ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 11, November 2019

Public Bus Alert Display Using Lora and IOT - A Review

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ABSTRACT: Public transportation system plays a major role in every aspect of life. It has a greater impact on economic development of the country. Tracking, monitoring, scheduling, alert services are the major challenges faced by this system. Currently, major services of this system are manually operated which are approximate and ease of access is denied to the people. This project aims in automating the services of the system that can provide the real time tracking experience of the public transport buses. The buses will be having LoRa Module within them and LoRa Module will be placed in every bus stops. GPS is used for getting the location of the buses. Users will be getting the bus tracking details as notifications in Large Display Unit placed in every Bus Station through IoT The processed data is sent to the cloud which serves as the interface between the user display unit and the system.

KEYWORDS: GSM SIM900, ARDUINO UNO, Stolen Vehicle, Congestion Control, LORA, IOT.

I. INTRODUCTION

The Internet of Things (IoT) is the network of system that enable objects to interchange data with the production using physical object implanted with electronics, software, sensors and connectivity. Smarter cities are based on smarter infrastructure. India is the second top settled Country in the World and is a firm rising budget[1]. It is facing very bad road congestion difficulties in its cities. Organization development is slow as compared to the growth in number of vehicles, due to space and cost constraints. Intelligent management of traffic flows can reduce the negative impact of congestion. In current existences, wireless networks are broadly used in the road transport as they provide more cost effective options. Radio Frequency Identification (RFID) is a radio centred communication method originally developed for identifying airplanes in the World War II ("friend-or-foe" system)[2]. The technique is already used also in transportation (e.g. cargo logistics), but is still considered as new technology in the field of safety-related applications. The RFID System consists of reader and tags. Both reader and tags are equipped for safety-related applications. The RFID system consists of reader and tags. Every reader and tags are furnished with antenna. An RFID tag reader uses antennas to communicate with the RFID reader. Data is transferred between a tag and a reader via low-power radio waves. RFID readers
are devices that convert radio waves from RFID tags into a form that can be delivered to the processing software. Global System for Mobile Communications (GSM) is the second-generation digital cellular mobile network. GSM is a cellular network, which means that cell phones link to it by penetrating for cells in the instant locality. There are five different cell sizes in a GSM network—macro, micro, Pico, fem to and umbrella cells. GSM networks activate in a number of various carrier frequency ranges (disconnected into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with maximum 2G GSM networks operating in the 900 MHz or 1800 MHz bands.

The whole paper is divided into 5 parts. Sections II describes about the literature survey. Section III discusses about the current problems that exist in making way to the vehicles. It also talks of how the proposed model will overcome the difficulties faced in developing Countries as well as developed countries. Section IV gives the implementation details of the proposed model. Section V describes experimental setup of the proposed model. Section VI presents the conclusion and enhancement of this work.

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II. LITERATURE SURVEY

Z. Wei, Y. Song, H. Liu, Y. Sheng, X. Wang, "Smartphones have been widely integrated with GPS receiver, which may provide accurate location information of vehicles without cost increase. Traditionally, LBS applications obtain vehicle locations then using the Hypertext Transfer Protocol (HTTP) protocol uploaded to central servers with a fixed frequency. In this paper, we exploit an intelligent strategy of GPS sensing and transmitting. Explicitly, we implemented a platform to collect real-time GPS data from vehicles. A common Android Smartphone serves as a GPS sensor in a vehicle. Client Application software is designed to generate GPS location updates with adaptive timestamps once it executed. In the final comparison, MQTT push technology is introduced into GPS transmission in order to effectively reduce mobile traffic.

Y. Chen, T. Kunz, One of the challenges faced by today's Internet of Things (IoT) is to efficiently support machine-to-machine communication, given that the remote sensors and the gateway devices are connected through low bandwidth, unreliable, or intermittent wireless communication links. In this paper, we quantitatively compare the performance of IoT protocols, namely MQTT (Message Queuing Telemetry Transport), CoAP (Constrained Application Protocol), DDS (Data Distribution Service) and a custom UDP-based protocol in a medical setting. The performance of the protocols was evaluated using a network emulator, allowing us to emulate a low bandwidth, high system latency, and high packet loss wireless access network. This paper reports the observed performance of the protocols and arrives at the conclusion that although DDS results in higher bandwidth usage than MQTT, its superior performance with regard to data latency and reliability makes it an attractive choice for medical IoT applications and beyond.

