Next Generation Networks of Smart Vehicle on Smart Road

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Abstract— **In this century we are dealing with much-advanced technology one of the versatile technology is internet of thing it is a sort of universal advanced network which connects many devices, sensors, and software together and which enable the smart machine to communicate among each other.in internet of things objects is used to collect the information and exchange the data.in return, we are getting the bulk amount of data being generated and these data are stored and processed into useful ways.**

Nowadays computer science is drastically changed and given a new way to understand the world with the help of the sensors vehicle are connected through the internet and gives us the useful and important information of every minute process.in this paper, we introduced the innovative ways of sensors and devices which are connected to the cloud and to the infrastructure and in return they get benefited in collision avoidance, smoothness of the road, traffic information, potholes apart from this we are also using the internet of things with our proposed architecture for a smart vehicle.

Keywords—(iot)internet of things,global positioning system,global system for mobile,(BASN)body area sensor network

PROBLEM DEFINATION

This paper is a review of technology required for driving a smart vehicle on the smart road. They are continuously communicating with each other through the internet and sending data. as it comes to the connectivity it is difficult to handle the bulk amount of data and transfer that data on the cloud. This paper presents the management and control of the different sensors on cloud. challenge is how to achieve connectivity in remote areas and with this perspective 3G and 4G are used. This sensor is individually dealing with any problem of daily life as they are predictive and well organized. Correctness is what make autonomous car possible.

Need of smart vehicle:

Now a day's wireless technology plays a very vital role in serving the user with an internet connection and GPS services the next wave of automotive technology is used of radar for collision avoidance, self-driving. This kind of car not only used to avoid a collision but also sending and receiving data for the smooth functioning of the vehicle.

Connectivity:

It is the principle that deeper stimulating the foundation of building the innovations. The internet is something open to all and affordable communication with one to one communication or with many devices. Not only our working environment but also our home is now getting interconnected with each other. With this digitalization technologies services in the cloud and our hosted application are becoming smarter that is why everything is responsive and adaptive.

A safer vehicle:

A vehicle should be saved for the user and the other road user to vehicle avoiding a collision by communicating each other on the road, the important is keeping a safe distance between two vehicles. The smart car can be sent off by its own and monitored smart technology can also be cutting down the cost of fuel. Guiding to check the availability of the parking. Near about, 30% of the traffic congestion is caused by only searching for a parking space. Another scenario is number of the accident will also be deducted accident which is caused by human such as stressed emotional disturbance, fatigue, and the distractions. Smart car will totally eliminate the human error.

Integrating with a smart phone:

At first glance, this may not be possible while a car is not just a smartphone, they are much more than that. According to the customer expectation how they are going to interact with their cars and the outside world.

INTRODUCTION

The terminology internet of things can be defined as the collection of a real-time physical data object from the network and then shared or utilized those data whenever required or which can connect the various things on the network. Now waiting for those days where everything in this world is going to be connected with the internet just imagine all our day to day activity start automatically whether it is

your home, workplace or a vehicle. A world where you can find the importance of IOT. Suppose if you are coming from your office so need to knock on the door imagine if its automatically open and unlock for you but when some stranger person tries to enter then the system is locking that person and immediately inform to you or report generated on your email id or even on your cell phone. This is only going to happen due to the internet of things.

Technologies like wireless communication are in demand in many areas many vehicles are equipped with this technology. wireless communication plays the role to communicate with the others cars on track via an internet or within car using sensors. by using this we can have the connection between vehicle to roadside infrastructure, vehicle to vehicle, a vehicle to cloud communication and vehicle to cell phones.

Technologies like wireless communication are in demand in many areas many vehicles are equipped with this technology. wireless communication plays the role to communicate with the others cars on track via an internet or within car using sensors. by using this we can have the connection between vehicle to roadside infrastructure, vehicle to vehicle, a vehicle to cloud communication and vehicle to cell phones. We have the infotainment like traffic information, voice communication, current road status whether it is smooth or rough. If the driver is over speeding then it is reminding the driver to slow down the first thing which comes to any person mind is safety it should be safe for the user and the other road user too.

By using another technology, swarm intelligence we can get the real-time information on road if any other vehicle passed through that road and if that road consist of potholes or smoothness is not there than that condition Was already encountered by the previous vehicle which has gone through that road know you can have idea about the communication and collaboration of the vehicle among each other which are showing the information about road condition, traffic information by getting this information it will be easier for the user to drive and to take the decision they all are depending on the information which we get from the car ahead of you.

