



Information of road events by using wireless sensor networks to vehicles

Amir Seyyedabbasi

Department of Computer Engineering, Faculty of Engineering and Natural Science, Istanbul Sabahattin Zaim University

Amir.seyyedabbasi@std.izu.edu.tr

Metin Koç

Department of Computer Engineering, Faculty of Engineering and Natural Science, Istanbul Sabahattin Zaim University

Metin.koc@std.izu.edu.tr

Farzad Kiani

Department of Computer Engineering, Faculty of Engineering and Natural Science, Istanbul Sabahattin Zaim University

Farzad.kiyani@gmail.com

Abstract: In recent decade's digital age and technology changing world rapidly, we spend the most of our time in traffic in metropolitan cities such as Istanbul due to car and population growth. Some problems caused traffic in highways like: car trouble, car accident and climatic reasons. This problems can be solved by using technology in all circumstances. In this article; ZigBee-enabled wireless sensor is intended to ensure the highway network and Bluetooth system with sensors to warn drivers that generated through mobile phones before a certain distance from the scene and the driver to take action.

Keywords: TIS, Zigbee, traffic estimate, Web services, synchronization

Introduction

Intelligent transportation applications management is gaining importance day by day. New technologies and applications with traffic management and road information could improve safety and Convenience in roads.

In Turkey, 91.8% of passengers in all modes of transportation, 88.8% of freight is transported by road. When this year on the occasion of the highways as of vehicle-km value are examined; In 2011, vehicle-km value increased by 6.7% compared to the previous year and

amounted to 85.50 billion vehicle-km. In 2010, 100 million vehicle-kilometers with 3.68 casualties per 2011 it fell 3.37 . Cameras in the road and Traffic Management System Center, multilane vehicle sensors, incident detection systems, speed warning systems are provided dynamic and up to date information on the road and environmental conditions to intelligent systems by drivers. In this context, traffic management systems, driver information systems, and weather sensors are carrying the most weight elements. Applications under the Traffic Management System Centers, variable message signs, variable traffic signs, camera monitoring systems, speed warning systems, Internet, multi-lane vehicle sensors, signaling systems, weather and road condition sensors are used in communications systems.

in our method, wireless technologies like Bluetooth 4.0 and Zigbee used for information systems. by means of communicationg with the mobile phone it is intended to inform the driver.

Related works

According last decades researches and activities about traffic information system, there are some methods to show information to end user, in literature this kind of instruments named Variable message sign (VMS), for example in figure1that showed Katunayake Expressway in Colombo, Sri Lanka. This kind of elements controlled from a station, it means most of time this table not showed the name of Katunayake Expressway, maybe it shows about some caution messages, speed limits and etc. consider the driver move speedy and there was a caution message on the tables, maybe the driver didn't see caution message and missed it. So it was maybe dangerous. Due to we think our method must be repeated until we sure the driver got it.



Figure 1- A single row matrix LED sign on Katunayake Expressway in Colombo, Sri Lanka

On the other hand, some people oblivious about the table messages, because most of the messages routine for example, fasten seat belt, move by low speed so people relinquish from messages, in the fact maybe there is important message about the road and the driver must have aware about it.

In S.M. Billal et al, proposed a mechanism for road vehicular density estimation that considers multiple road factors, such as road length and junctions. [8] In this paper they presented distributed method for road traffic estimation named “road oriented traffic



information system (ROTIS)” also authors have implemented ROTIS with VANET routing protocols to see its impact on the packet delivery ratio and end-to-end delay. [8] In this paper a cell consider as a car that means one car is a one cell and ROTIS is designed to form cells of any size considering the road length. [7]

In V.Monolopoulos et al, proposed a smartphone-based traffic information system for sustainable cities with help of android smartphone, server and authentication server, so the server must collect traffic information and then broadcast to the smartphones. [8] So the collecting data in this method is difficult and maybe not be updated. So we want to improve this method.

