

Computer Science Technology Trends in The Internet of Things (IOT) with A Proposal of IOT Device for Vehicle and Human Safety

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ABSTRACT

In this paper we are going to deal with the types of Internet of Things (IOT) devices used in a Smart City, role of computer science in IOT in various streams and some Case Studies from different sources. We are presenting a cost-efficient and effective way of proposing a IOT device that is used to detect Drunk and Driven cases, Over speed cases, Health issues during driving, Sleepiness during driving and also to detect Theft of the vehicles. In this paper we discuss about numerous types of Internet of Things (IOT) devices, some main causes of road accidents, how to detect them, and a proposal. We are still in the basic stage of proposal and future work to be done.

Keywords: Cost-efficient, Drunk and Driven, Internet of Things, Road Accidents.

1. INTRODUCTION

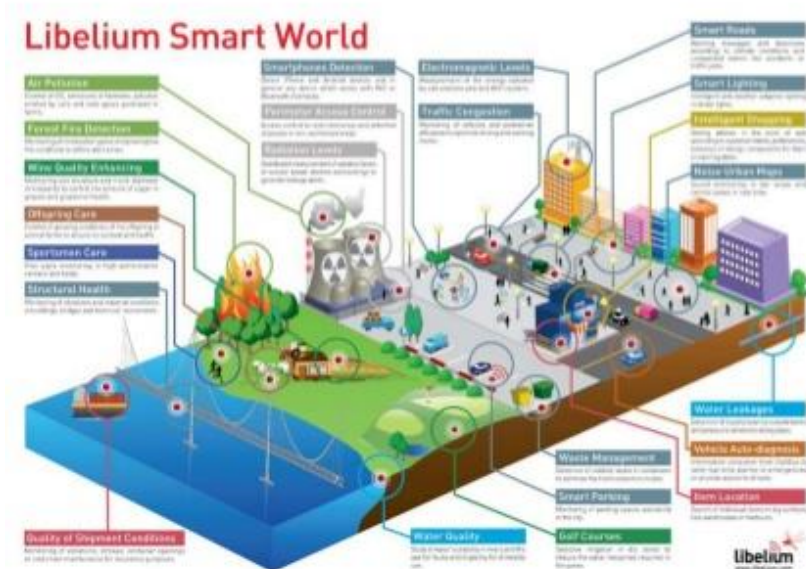
“Internet of Things (IOT)” is today's one of the most emerging and popular technology in the world. We need everything smart now a days Smart Phones, Smart Devices, Smart Homes etc. Is it possible to make everything smart? Is the common question we get in our mind and answer for that impossible question can be made possible using Internet of Things (IOT)?

What is IOT? Why did it named as Internet of Things (IOT)? When did it evolved? What are its uses? These are few basic questions that evolve in our mind and what we got the answers were: IOT helps us to move towards a smarter Internet. What is Internet? It means Inter connected networks that are communicating using some communication protocols. The Internet as we know it today first started being developed in the late 1960's in California in the United States. Can you just imagine to connect, share, sense and communicate billions of devices with each other using some Internet protocol (IP) networks? Yes you can and this is the world of Internet of Things (IOT). The IOT concept was coined by a member of the Radio Frequency Identification (RFID) development community in 1999. We can use Internet of Things (IOT) for everyday objects that are readable, recognizable, addressable, locatable, and controllable, via Internet as a communication means. It is a assumption that by 2020 number of IOT devices may reach up to 50 billion [1].

IOT Devices for Smart World

There are nearly thousands of IOT devices in use now days. The future appliances, automotive sector, banking sector, irrigation sector, industrial sector, pollution Control board, Educational sector and many more are going to be evolved. There are many number of advantages using Internet of Things, It makes life, easier, simpler, comfortable, and mainly safe and secured. The Future is now perspective of a smart city. If everything used by the people in a city are smart then obviously it becomes a smart city, smart country and a smart world.

