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Intelligent Traffic Management System Based on Smart Internet of Vehicles: A Review

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Abstract*: *Internet of Things (IoT) is a world-wide network connecting all the smart objects together. It is the medium by which all things are enable to talk with each other. Whenever those smart things are restricted to connected vehicles only, then it is called as Internet of Vehicles. (IoV) In recent years popularity of private cars is getting urban traffic more and more crowded. As a result traffic is becoming one of important problems in big cities in all over the world. Some of the traffic concerns are congestions and accidents which have caused a huge waste of time, property damage & environmental pollution. This research paper provides Internet of Vehicle (IoV) based on intelligent traffic management system, which is featured by high compatibility, easy to upgrade to replace traditional traffic management system, low cost and the proposed system can improve road traffic tremendously. The Internet of Vehicles is based on the internet, detection technologies and network wireless sensors to recognize traffic object, monitoring, managing and tracking & processed automatically. The basic functionalities of the proposed system include monitoring of speed limits, pollution checks, emergency response to road accidents and providing security to the server etc. should also be taken care to make life easier.
Keywords*: *Internet of things, Internet of vehicles, Monitoring, Tracking, Communication, Server.

I. INTRODUCTION

In 1999 the concept Internet of Things (IoT) was first introduce by Kevin Ashton. IoT describe a different apparent objects and their virtual representation in the internet. IoT establish a world where all objects around us which is resulting from a natural impulse or tendency and they are connected to each other & communicate with each other. The aim of IoT is to create a better world for the human beings. IoT is the latest and becoming recognizable model. The IoT it is bridge between the virtual world and physical world. The major objectives of IoT are to create smart environment based on self-aware thing for new and innovative things. The IoT involves the increasing prevalence of objects & entities provided with unique identifiers and it has capability to transfer data automatically over a networking the vehicles perhaps also the traffic congestion on the road is increases. Now, it is a very serious problem on road, more number of vehicles are present and due to that pollution increases and road accidents have been a major issue for most of the countries. Hence number of death due to road accidents is increasing year by year making safety a major concern. The internet of things is the network of physical object devices, vehicles, buildings and other items which are embedded with electronics, sensor, software and network connectivity.

In today's world internet is a global phenomenon. Many more devices are getting internet friendly, due to which with the help of internet traffic management in transportation working becomes easier. As vehicle ownership has been increasing at an exponential rate, more traffic issues arises. It is logical that the monitoring of speed limits, pollution checks, vehicle tracking, alcohol detection and emergency response to road accidents should also be taken care to make life easier.

The traditional solutions offered to this problem are periodic pollution checks, monitoring of vehicular speed through speed trackers and CCTV cameras. While the choices being obvious, these strategies tends to be unsuccessful when it comes to monitoring of a huge number of vehicles i.e. when the number of vehicles increases then the effectiveness by which a road transport authority can handle the incoming breaches of vehicular code decreases. This is how Internet of Things (IoT) comes into play. Out of the various proposed methodologies with wireless sensor networks in traffic management, the prospects of Internet of Vehicles stand out. This paper mainly focuses on discussing the methodology and advantages. In short Internet of Vehicle (IoV) is nothing but it is the combination of physical object, controller, actuators, sensor and internet.

II. LITERATURE REVIEW

Literature review is carried out to gain knowledge and skills need to complete this project. The main sources for this project are the previous projects and thesis that is related to this project. And the other sources are journals and articles obtained from internet. This chapter discuss about the project and thesis related to this project. Therefore by analysis of the project did by other researches, these is a possibility to know what features are lacking in their projects. It is very important to improve and to develop a successful project.

Information about few research papers or previously implemented projects that we have used as a reference for making our project is mentioned below:

In [1], The intelligent TPMS based on vehicular networking technology was developed in this paper, which is a full tire life-cycle tracking service system & provides a new solution for the tire maintenance. The system transmits the monitoring data to the cloud server via the mobile Internet, and digs out the tire pressure and temperature varying pattern, then give feedbacks to the users.

