Vehicle to Vehicle Communication System Using Li- Fi Technology

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Abstract-*This paper introduces a novel method ,known as NNH Nearest Neighbor Histogram, which makes use of detailed histogram constructions to enhance the efficiency of NN search algorithms, this concept is useful for vehicle to vehicle communication. A principal characteristic of this manner is that to analysis the traffic and road safety while traveling to destination from one point to other The total structure Is based on the li-fi and wi-fi communication. Additionally the key position of vehicle has been implied by using the aid of GPS which appropriate consumer can manipulate the protection while traveling using the same vehicle. The GPS is also getting used right here for finding the particular car area so that it may be determined while traveling.*

Keywords-light emmiting diode; photodiodes; vehicle to vehicle communication; styling;

I. INTRODUCTION

The car communication system is not designed for a particular brand or vehicle. This can be used in every vehicle with a little modification. The IEEE 802.11p protocol is used to get the efficient high speed communication. The system is designed considering the normal car user can also use it. The system is mainly divided in 3 sections which are described in section III Section IV and Section V and they are car positioning system, anchor system and signal communicators. The main advantage of the system is at the cost of GPS system a person can get the full car communication system and which will help him in secure transport which a GPS system can't support. The system is made to set up its own network among the cars. The cars are made to share their data. Car communication networks will provide a wide range of applications with different characteristics. As these networks have not yet been implemented, a list of such applications is speculative and apt to change in the future (However safety, which is the main purpose of these networks, will most probably remain the most important applications). Furthermore some of these applications require technologies that are not available now. Ultimately we would like to delegate the full handling control of our cars to the vehicles themselves; somewhat similar to autopilot. The classifications of applications are not unique and many institutions involved in intelligent transportation systems propose their own set of applications and classifications.

Two channel-access mechanisms are implemented, which identifies carrier-sense with collision avoidance. It communicates with positive acknowledgement for successfully received packets. Access control the device maintains a list of trusted devices within the network sequential freshness to reject data frames that have been replayed the network controller compares the freshness value with the last known value from the device.

II. OBJECTIVES

To develop a smart system that can track the vehicle, and implementing advanced technologies in cars for making it more intelligent and interactive for avoiding accidents on roads. Intelligent systems are in used with every aspect for systems, cars are the critical systems which are real time scenario. The smart systems not only deals with component monitoring, it does even more than that like Passenger activity monitoring, behavior analysis, system behavior, notifications & co-ordinate.

1. Traffic analysis .
2. Speed Calculation.
3. Speed transfer to nearest vehicle.
4. Distance mapping.

III. LITERATURE SURVEY

Husain Fidvi ET. al [3] have proposed vehicle to vehicle communication system that does not require a tracking global positioning System or even a Wi-Fi or 3G wireless connectivity. It was proposed to use Programmable Interface Controller (PIC) sonar which sends 40 KHz short pulse of sound that is undetectable by human ear. The echo of the signal will be detected by microcontroller. The distance is calculated by the time required for echo signal to be transmitted and received [3].This technology is demonstrated in the figure below

Several research works have been attempted in literature for vehicle to vehicle communication using an advantage of light. As light frequency spectrum is huge, it is

beneficial to be adopted in a short-range wireless communication [5]-[9]. In this work, we aim to develop a cost effective yet inexpensive mechanism for vehicle to vehicle. Which is light. The rest of the paper is organized as follows. Section II explains the details of the proposed system design. In section III, the system diagram is explained. Section IV provides details about the results of the system.

Recently, light emitting diode (LED) based optical wireless communication (OWC) systems have been developed. Especially, an OWC technology using visible light communication (VLC), has been receiving much attention. The LED is suitable as an optical-signal-sending device because light intensity of the LED can be modulated at high speed in comparison with traditional lighting devices, such as incandescent bulbs and florescent lamps. Furthermore, LEDs are inexpensive, already used for lighting and sign-ages, and have high energy efficiency and long operating life. Moreover, basic performances of LEDs are being improved constantly while achieving even lower cost.

IV. RELEVANT MATHEMATICS ASSOCIATED WITH THE PROJECT

Let S be a system that describes Vehicle to Vehicle Communication

S= I,O,P,F,s,Ic

Identify input as I

Let I=i1,i2,i3,..id (The input will be command based Text and device id.)