The Future is Now *- Perspectives of a Smart City*



Sensors for

- Air pollution
- Fire detection
- Water quality
- Smart parking
- Traffic congestion
- Waste management
- Golf course conditions

... sensor city

Jury Konga
eGovFutures Group

17

Fig.1: Types of IOT devices for developing a Smart City [1]

The smart world is in the hands of Internet of Things (IOT)

Structural Health of Buildings: This is structural Engineering and can be helpful for Archeologists to some proactive maintenance and restoration activities using IOT device. The IOT devices will be helpful to find out impact of Earthquakes on the buildings and save lives. This help the citizens who were living in the buildings aware of the conditions.

Waste Management: This is the most common problem in city now a days due to the increasing population. In order to solve this problem IOT devices are being used to intimate when the dustbin gets filled and passes the message to the owner. For instance, the use of intelligent waste containers, which detect the level of load and allow for an optimization of the collector trucks route, can reduce the cost of waste collection and improve the quality of recycling.

Air Quality: IOT devices can also be used as anti-pollution agents to reduce the Air pollution in the area. This type of IOT devices should also been used in Industries where chemical and Poisonous gases will be released. These are mandatory for the Mining Industries to intimate the workers or to release some anti-pollution agents when gas gets leaked somewhere.

Traffic Congestion: Even though there is camera based traffic monitoring, wide spread communication must be done using IOT devices. Because, it will be helpful to send officers immediately where the traffic congestion takes place and it gives intimation to the vehicles to choose another way. By this lot of time and also energy of vehicles can be saved. Correct road map of Source and destination can be given. Every vehicle must be GPS enabled to use these type of services from IOT devices.

City Energy Consumption: IOT can also produce the analysis of most energy Consumption devices to the authorities and this makes them to set priority and get complete details of energy required for different services. In order to obtain such a service, power draw monitoring devices must be integrated with the power grid in the city.

Smart Parking: The smart parking service is based on road sensors and intelligent displays that direct motorists along the best path to park in the city. This technologies can be brought using RFID's.

Smart Lighting: This service can optimize the street lamp intensity according to the time of the day, the weather condition, and the presence of people. It is extremely important because Street lights will go on for entire night even when no one is walking in the street and lot of power can be saved by using IOT devices [9].

Health Care: In healthcare industry, Internet of Things (IOT) provides an opportunity of discovering healthcare information of the patient who had a Radio-Frequency Identification (RFID) tag. These objects may be equipped with devices such as sensors, actuators, and RFID tags, in order to allow patients, doctors, equipment's and other healthcare actors to be connected anytime and anywhere with anything and anyone [10].

2. COMPUTER SCIENCE TECHNOLOGY TRENDS IN IOT

There are many types of Subjects and Sectors that involve in introducing a Internet of Thing (IOT) device. In this section we discussed about various technologies that helps IOT to get developed but IOT technological trends are not only limited to these. There are numerous trends developing now a days to improve efficiency, correctness, reliability, accuracy, communication, security etc.

INTERNET PROTOCOL VERSION 6 (IPV6)

IPv4 can provide 4 billion IP addresses which thought to be enough at the time of its invention at 1981. But as the need of IP addresses are improving day by day, the need of improving IP addresses is recognized and concept of IPv6 was introduced in 1990's. IPv6 is the next Internet addressing protocol that is used to replace IPv4.

With IPv6, there are approximately 3.4×10^{38} (340 trillion trillion trillion) unique IPv6 addresses, allowing the Internet to enhance to the needs. Given the huge number of connected devices (50 billion), IPv6 had the ability to be used to address all these devices (and systems), diminishing the need of network address translation (NAT) and

improving one to one connectivity and control over the devices. These features provide integration of physical objects into the Internet world.

3. CLOUD COMPUTING

Cloud computing is one of the enabling and eligible platforms to support IOT. IOT connects billions of devices, sensors and actuators to create new and innovative improved applications. In order to support these applications we need a reliable, elastic, accurate and agile platform. For that problem Cloud Computing is the optimal solution. It provides many services such as Storage as a service, Infrastructure as a service, Platform as a service, Database as a service etc. All these are given for pay as you go type i.e. as a rental process. There are many organizations that gives Cloud services such as Amazon, Microsoft Azure, Nimbus, Eucalyptus and many.

4. DATA ANALYTICS

It is really a tough job to store all the data coming from millions of IOT devices and make its Analysis. For this purpose Data Analytics, Data Mining, Big Data, Business Intelligence are some technologies used to analysis by using different Algorithms and techniques for data we produce day by day.