K. Tanaka, K. Naito, This paper demonstrates a new unconscious sensing system for bus location. Our system is a new type of application based on participatory sensing systems. However, it can perform sensing operation without users' operation. Therefore, we can employ the mechanism to realize practical application such as bus location systems. Our sensing system consists of a beacon device, a smartphone application, and a cloud service. The beacon device is installed on a bus to activate the smartphone application. The smartphone application can upload a bus location to the cloud service when the smartphone application detects the beacon device. The cloud service manages the bus location and distributes them for smartphone applications. The demonstration shows a prototype system for a bus location system based on the new participatory sensing mechanism.

J. Gong, M. Liu, S. Zhang, " Advanced traveler information systems (ATIS) are one component of intelligent transportation systems (ITS), and a major component of ATIS is travel time information. Global positioning system-based automatic vehicle location (AVL) systems have been adopted by many transit agencies for tracking their vehicles and predicting travel time in real time. It is a very important subject to improve the precision and reliability of the prediction model which can attract additional ridership, reduce passengers' anxieties and waiting times at bus stop, and increase their satisfaction. Furthermore, it can promote the development of city public transportation. This paper presents an improved approach to predict the public bus arrival time based on historical and real-time GPS data. After analyzing the components of bus arrival time systematically, the bus arrival time and dwell time at previous stops are chosen as the main input variables of the prediction model. At first, the algorithm of data interpolation and processing is designed to get the real-time GPS data as the input variables of the prediction models. Secondly, the statistical model is obtained based on the historical data of average running time of each link and dwelling time of each stop at given time-of-day and day-ofweek, respectively. Thirdly, a hybrid dynamic prediction model is proposed to predict the bus arrival time. Finally, Actual GPS data from bus route 244 located in Shenyang, CHINA are used as a test bed. The index of Mean Absolute Percentage Error (MAPE) is used to evaluate the three models. The results show that the improved model outperforms the historical data based model in terms of prediction accuracy ystem for a bus location system based on the new participatory sensing mechanism.

D. J. Gong, M. Liu, S. Zhang, Advanced traveler information systems (ATIS) are one component of intelligent transportation systems (ITS), and a major component of ATIS is travel time information. Global positioning system-based automatic vehicle location (AVL) systems have been adopted by many transit agencies for tracking their vehicles and predicting travel time in real time. It is a very important subject to improve the precision and reliability of

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the prediction model which can attract additional ridership, reduce passengers' anxieties and waiting times at bus stop, and increase their satisfaction. Furthermore, it can promote the development of city public transportation. This paper presents an improved approach to predict the public bus arrival time based on historical and real-time GPS data. After analyzing the components of bus arrival time systematically, the bus arrival time and dwell time at previous stops are chosen as the main input variables of the prediction model. At first, the algorithm of data interpolation and processing is designed to get the real-time GPS data as the input variables of the prediction models. Secondly, the statistical model is obtained based on the historical data of average running time of each link and dwelling time of each stop at given time-of-day and day-ofweek, respectively. Thirdly, a hybrid dynamic prediction model is proposed to predict the bus arrival time. Finally, Actual GPS data from bus route 244 located in Shenyang, CHINA are used as a test bed. The index of Mean Absolute Percentage Error (MAPE) is used to evaluate the three models. The results show that the improved model outperforms the historical data based model in terms of prediction accuracy.

L. Singla, P. Bhatia, In this fast life, everyone is in hurry to reach their destinations. In this case, waiting for the buses is not reliable. People who rely on the public transport their major concern is to know the real-time location of the bus for which they are waiting for and the time it will take to reach their bus stop. This information helps people in making better traveling decisions. This paper gives the major challenges in the public transport system and discusses various approaches to intelligently manage it. A current position of the bus is acquired by integrating GPS device on the bus and coordinates of the bus are sent by either GPRS service provided by GSM networks or SMS or RFID. GPS device is enabled on the tracking device and this information is sent to a centralized control unit or directly at the bus stops using RF receivers. This system is further integrated with the historical average speeds of each segment. This is done to improve the accuracy by including the factors like a volume of traffic, crossings in each segment, day and time of day. People can track information using LEDs at bus stops, SMS, web application or Android application. GPS coordinates of the bus when sent to the centralized server where various arrival time estimation algorithms are applied using historical speed patterns.