Identify output as O

Let
O=the receiver will post the command based when he is authenticated.

Identify the processes as P P=E,D
where,
E=parameter id, D=parameter(LIFI command)

Identify user as Ic=user should always be online and authorized.

V. SYSTEM DESIGN

The proposed system requires a transmitter and a receiver in each vehicle in both rear and front sides of the vehicle. Thus more scenarios will be applicable. For the time being, only two scenarios will be studied in this paper.

A. First Scenario

As shown in figure 2, when vehicle 1 is braking, the speed meter in the vehicle will be sensing that the current speed is lower than the previous speed. Thus, a message will be sent through the transmitter which is placed in the rear lights to vehicle 2. The message will be received by vehicle 2 using the photodiode which is placed at the front of vehicle 2. A notice of (Slow DOWN) will be displayed in vehicle 2 using an LCD.

Fig. 1First scenario of vehicle to vehicle communication using Li-Fi.

B. Second Scenario

As shown in figure 3, when vehicle 1 is in T-junction, it will keep sending its speed-information to vehicle 2 using the LED at the headlights. The speed-information will be received by the photodiode in vehicle 2 and compared to vehicle 2 speeds. If vehicle 2 is about to cross the junction while vehicle 1 is moving with a high speed, the driver will be alerted to check the other vehicle which is around in the area.

Fig. 2 Second scenario of vehicle to vehicle communication using Li-Fi.

VI. SYSTEM DIAGRAM

The block diagram of the system is shown in figure 4. The functionality of the building blocks of the system is described next. The data source e.g. (speed sensor) reads the speed of the vehicle. The speed data from the sensor is peak to peak AC voltage so it will be converted to DC voltage to be readable by the microcontroller. Then the data will be processed by microcontroller (e.g. to compare between the current and previous speed). New processed data will then be transmitted to the LED driver. LED driver will make the current constant to protect LED. Then, data will transmit by

the LED light as carrier. Upon data transmission wirelessly through light, the photodiode will detect the transmitted light in form of current. Trans-impedance amplifier function is used to convert the received current into voltage. Finally voltage will be processed through microcontroller to be readable by the LCD.

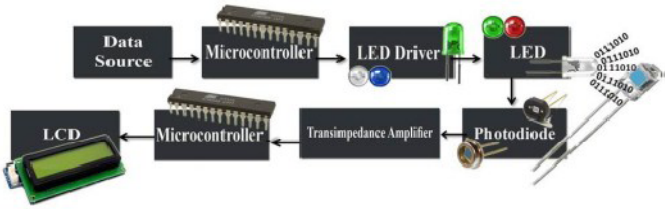


Fig. 3 Building blocks of the developed Li-Fi system.

VII. TESTING

Unit Testing:

- Unit Testing is a method by which individual units of source code are tested to determine if they are fit to use.
- We are going to implement unit testing for this project.
- A unit is the smallest testable part of an application. We are going to test each unit or module from code.

Task Testing:

- Task Testing is the basic of all kinds of testing related to software. Tn Task Testing we will check whether the system is performing the allocated task correctly or not, if yes well and good if not then test cases will be designed to improve the performance of the system.

Inter-Task Testing:

- Inter-task Testing basically deals with testing whether the interactions between different modules of the system is properly working, in other words, we can say that inter-task testing deals with testing of interrelationship between modules.
- In this Folder Locking System, testing is performed for checking the authentication of the user for Candidate Points Identification.

VIII. RESULTS

An object is classified by a majority vote of its neighbours, with the object being assigned to the class most common among its k nearest neighbours (k is a positive integer, typically small). If k = 1, then the object is simply assigned to the class of that single nearest neighbour.

In k-NN regression, the output is the property value for the object. This value is the average of the values of its k nearest neighbours.

k-NN is a type of instance-based learning, or lazy learning, where the function is only approximated locally and all computation is deferred until classification. The k-NN algorithm is among the simplest of all machine learning algorithms.

