and out of the zone. Mobile readers are handheld devices or fixed in moving vehicles.

The interrogation between the Tag and the Reader is done in different ways depending on the radio frequency band used by the Tag. Some Tags use near field in which Low and High frequency radio waves are used. In this condition, the tag and the Reader will be closely coupled through radio frequencies. The Tag is capable of modulating the signals of the reader by changing its electrical load.

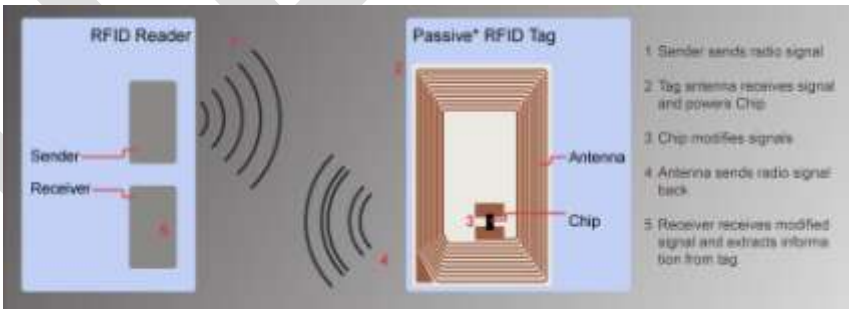

Figure 2: RFID Transponders

Through changing the load between the lower and higher loads, the Tag can produce a change which can be detected by the reader. The Tags using UHF and Higher frequencies require a different approach. Here the Tag is more than one radio length away from the reader and back scatters the signal.

SOFTWARE

MPLAB Integrated Development Environment (IDE) is a free, integrated toolset for the development of embedded applications employing Microchip's PIC8bit, 16bit and 32bit microcontrollers. MPLAB IDE tool is easy to use and includes software components for fast application development and debugging. PICPgm is a PC-Software to program PIC microcontrollers using external programmer hardware connected to the PC. It allows

- Flashing program a HEX file into a PIC microcontroller
- Read the content of a PIC microcontroller and save it to a HEX file
- Erase a PIC microcontroller
- Check if a PIC microcontroller is empty, i.e. not programmed (Blank Check)

CONCLUSION

The results of this literature review have shown that many benefits are obtained through deployments of ITS systems in an existing transportation system. Based on documented experience locally and throughout the country, ITS deployments in current scenario have the potential to offer major benefits. Even though the Intelligent Transportation system (ITS) provides the major advantages over the existing Transportation system, the implementation of such system depends on the Government, and proper awareness of the applications in the ITS system should be made available to the common public, And finally there is a need for further development of this system to make more convenient and more cost effective.

FUTURE SCOPE

The proposed work is mainly focused on receiving the data from the remote wireless nodes and finding alternative solution to conventional wiring harness. There are different possibilities for extension of the research work and they listed as under:

- In our work only three control nodes are provided we can deploy several control nodes with mesh networking to cover maximum functionality.
- We have used 8 MHz Microcontrollers. In future we can construct low power microcontrollers for wireless sensors.
- GUI for Data log facility on PC can serve purpose of Diagnostic and ease for the fault finding.
- More expertise require for packaging and installation of wireless modules.

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