Foisal Mahedi Hasan et al The paper-based public transport ticketing system, prevailing in the mega city Dhaka (Bangladesh), introduces severe malfunction in the system, a malicious argument among public, corruption and most of all traffic jam. This paper actually suggests a much more public friendly, automated system of ticketing as well as the credit transaction with the use of RFID based tickets. The total system mainly acts to bring out the consistency among various bus agencies that will conclude in uniform access of passengers in daily rides through an automated server being updated every single time the passengers travel by carrying the RFID based tickets.

R. Hamon, P. Borgnat, P. Flandrin, C. Robardet, Dynamic graphs are commonly used for describing networks with a time evolution. A method has been proposed to transform these graphs into a collection of signals indexed by vertices. This approach is here further explored in a number of different directions. First, the importance of a good indexing of a graph is stressed, and a solution is proposed using a node labeling algorithm which follows the structure of the graph. Second, a spectral analysis of identified signals is performed to compute features linked to graph properties such as regularity or structure in communities. Finally, these features can be tracked over time to evidence the structure evolution of the graph. As a case study, the approach is applied to a dynamic graph based on a dataset of trips made using the bike sharing system Vlov in use in Lyon, France. This is shown to offer specific insights on behaviors of bike users over time in two districts of the city.

B. Danila, Y. Yu, J. K. Marsh, K. Bassler We present a heuristic algorithm for the optimization of transport on complex networks. Previously proposed network transport optimization algorithms aim at avoiding or reducing link overload. Our algorithm balances traffic on a network by minimizing the maximum node betweenness with as little path lengthening as possible, thus being useful in cases when networks are jamming due to node congestion. By using the resulting routing, a network can sustain significantly higher traffic without jamming than in the case of shortest path routing.

R. Hua-Ling, This paper investigates the problem of estimation of time-dependent passenger origin-destination (OD) matrices in congested transit networks where real-time updated passenger counts and prior OD matrices are available.

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Vol. 8, Issue 11, November 2019

A bilevel programming model is proposed for the dynamic estimation of passenger OD matrix. The upper level minimizes the sum of error measurements in dynamic passenger counts and time-dependent OD matrices, and the lower level is a new schedule-based dynamic transit assignment model that can determine simultaneously the dynamic average travel costs and route choices of passengers in congested transit networks. The lower-level problem can be formulated as a variational inequality problem. A heuristic solution algorithm is adapted for solving the proposed bilevel programming model. Finally, a numerical example is used to illustrate the applications of the proposed model and solution algorithm.

P. Verma, J.S.Bhatia, GPS is one of the technologies that are used in a huge number of applications today. One of the applications is tracking your vehicle and keeps regular monitoring on them. This tracking system can inform you the location and route traveled by a vehicle, and that information can be observed from any other remote location. It also includes the web application that provides you the exact location of a target. This system enables us to track the target in any weather conditions. This system uses GPS and GSM technologies. The paper includes the hardware part which comprises of GPS, GSM, Atmega microcontroller MAX 232, 16x2 LCD and software part is used for interfacing all the required modules and a web application are also developed at the client side. The main objective is to design a system that can be easily installed and to provide the platform for further enhancement.

Congestion on roads lead vehicle to move slow in a traffic, which increases time to travel. In [4],green wave system was defined , which was used to allow go-ahead clearance to the ambulance vehicle by turning all the red lights to green on the lane of emergency vehicle by providing comprehensive green wave system. A 'green wave' is the synchronization of the green phase of traffic signals. A green wave system, a vehicle passing through a green signal will continue receive green signals as it travels down. The green wave system will also track a stolen vehicle when it passes through a traffic light. The advantage with this system is that GPS inside the vehicle does not require additional power. The drawback of this system is that, when the green wave is disturbed, it causes traffic problem that can be exacerbated by the synchronization. In[5] determines that Currently we have video traffic surveillance and monitoring system which involves a manual analysis of data by the traffic management team to determine the traffic light duration in every of the intersection. It will transfer the same information to the nearby police officers to take therequired action.

