Intelligent Transportation System Using RFID assisted Vehicle Positioning System

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***Abstract*—** The Project aims at developing a systematic approach to deploy Radio Frequency identification system (RFID) for Vehicle Positioning in Public transportation system. One of the best ways to encourage people to use the public transit is to make it more attractive by improving the services offered. There are many methods available to make public transit service more attractive, one of which is to provide bus arrival time information at the bus stops through user request.

The use of Intelligent Transportation Systems (ITS) for better operations and management of traffic is a promising management solution. The process of applying ITS technologies in the Indian transport conditions is in a beginning stage. There are many ITS applications that will be useful in the Indian scenario and one of the important applications among them will be Advanced Public Transportation Systems (APTS). A reliable bus service network will attract more people to use the same, thereby reducing congestion on road.

Index Terms*—*RFID, ITS, APTS, Vehicle Positioning, Public Transportation.

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I. INTRODUCTION

Intelligent Transportation Systems (ITS) is the application of computer, electronics, and communication technologies and management strategies in an integrated manner to provide traveler information to increase the efficiency of the surface transportation systems. These systems involve vehicles, drivers, passengers, road operators, and managers all interacting with each other and the environment, and linking with the complex infrastructure systems to improve the safety and capacity of road systems.

ITS improves transportation safety and mobility and enhances global connectivity by means of productivity improvements achieved through the integration of advanced communications technologies into the transportation infrastructure and in vehicles. Intelligent transportation systems encompass a broad range of wireless and wire line communication based information and electronics technologies to better manage traffic and maximize the utilization of the existing transportation infrastructure. It improves driving experience, safety and capacity of road systems, reduces risks in transportation, relieves traffic congestion, improves transportation efficiency and reduces pollution.

II. OBJECTIVES

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 improve traffic safety
- to relieve traffic congestion
- to improve transportation efficiency
- to reduce air pollution

ITS have resulted in an increase in the amount of interest in Dynamic Traffic Assignment (DTA) in order to effectively manage the vehicles in real time and to predict the state of the network in the future. One of the main components of Intelligent Transportation Systems is Advanced Traveler Information Systems (ATIS) whose main aim is to provide descriptive or prescriptive information to the users to improve their travel experience. Descriptive information updates the user about the general state of the network or of certain important links in the network. Examples of descriptive information are the travel times on important corridors or the location. On the other hand, prescriptive information provides specific recommendations to users (e.g. by prescribing the routes to follow).

III. SYSTEM DESCRIPTION

In the proposed system Fig.1, the Passive RFID tags are fitted on the roofs of busses used for public transportation and RFID readers which 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 micro-controller unit on the bus stops also have a serial to Ethernet converter which converts the serial information of controller to Ethernet packets using telnet application. The bus identification number

 ISSN: 2321-8169
846 – 849

through passive RFID tag are sent to a centralized server with the help of RFID receivers, The routes information and the bus running information is stored in a database 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.

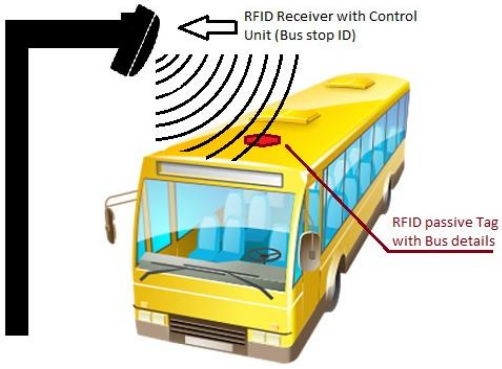

Fig.1 Architectural View of Proposed System

IV. SYSTEM BLOCK DIAGRAM

The block diagram of the proposed system is given in Fig.2, the block describes about the components and modules used in the systems.

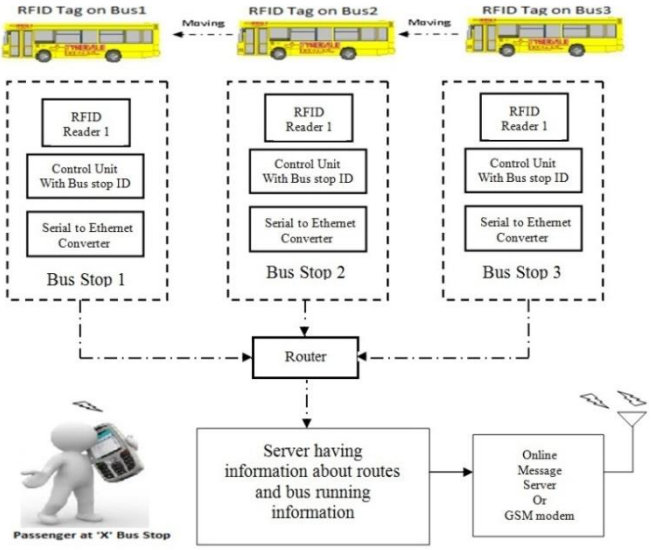

Fig.2. System Block Diagram

The major blocks are,

- RFID Receivers and Passive Tags (125khz)
- Microcontroller (with two UART)
- Stellaris Serial to Ethernet converter
- Router
- GSM modem
- Database server

A. RFID Receivers and Passive Tags

Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by and read at short ranges (a few meters) via magnetic fields and then act as a passive transponder to emit microwaves. RFID tags contain at least two parts: an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, collecting DC power from the incident reader signal, and other specialized functions; and an antenna for receiving and transmitting the signal. The tag information is stored in a non-volatile memory. The RFID tag includes either a chip-wired logic or a programmed or programmable data processor for processing the transmission and sensor data

B. Microcontroller

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.