For the connection of the vehicle require an enhanced connectivity and strong communication between the vehicle to a vehicle then only this vehicle can be connected to the roadside infrastructure, Wi-Fi, internet 4G,5G from unit to unit. This paper presents a combination of the Android system with the automation as smartphone technology is successful that we can't imagine a day without a cell phone. if this technology is added to the vehicle then it will be beneficial to track the GPS location of a vehicle and predict the location by longitude, latitude data. this vehicle data which are trace can be drawn on the map to identify the physical location of the vehicle.
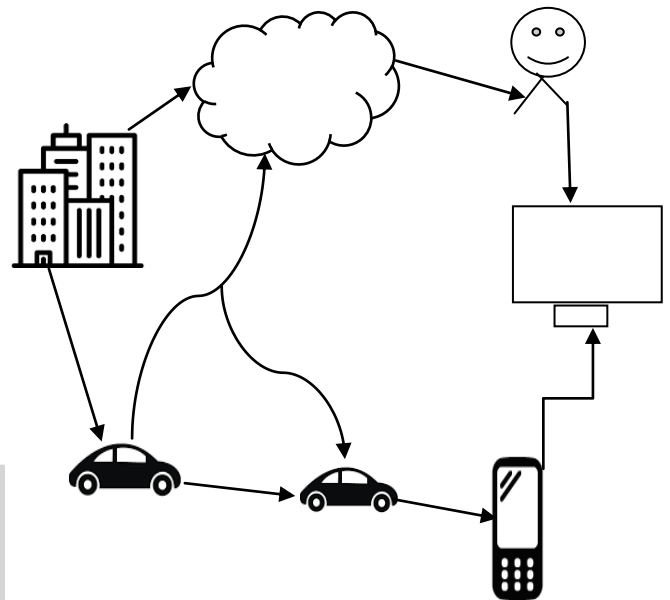

Fig1: connectivity across object using IOT

Cloud computing:

Cloud computing is a technology that uses the internet to maintain the data online irrespective of the size whether it is higher level data or low-level data it can manage and store very well.it provides low cost and scalable services to any enterprises the resources are stored in the cloud but the client does not know what Is the exact location of those resources and where it is stored. One of the important aspects of the cloud is virtualization its means physical devices are separated into many individual devices which can be easily managed and operate to perform any activity you can access to the cloud from anywhere it does not need to install on the user Pc.

 The services that are owned by the cloud can get You back as per your request. This phenomenon is called pay as you go. Some cloud provider is Google, Amazon, IBM, Bluemix.

Advantages:

- It enhances the individual capacity to use the software from any devices or from any browser.
- It is cost saving.
- It gives you enough space to store your personal data or files comfortably whether it is images or files.
- It gives advanced and well-versed management through the central station.
- It is scalable organization can be included as per there needs and can be excluded.
- Hardware is not required as every minute detailing are uploading on cloud.

Disadvantages:

- Security-related issue when it comes for financial activity.

- It Can be the victim of a natural disaster if the geographical location of the server is in another country and user is in another country location so the user may suffer that lost if any harm to the server due to disaster.

- Transferring the data from one host to another might give you interoperability issue

- Lack in redundancy if purchased a proper plan so it required extra cost

- If we want to change our previous provider to the new one so it becomes very hectic to switch your provider and this process is painful.

LITERATURE SURVEY

Following are some papers which are published in concern with IOT and cloud computing.

1. Internet of things approaches to cloud-based smart car parking has been an interest among the researchers yacine atif, jianguo ding, Manfred A jeusfeld gives a multi-layered system of PSP business model and explained each layer in detail.

This paper gives the solution of the parking problem and they have created a new source of revenue apart from this they also introduced us with the new entities in the intermediate market. And this market is also known as PSP. Whatever the information is recorded that are shared on the cloud platform for this activity car parking lots are connected with the internet providers.

2. Smart city implementation model based on IoT technology has been an interest among the researchers jaehak byun, sooyeop kim, jaehun sa, sangphil Kim, yong talshin gives an illustration on IOT based model which are helpful to industrial world to understand the IOT business.

In this paper a detailed information regarding standard and component are discussed and whatever the business model is there in which the iot is implemented for the smart city that business model is examined.

This paper was to represent the present practical knowledge about the service models using the technology and this model gives the services like smart parking to avoid the inconvenience of illegal parking.it gives the real-time scenarios of the available parking.

3. Smart vehicle implementation using the internet of things and cloud computing extension by Adhish Nanda and Varsha Photur illustrate that vehicles are connected with each other through internet access and offer you pay as services.

