INTELLIGENT PUBLIC TRANSIT SYSTEM USING RFID AND ZIGBEE

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Abstract: The paper proposes a system which focuses on enhancing the usability and productivity of existing bus transportation system in Indian cities. The technology has a role to play for completion of the goal by means of providing an effective solution by establishing a wireless communication network in the city. The paper introduces a framework as an improvement to the existing city bus public transport system in India - Arrival Time Prediction of bus in real time and approximate Seat Availability in the bus. ZigBee and GSM/GPRS Technologies can be utilized to establish a wireless network among Buses, Bus Stops and Central Bus Stand in order to create this interconnection. The paper also suggests modifications in the design of currently used Digital Ticketing Machine to implement the feature of conveying the seat availability. ZigBee modules are used for short-range communication and Long-range communication is established using GSM messaging. The improvements in the system are expected to encourage more and more people to use public transport in order to overcome the problem of traffic and excessive fuel consumption.

Keywords: GPRS, GSM, Microcontroller.

I. INTRODUCTION

Current bus services are congested, unreliable, untimely and uncoordinated in India. The ownership and operation of most public transport services have significantly reduced its productivity. India’s cities desperately necessitate improved and trustworthy public transport service. The public transport needs to scale the productivity with increasing population and its needs, the improvement in infrastructure must be assisted with the smart approaches of Machine-to-Machine (M2M) communication. This social issue has encouraged us to come up with an idea for the betterment.

This proposal best describes a low cost and frugal, yet practical solution for the concerned problem using ZigBee and GSM/GPRS as a communication medium. The usability of public transport can be enhanced by informing the real waiting time and occupancy/vacancy to the passengers.[3] So the main objective of this paper is to give a possible solution to implement the proposed changes in existing public transport system to enhance its usability and profitability.

It is possible to establish a wireless network between various components of public transport system e.g. buses, bus stops and central bus stand; by several means. Some of the Intelligent Transport Systems in several countries use short range communication technologies and 3G internet connectivity solutions.[5] The costs involved to setup and run the systems are high as well as reliability associated with TCP/IP connectivity is poor; which tends to increased complexity and reduced reliability of system algorithm.
The referred system can be modified for performance improvement and cost deduction from earlier ones.[6][7] The short distance connectivity between bus and bus stops can be established by means of Bluetooth, ZigBee or Wi-Fi technology. By considering parameters like cost, power consumption it is a wise decision to go with ZigBee technology; which facilitates low power consumption and low cost over others. Hence by using ZigBee technology and GSM services which will allow reliable point to point connectivity system can be developed.

II. HARDWARE SYSTEM

III. METHODOLOGY

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

GPRS:

GPRS (general packet radio service) is a packet-based data bearer service for wireless communication services that is delivered as a network overlay for GSM, CDMA and TDMA (ANSI-I36) networks. GPRS applies a packet radio principle to transfer user data packets in an efficient way between GSM mobile stations and external packet data networks. Packet switching is where data is split into packets that are transmitted separately and then reassembled at the receiving end. GPRS supports the world's leading packet-based Internet communication protocols, Internet protocol (IP) and X.25, a protocol that is used mainly in Europe. GPRS enables any existing IP or X.25 application to operate over a GSM cellular connection. Cellular networks with GPRS capabilities are wireless extensions of the Internet and X.25 networks.
ZIGBEE:

Zigbee modules feature a UART interface, which allows any microcontroller or microprocessor to immediately use the services of the Zigbee protocol. All a Zigbee hardware designer has to do in this case is ensure that the host’s serial port logic levels are compatible with the XBee’s 2.8- to 3.4-V logic levels. The logic level conversion can be performed using either a standard RS-232 IC or logic level translators such as the 74LVTH125 when the host is directly connected to the XBee UART. The XBee RF Modules interface to a host device through a logic-level asynchronous Serial port. Through its serial port, the module can communicate with any logic and voltage Compatible UART; or through a level translator to any serial device.

Data is presented to the XBee module through its DIN pin, and it must be in the asynchronous serial format, which consists of a start bit, 8 data bits, and a stop bit. Because the input data goes directly into the input of a UART within the XBee module, no bit inversions are necessary within the asynchronous serial data stream. All of the required timing and parity checking is automatically taken care of by the XBee’s UART.

RFID:

Radio Frequency Identification (RFID) is a silicon chip-based transponder that communicates via radio waves. Radio Frequency Identification is a technology which uses tags as a component in an integrated supply chain solution set that will evolve over the next several years. RFID tags contain a chip which holds an electronic product code (EPC) number that points to additional data detailing the contents of the package. Readers identify the EPC numbers at a distance, without line-of-sight scanning or involving physical contact. Middleware can perform initial filtering on data from the readers. Applications are evolving to comply with shipping products to automatically processing transactions based on RFID technology RFID Reader Module, are also called as interrogators. They convert radio waves returned from the RFID tag into a form that can be passed on to Controllers, which can make use of it. RFID tags and readers have to be tuned to the same frequency in order to Communicate. RFID systems use many different frequencies, but the most common and widely used & supported by our Reader is 125 KHz.
Tags are classified into two types based on operating power supply fed to it.

1. Active Tags
2. Passive Tags

**Active Tags:** These tags have integrated batteries for powering the chip. Active Tags are powered by batteries and either have to be recharged, have their batteries replaced or be disposed of when the batteries fail.

**Passive Tags:** Passive tags are the tags that do not have batteries and have indefinite life expectancies.

**IV. CONCLUSION**

The developed system is more reliable the public transit, more will be its usability. The key areas of project development were ticketing machine with primitive features was made to ensure accurate vacancy information. The second one is the critical operations for the autonomous monitoring require GUI and centrally managed system. We were successfully able to meet this requirement by developing the backend using algorithms and MATLAB programming. The third one is setting up a coordinated small-distance and long distance wireless communication network: The team worked on different types of communication networks and established interchange of information. The specially developed data formats were used for it.

**V. REFERENCES**

[1] “Intelligent Transport Systems In India” by European Business and Technology Centre(EBTC), A Report – 2012