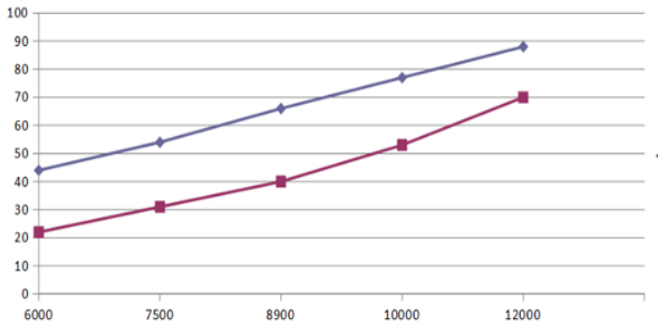
Both for classification and regression, it can be useful to assign weight to the contributions of the neighbours, so that the nearer neighbours contribute more to the average than the more distant ones. For example, a common weighting scheme consists in giving each neighbour a weight of 1/d, where d is the distance to the neighbour.

The neighbours are taken from a set of objects for which the class (for k-NN classification) or the object property value (for k-NN regression) is known.

Result Analysis:

The primary execution measurements used to assess the proposed systems are question reaction time and encryption time. Fig.1 Show the reaction time measures the length of time from the time the question is issued until the outcomes are gotten at the customer. It gives the calculation time at the server and the customer, still on the grounds that the time required for exchange of last and transitional results in the middle of customer and server.

File size in KB	[query response time using Previous technique]	knn [query response time using knn technique]
6000	44	22
7500	54	31
8900	66	40
10000	77	53
12000	88	70



IX. CONCLUSIONS

In conclusion, the concept of Li-Fi had been introduced along with existing techniques and classical trends used for vehicle to vehicle communications. As this project aims to propose a cost effective solution to reduce accidents in Oman, the design guidelines and details of system components were thoroughly explored. Due to unavailability of all system components, proof of concept has been illustrated in this paper by sending data through Li-Fi small-scale prototype. Both numerical simulations and experimental work were presented and results agree well.

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REFERENCES

[1] Noof Al Abdulsalam, Raya Al Hajri, Zahra Al Abri, Zainab Al Lawati, and Mohammed M. Bait-Suwailam, "Design and Implementation of a Vehicle to Vehicle Communication System Using Li-Fi Technology", International Conference on Information and Communication Technology Research (ICTRC2015), pp. 136-139

[2] W.-L. Jin, "SPIVC: A Smartphone-based inter-vehicle communication system," Proceedings of Transportation Research Board Annual Meeting, 2012.

[3] Boukerche et al., "Vehicular Ad Hoc Networks: a new challenge for localization-based systems," Computer Communications, ScienceDirect, 2008, pp. 1-12.

[4] N. M. Husain Fidvi, "Car to Car Communication System," source: car communication system, [Available Online: http://www.engineersgarage.com/contribution/car-to-car-communication-system?page=1]

[5] FCC, [Available Onlinehttp://www.fcc.gov/Bureaus/Engineering_Technology/News_Releases/1999/nret9006.html], October, 1999.

[6] T. H. M. A. Y. K. K. K. Isamu Takai, "Optical Vehicle-to-Vehicle Communication System Using LED Transmitter and Camera Receiver," IEEE Photonics Journal, Vol. 6, No. 5, October 2014, pp. 7902513-7902513.

[7] H. Elgala, R. Mesleh, and H. Haas, "Indoor Broadcasting via White LEDs and OFDM," IEEE Trans. on Consumer Electronics, Vol. 55, No. 3, Aug. 2009, pp. 1127-1134.

[8] W. Jia-yuan, Z. Nian-yu, W. Dong, I. Kentaro, I. Zensei and N. Yoshinori, "Experimental study on visible light communication based on LED," The Journal of China Universities of Posts and Telecommunications, Vol. 19, No. 2, October 2012, pp. 197-200.

[9] H. Elgala, R. Mesleh, H. Haas and B. Pricope, "OFDM Visible Light Wireless Communication Based on White LEDs," In the Vehiclar Technology Conference Proceeding, 22-25 April, 2007, pp. 2185-2189.

[10] N. Lourenco et. al, "Visible Light Communication System for Outdoor Applications," In the 8th International Symposium on Communication Systems, Networks and Digital Signal Processing, 18-20 July 2012, pp. 1-6. 2015 International Conference on Information and Communication Technology Research (ICTRC2015)