In [2],Nouman has proposed, TPMS system vehicle friendly & user friendly. The implementation of this system gives the available hardware discussed Vehicle testing which gave reliable and stable response. Compared to TPMS systems available in market, this system has its own advantages. The transmitting unit's size can be reduced if a pressure transducer is used instead of OMRON sensor which basically is a general purpose sensor. Application Specific Integrated Circuit (ASIC) for the transmitting unit will greatly reduce size. Reduction in size will not affect working of system. And to increase possible no. of systems, the packet size can also be increased. These modifications can be made if this technique is to be launched as a product.

In [3], The microcontroller MSP430F149 is used as CPU and along with that GPS, RS232 and Fuel level sensor is used for tracking vehicle, communication and fuel level respectively.

In [4], The proposed system has unit mounted on stem valve of tire and remains outside the tire, it can measure wide range of the pressure. The system used for the board RF receiver along with LCD and keypad for user interface.

The[5], paper introduce a real time traffic monitoring system to solve the problem of real time traffic controlling and monitoring. The proposed system presents a new way of traffic control by the better utilization of resources. The traffic administration department can use this real time traffic monitoring information to detect the dangerous situations on the road and thereby react by imposing immediate actions. On the whole IoT will play an important role in traffic monitoring by improving the efficiency of traffic safety and travelling costs.

The [6] article presents a kind of scheme of direct TPMS, introduces the principle of the system. The communication can greatly improved through carefully choosing the RF module. The transmission module has the low power property. The wireless signal transmission is solved by adopting FSK, CRC checkout and Manchester coding. The testing results indicate that the system meets the needs of the real application well. Researches show TPMS has a bright prospect.

The[7], paper has developed and implemented a novel traffic system that is capable of monitoring and managing urban traffic. This system is tested with various conditions and is proved to be scalable. The additional vehicle spotting feature makes this system different from the other implementation. The incorporation of IoT into the system makes this as a blend of standard and advanced technologies. Vehicle owners can track their vehicle from anywhere in the world. The system developed in this paper proves to be reliable and cost-effective.

This patent[8], The invention comprises two major aspects: sharing the receiver function with another vehicle operation to economize on initial expense as well as upon power requirements, & establishing a record of the tire position of each transmitter, assigning an identification code to each transmitter and updating the record when tires are rotated, so that the pressure data can be related to a specific tire position.

In[9], The main task of our study is trying through the study of driver's driving behaviour and in coordinating with the information provided from the pre-warning system to decelerate the vehicle speed prior to the happening of accident and if accident happens to reduce the damages to the least level.

In this paper IoT is an emerging research paradigm and apparently the discovery of its body of knowledge is still in an infancy stage. So, the exact definition, architecture, scope, and standard are still not concretely defined [10]. However, most scholars agree on the idea of expanding and interpreting the pioneering conceptual definition of Kevin Ashton who defined IoT as "a standardized way for computer to understand the real world".

With a key feature to create a smart environment together with quick response to support certain decisions and/or operations of human, IoT-based systems have been proposed in several applications such as supporting disabilities, managing diabetes therapy, building smart home, improving safety in mining operations, and using IoT for an intelligent relationship and is sometimes interchangeably used with a Ubiquitous Computing (or Ubicomp) [12].

The slightly different is that Ubicomp does not necessary require the internet connection to enable communication among objects. It is used rather in a broader sense for defining smart ecology than IoT. For example, applying sensor technology to capture data to make a certain response is Ubicomp but not IoT. Internet of things, to put in simpler words, is the interaction between things, which, according to our case, is the communication between a vehicle, a centralized processing unit and traffic lights. The following equation describes IoT in a simplified manner [11].

III. PROPOSED WORK

For the prospects of Internet of Vehicles (loV) to be a reality, the vehicles need to be able to work and communicate seamlessly. Communications in this proposal are as follows:

A. Communication between the vehicles and the vehicle owners

Few attributes of the vehicle like vehicle speed and fuel level are directly reported to the users in the vehicles, only when the vehicle is in use. However, to enable the user to receive active updates even when the vehicle is not being used and when the user is away from the vehicle, an onboard processor is useful.

B. Communication between vehicles and a centralized server

The data monitored from the vehicle is relayed to the nearest communications node via computer. The node in-turn communicates the data via a satellite to the communications node of the server which monitors breaches.