New data is analyzed and stored in the system memory to improve the relevance of the analytics content to improve the speed in decision making. And this makes our work easier.

Companies such as SAP¹⁴, Microsoft¹⁵, IBM¹⁶ and Teradata¹⁷ are building in-memory database solutions that can perform high analytical and transactional processing.

A new real-time analytics such as streaming analytics uses complex algorithms to process instantly the streams of event data it receives from one or more sources. Some examples for IOT applications that require streaming analytics could be road traffic data and telephone conversations. IOT creates opportunities for analytics to be performed in real time and also allows large volumes of data to be stored for analysis at a later time.

5. SECURITY AND PRIVACY

The major challenge today for either IOT or Cloud is Security and Privacy. Today, various encryption and authentication technologies such as Rivest Shamir Adleman (RSA), Diffie Hellman (DFA) and message authentication code (MAC) protect the confidentiality and authenticity of transaction data as it “transits” between networks.

Encryptions such as full disk encryption (FDE) is also performed in IOT for user data “at rest” to prevent unauthorized access and data tampering. The advantage of FDE is that it requires no special attention on the part of the end user after he initially unlocks the computer. As data is written, it is automatically encrypted. When it is read, it is automatically decrypted. Because everything on the hard drive is encrypted, including the operating system, a

disadvantage of FDE is that the encrypting/decrypting process can slow down data access times, particularly when virtual memory is being heavily accessed [8].

6. MY PROPOSAL IN IOT

In this paper we are proposing a IOT device that is helpful for human safety and vehicle safety. By developing these type of IOT devices we can minimize the accident rate, death rate and theft of vehicles Can Also Be Controlled.

“70 per cent of road accidents in India due to drunken driving”.

Mr. Kapila said that victims of Road accidents in India are raising day by day while decreasing in many other nations with more population than compared to our country. Each day, nearly 3,500 people die on the roads worldwide. Tens of thousands more are injured. Drunken driving has increased about 7 times in Delhi, 16 times in Mumbai since 2001 [3].

It is very useful to develop a IOT device to reduce these road accidents as thousands are people are getting injured and mostly dead due to this. Firstly we need to know the causes of Road accidents?

The Major Cause Of Road Accidents In Today’s Life Is Mainly Due To these Important Factors :

1. Alcoholic Consumption
2. Dizziness or Sleepiness
3. Heart Attacks or Severe Health Problems
4. Over Speed

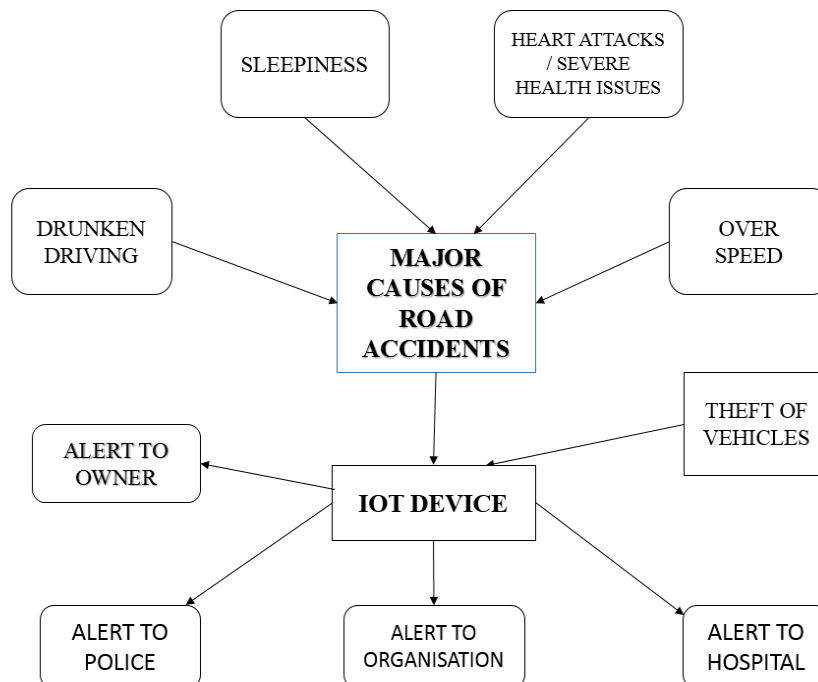


Fig.2: Roadmap of Major causes of Road Accidents with the alerts given by IOT device