III. PROPOSED MODEL

Under normal condition, the traffic control system has a problem i.e. when the traffic lane waits until the green light, time duration settings is almost similar and static. A-road was always crowded with vehicles and go-ahead time is short. Hence all the vehicles are not able likely to pass through the lane in the defined time. But sub lane has few vehicles and go-ahead time is relatively long. Emergency vehicles are not considered such as fire engines and ambulance [7]. The problems of typical traffic light controller are heavy traffic jam with increasing number of vehicles, No traffic but still people need to wait. The above problem can be avoided by implementing the smart traffic control system at the traffic signal junctions. The following are the list of components used in the experiments such as RFID tag, RFID Reader, ARDUINO UNO, GSM SIM900 Module.

A. RFID (Radio Frequency Identification)

There are two types of tags, active and passive tags. Active tags have an on-board battery and periodically transmit its ID signal. Passive tags are cheaper and small because it has no internal battery; hence the tag uses the power from the RFID reader. RFID tags contain at least two parts: an combined circuit for processing and storing information, modifying and demodulating a radio frequency(RF) signal, gathering DC power from the instance reader signal, and added dedicated functions; and an antenna for accepting and transmitting the signal. The tag data is deposited in a dynamic memory. Fig 3.1 shows the RFID reader. RFID offers advantages over physical schemes or usage of bar codes. The tag can be read when the tag is delivered near a reader, even if it is covered by the object or not visible.

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Fig 1 RFID READER

RFID range depends on antenna, frequency, tag orientation, efficiency and transmitting power. RFID ranges from few centimetres to hundred meters. RFID reader uses frequency 125 KHz with the range of 10 to 15cm.

B. ARDUINO UNO

Arduino is the first open source microcontroller based kit for constructing digital hardware devices and interactive objects that can intellect and govern the physical world. The board is based on computer hardware and Software Company. The Arduino platform offer an integrated development environment (IDE) created on the various project, for encoding the microcontrollers. The Arduino IDE has support for C, C++ and Java programming languages. Fig 3.2 shows the arduino UNO microcontroller.

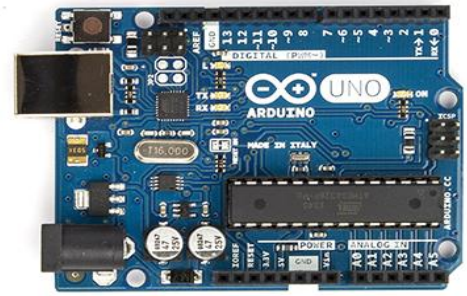

Fig 2 ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATMEGA328. The board contains 14 digital input/output pins (among that 6 pins can be used as PWM outputs), 6 analog inputs pins, 16 MHz quartz crystal, power jack ,USB connection, reset button and a ICSP header. It contains everything needed to support the microcontroller; merely attach it to a computer using battery or with USB cable or power with AC to DC adapter to start the working of the arduino board.

C. GSM SIM900a

GSM (Global System for Mobile communications) is an open, digital cellular technology used for communicating mobile expression and information facilities. GSM enables voice calls and supports data transfer speeds up to 9.6 kbps, jointly with the broadcast of SMS (Short Message Service).GSM modem is connected with the microcontroller. This allows the computer to interconnect the GSM modem above the mobile network. GSM networks operate in a different carrier frequency ranges operating in the 900 MHz or 1800 MHz bands. Fig 3.3 shows the GSM SIM900.

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Fig.3 GSM SIM900a

GSM modem provisions comprehensive AT command set for directing/receiving SMS messages. GSM is controlled by AT(Attention) commands for sending messages such as ATE0,AT+CMGF=1, AT+CSCS=”GSM”.GSM modem is highly flexible plug and play band GSM modem, interface to RS232. GSM support features such as voice, data, SMS, GPRS and integrated TCP/IP stack.

IV. CONCLUSION

IoT-based bus location system that can improve the service quality of the bus network and improve the efficiency of operation management. The proposed system provides the bus approach information by utilizing the location and delay information of the bus, and can be realized with low operational cost. The principle of LoRaWAN is used to collect the location information of all buses and deliver the calculated delay information to smart bus stops using electronic paper. A prototype system was implemented, a basic evaluation experiment was conducted and trial calculations for the cost were performed. The corresponding results confirmed that the system can be realized at a lower cost than the bus location system using 3G/LTE.

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