Our method

In this article we want to analyze Traffic Information Systems (TIS), that traffic data were collected and distributed by sensors attached to the road network. [4] Sensor nodes send message to the existing end users at the road. This message contain information about road traffic volume, direction about change road and etc. there are an accident in the road ahead so it caused traffic, the end user must know about it, we need Traffic Information Systems (TIS) for this reason. In this article we use Sink node, Zigbee sensor nodes, Server, cellular phone networks LTE and Bluetooth BLE.

we propose that in every 100 meters put Zigbee sensor node, that this nodes could get road traffic information, according figure1, the end users that along in this road have connection with these nodes, when an accident reported form server to this nodes, nodes starts to send message to the end users that coverage on that zone, the main problem in this situation is that the end users maybe missed this message, actually Zigbee sensor nodes send a message in 20m/s , consider the end user (car) has 50Km/h speed and Zigbee sensor node send a message in 20m/s, so that car easily get the message.

Another point of view that is, when Zigbee sensor nodes start to send messages. We consider in a road with 1 km length, there are 10 Zigbee sensor node in every 100 meters, so when server send an accident message to nodes, the first node that has 500 meter distance from accident zone, will tried to send message to the end users, at this time one id Assigned to the end user that received our message, if an end user missed this message, Sensor nodes that located in near of accident zone tried to send message again until they sure about that end user get message, be sure about an end user get a message is assigned id in our method. According our simulation and computing there will not exist a car that missed message, from other hand maybe some cars doesn't have this communication system or the devise in that cars discharged or damaged.

In our method there are a web service that collected road traffic information from Municipality traffic systems, in this way web service must have a safe and fast communication with the server that located in every road for distributing traffic information to sensor nodes, so we used Json web service technology to do this. JavaScript Object Notation (JSON) is a

human-readable data-interchange format. It is based on a subset of the programming language JavaScript with the purpose, to be parsed correctly by the JavaScript compiler.[5]

Our communication system from End users and Server node are cellular phone network LTE, In addition, LTE systems provide not only telecommunications services, but also data and multimedia services. To support multimedia services high data rate services with good system reliability will be provided. At the same time, a low per-bit transmission cost will be maintained. [6]

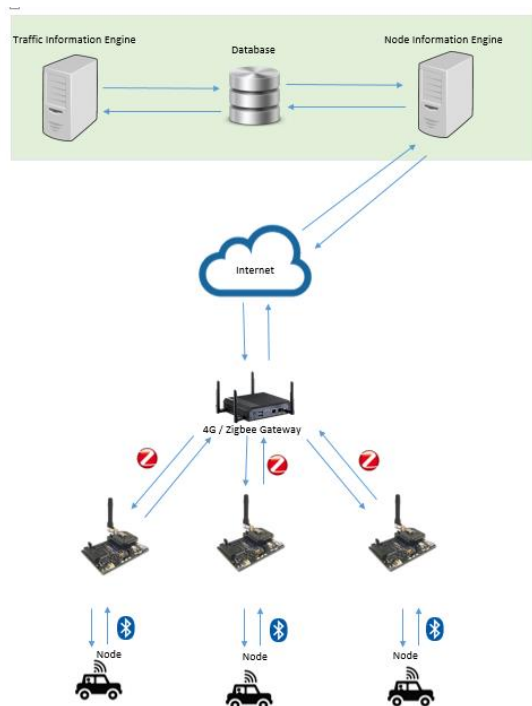


Figure 2 - Proposed Model

Conclusion

In this paper, we proposed a hybrid methods of communication to raise the traffic information system Efficiency, our goal at this paper was to reduce traffic accidents via end user communication and server, so we use new technologies like LTE, Zigbee and Bluetooth to prove this. The main problem that forced us to prepare a hybrid method was the end user miss the important traffic messages from server because there isn't enough agency to publish messages. Nowadays most of people use the new technologies and in this way we use LTE system to send messages because LTE prepared more speed and security in compassion of other method like 2G and 3G.



Future works

Our method based on theory and we hope to implement as soon as, and in the future we want to extend this project to other field of computer science like forecast traffic based on Data mining because after this we will have a good source of traffic information like which hours traffic was high and which days and etc. so this kind of study about traffic information system will be continued in most of fields of computer science.

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