C. Stellaris Serial to Ethernet Converter

The Stellaris Serial-to-Ethernet Reference Design Kit (RDK-S2E) offers a complete, open-tool, and ready-to-implement solution designed to add web connectivity to any serial device. Serial-to-Ethernet converter available with a highly integrated Cortex-M3 microcontroller with 50 MHz of performance and ample single-cycle, on-chip Flash and SRAM memory for efficient network traffic handling.

The serial-to-Ethernet module has the following features:

- 10/100 Mbit Ethernet port
- IP configuration with static IP address or DHCP
- Telnet server for access to serial port
- UDP responder for device discover

D. Router

A router is a device that forwards data's between computer networks, creating an overlay internetwork. A router is connected to two or more data lines from different networks. When a data packet comes in one of the lines, the router reads the address information in the packet to determine its ultimate destination. Then, using information in its routing table , it directs the packet to the next network on its journey, the router used in the proposed systems was of BSNL 4 channel router.

E. GSM Modem

The GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate to Personal computer or a microcontroller. This type of modem operates through AT commands, this command activates the modem for different

applications, and this modem is used as a SMS gateway for server. The SMS is routed through this modem to the user who sends the request and transmits the information from database to the requested user. This GSM modem is a highly flexible plug and play dual band SIM300 GSM modem for direct and easy integration to RS232 applications.

F. Database Server

The Database server in the proposed system consist of a information related to the bus routes and saves the bus running information from the network nodes, which continuously updates the bus running positions. This database server is also equipped with the GSM modem as SMS gateway and internet connection for accessing the information stored in it.

V. SOFTWARE USED

There are different software's used in the proposed systems, which are as follows,

- MPLAB IDE for Microcontroller
- PICpgm for Flashing Microcontroller
- Tera-term telnet simulator

A. MPLAB IDE

MPLAB Integrated Development Environment (IDE) is a free, integrated toolset for the development of embedded applications employing Microchip's PIC 8bit,16bit and 32bit and dsPIC microcontrollers. MPLAB IDE runs as a 32-bit application on MS Windows®, is easy to use and includes a host of free software components for fast application development and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software and hardware development tools. Moving between tools is a snap, and upgrading from the free software simulator to hardware debug and programming tools is done in a flash because MPLAB IDE has the same user interface for all tools.

B. PICpgm

PICPgm is a Computer Open source-Software to program for PIC microcontrollers using external hardware programmer connected to the PC and the target Microcontroller. This programmer is capable of Writing, Reading and Locking the control bits of microcontroller as security feature.
It allows to:

- 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)

The PICPgm Development Programmer Software is Freeware. It is available with a Graphical User Interface (GUI) and a Command Line interface.

C. Tera-term Telnet Simulator

Tera-term is an open-source, terminal emulator program refer screen shot given in Fig.3, It emulates different types of computer terminals. This application is used to receive the Serial information from various serial to Ethernet converter which sends the information through specific IP address to database, this software is installed in the database system and the telnet mode has to be enabled with proper port numbers as configured in the serial to Ethernet converter module. This information from the tera term can be saved into the data base and can be retrieved whenever required.

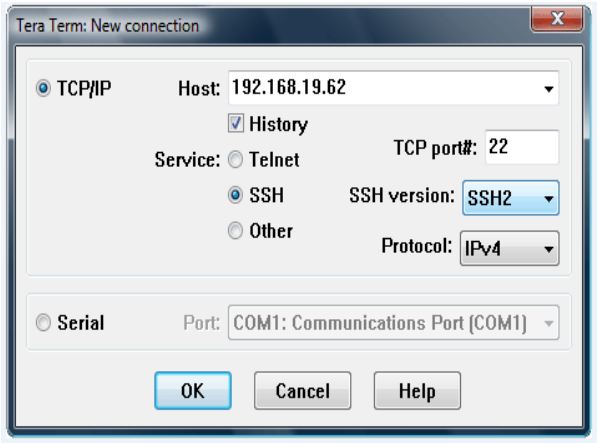

Fig.3 Tera-term emulator

VI. CONCLUSION

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.

ACKNOWLEDGMENT

I am thankful to my seminar guide & P.G. co-ordinator in E&TC Engineering Department for her constant encouragement and guidance. I am also thankful to Principle of Institute and Head of E&TC Engineering Department for their valuable support. I take this opportunity to excess my deep sense of gratitude towards those, who have helped us in various ways, for preparing my seminar. At the last but not least, I am thankful to my parents who had encouraged and inspired me with their blessing.

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