C. Communication between server and third parties like ambulance, police patrol, fire-engine, etc.

This mode of communication occurs between the server and the third parties including:

1) Emergency response like fire-engine, ambulanc
2) Police patrol
3) Pollution control

Data deemed to be of primary concern are the data regarding to vehicular collision, theft, temperature spikes, etc. When these data are reported from the onboard processor on the vehicle, to the *server*, they are forwarded to the respective third parties.

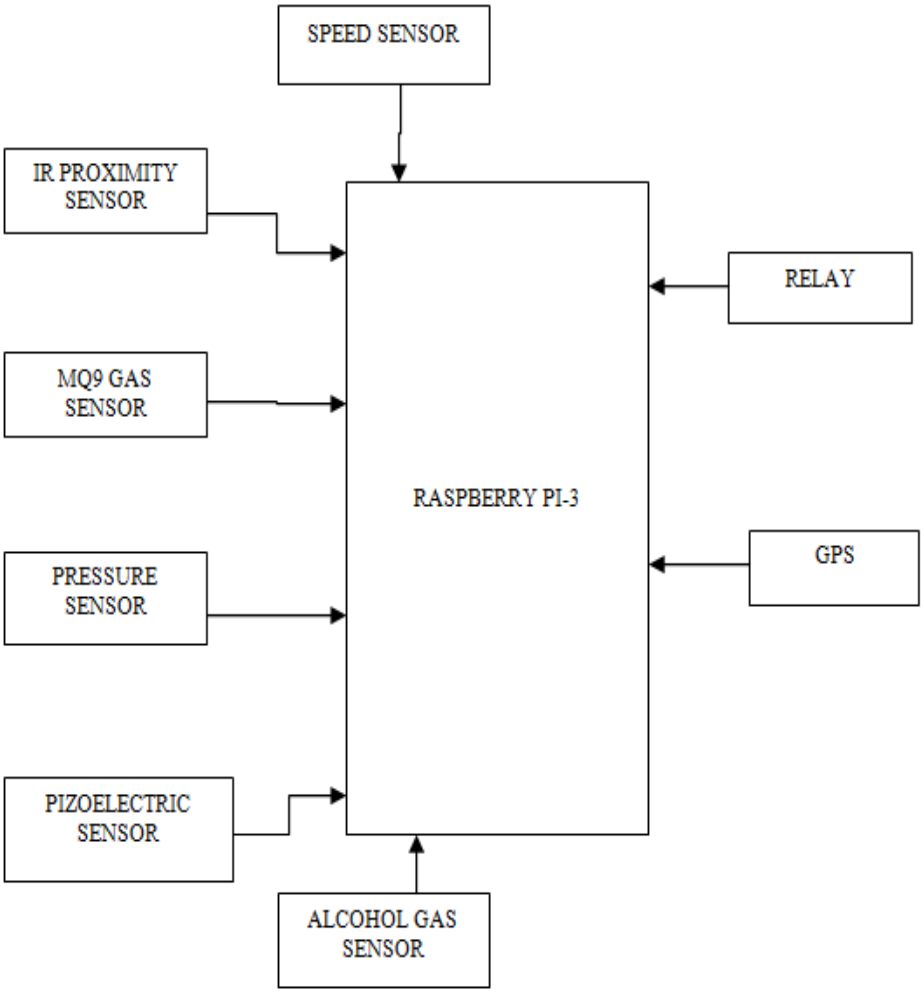

Fig 1: Proposed system block diagram

IV. APPLICATION OF IOV

A. Smart Cities

The IoT has the potential to change entire cities by solving real problems citizens face each day. With the proper connections and data, the Internet of vehicle (IoV) can reduce crime, noise, and pollution.

B. Connected Car

These vehicles are equipped with Internet access and can share that access with others, just like connecting to a wireless network in a home or office. More vehicles are starting to come equipped with this functionality, so prepare to see more apps included in future cars.

C. Intelligent transportation system

Support for vehicular ecosystem, use of in vehicle sensor network, GPS and wireless networks for developing smart vehicles, vehicle tracking, Emergency vehicle notification system.