Dr. Westby G. Fisher, MD, Cardiology, said that Alcohol is a diuretic. As such, it causes people to lose intravascular volume. In response to this drop in volume, the heart increases its flow by first increasing the force of contraction with each heartbeat, then later by increasing the heart rate to make sure blood pressure is maintained [4]. If a IOT device gets responded to this variation in the heartbeat immediately it gives intimation to the Police Station nearby and also can prevent from a road accident by giving a message or call to the person to stop the vehicle.

ANGELA EPSTEIN said that the heart rate goes down by between 10 and 30 beats per minute when we sleep. This produces a decline in blood pressure, which occurs in restful sleep [5]. That means when a driver of a vehicle gets sleepy or drowsy IOT device must sense it and intimate to the driver and do some mechanisms to get awake in order to avoid accidents.

A slow heart rate is common during a heart attack. Bradycardia is a heart rate below 60 beats per minute and often with a heart attack is associated with chest pain or angina. If the heart rate is too slow, often below 40 beats per minute, dizziness, inability to concentrate and dangerously low blood pressure result [6]. So when a person got heart attack suddenly in the middle of the journey while driving, the vehicle must be stopped immediately and our IOT device must intimate to the nearby hospital and ambulance service must be sent to the place. In such condition we can save the life and also prevent from any road accident.

Another important and main cause of accidents is not controlling Speed of the vehicle. If IOT device which is connected to the speed sensor is improved. Then if the speed is not controlled in specific areas, then it must be intimated and gives warning to the driver to control the speed. Even then if the speed is not controlled by the driver then intimation must be given to the nearby Police Station.

1.65 lakh vehicles stolen in a year in India. A total of 1.51 lakh cases of vehicle thefts were registered in 2011 and the number rose to 1.54 lakh in 2012 and 1.65 lakh in 2013 [7]. Theft of vehicle is a major problem faced by many people now a days. If an IOT device that intimates the vehicle location to the owner, if it is a theft he can immediately intimate it to the Police and Police station near to the vehicle gets intimated and after recovery of the vehicle the further proceedings of the case can be done. By this way recovery of the lost vehicles can be done easily by the police and safety of the vehicles will be in our hand.

As by above case studies we can know that heartbeat variation is the common element and we have to implement an IOT device used to measure heartbeat of the person. In order to check the heartbeat of the person we can implement a new type of sensor in IOT device that is capable of measuring heartbeat at a distance of 0.5meters to 1.5 meters without touching human body. We can use it to develop an IOT device particularly in automobiles so that we can prevent maximum number of road accidents.

A 5.8-GHz ISM-Band radio-frequency sensor has been developed for non-contact measurement of respiration and heart rate from stationary and semi-stationary subjects at a distance of 0.5 to 1.5 meters. We report on the accuracy of the heart rate measurements obtained using two algorithmic approaches. One algorithm is based on automated detection of individual peaks associated with each cardiac cycle; a second algorithm extracts a heart rate over a 60-second period using spectral analysis. Peaks were also extracted manually for comparison with the automated method. Non-contact measurement of heart rate will be useful in chronic disease monitoring for conditions such as heart failure and cardiovascular disease [8].

7. CONCLUSION

In this paper we have analyzed some solutions to prevent accidents. Some industries are already using these type of technologies to improve IOT devices. The result of developing this type of IOT device will be a boon to the present day living. We can develop it by using Raspberry Pi and many. This have many uses mainly for the safety of vehicles and human. By developing these type of devices we can be safe and secure preventing many types of hazards. We proposed about IOT devices used in specifically automotive field as IOT is still in Low stage in our country and yet to be improved a lot. When these type of advancements are in use, control of the road accidents will definitely be decreased. In this paper we gave a proposal of IOT device and the future work to get it completed is yet to be done. We took it as a starting point to write this paper and we have done our level best. We sincerely hope that you like the paper and we will definitely correct if there are any mistakes done unknowingly.

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