V. CONCLUSION

Taking everything into account, the internet of things is closer to being executed than the normal individual would think. In this paper a dynamic methodology has been proposed in most effective way to handle the issue of vehicle crash and location by utilizing the idea of Internet of things. Internet of thing based smart internet of vehicle system finds solution for vehicle safety and ease the work for automobile forensic studies by providing vital data. This research paper is intended to suggest a much effective way of traffic management & in making safety while travelling for everybody.

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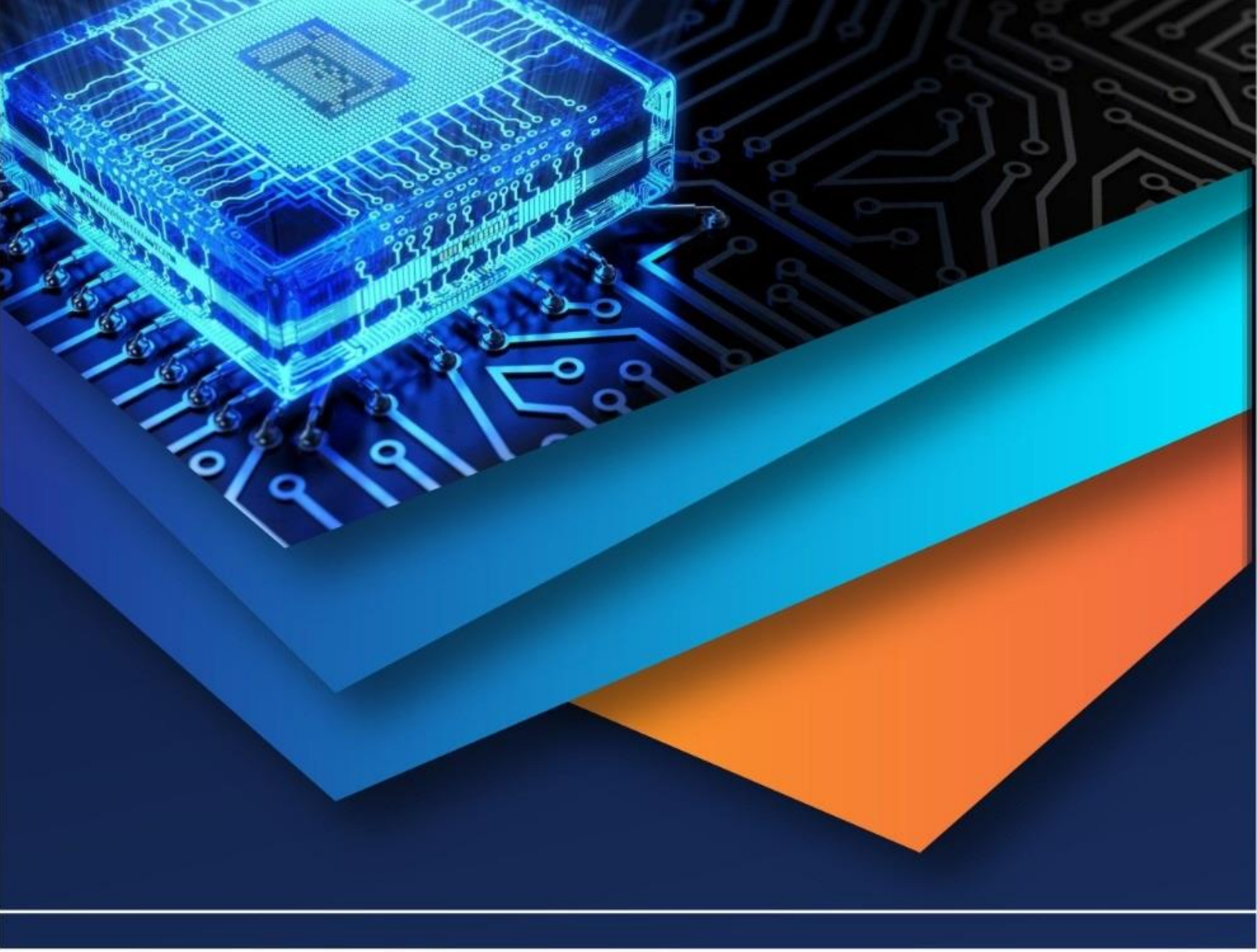

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