They are also having access between vehicle to vehicle, a vehicle to infrastructure, the vehicle to cloud communication links, vehicle to cloud and vehicle to mobiles with the internet of a 4G network for fast transmission of data.in this paper they are utilizing the technology like cloud computing and internet of things.

4. Security issues in cloud computing by P SV Sainadh, U. Satish Kumar, S. Hariha Reddy discussed the security issues related to cloud computing. now a day's technology like cloud computing is in great demand it gives the scalable access to share the pool of the different resources which were hosted in the data centre.

They give us the solution to the large front investment and financial risk-oriented issues though cloud computing gives you a great advantage for the user still, there are some lacunas.to overcome this lacuna they discussed security issue, requirement, and challenges regarding cloud computing.

5. Survey on mobile cloud computing MCC its security and future research challenges by G. Kishore Kumar and Dr. M. Gobi enlighten the current trends in mobile cloud computing in an area like security issues challenges and associated researches challenges.

Its shows the cloud computing is tremendous increasing in every area so the collaboration of cloud computing and mobile cloud computing together know as mobile cloud computing MCC. they also give us the architecture of MCC for better understanding and why the security is needed in MCC.

6. Establishing the cloud computing security in trust-based cloud service provider by Prof Dhanshri Patil, Ms Pranita Patil and Ms Priyanka Patil illustrate that the quality of services we are getting from the cloud is the most important one as customer point of view, customer uses these services as per there requirement.

Example: backup, recovery of the data and if in suppose if the data is lost or damage the business may get affected therefore it is very sensitive issue to tackle.

To support the customer reliability this paper offers a framework of cloud service provider which involve the competence of risk interaction and backup recovery. They also represent the case study to present the application of the different approaches.

7. The glimpse of cloud computing by Anushka Gaur and Anurag Jain.

This paper illustrates the detailed concept regarding the cloud computing and its architecture, services and the deployment models it also gives light on the concept of virtualization after this. They discussed the application, advantages, and disadvantages of the cloud.

8. An overview of cloud computing platform, security issues, and applications by Akshat Ajabro Uike, Dr M. A Pund, and Sangram S. Dandge gives the issues

and solutions related with the cloud and discussed the current issue of cloud computing industry

9. A smart vehicle monitoring system using IOT by N. Upendra Yadav and Prof Kamalakannan describe a design of information system that monitors the vehicle and condition of the vehicle on road.

it also gives you the current location of the vehicle and exact road condition. It can detect the vibration when a vehicle meets with the accident. by using GSM and GPS modem you can detect the vehicle.

10. Internet of things for the smart vehicle by Andrea Zanella and Lorenzo Vangelista illustrate the urban internet of things system the main reason to design is to support the smart city vision.

This paper provides a comprehensive survey of the different protocol, architectures, and technology related to the cloud and internet of things. furthermore, it discusses the technical solutions and guideline adopted in the Padova project Italy.

METHOD

From the architectural point of view, it provides an innovative vehicle navigation architecture so we proposed a 2-level architecture. each level is explained in detailed. Now we can imagine the road condition with such wireless technology. Internet, internet of things and cloud computing with the help of such things the system will become more powerful, dynamic, flexible to use, and fast and convenient for the vehicle and the other road user.
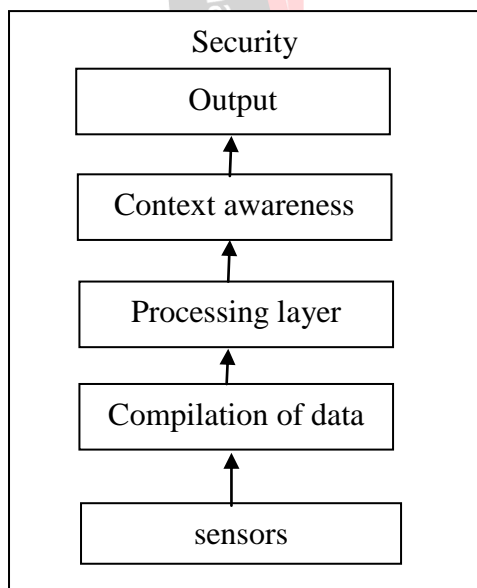

Fig2. Physical architecture

Tire1: physical level architecture:

Sometimes many sensors we are implementing and it is admissible to say that this sensor can form a body area sensor network as it is deployed to provide real-time scenarios of the road and gives every minute detail of any hurdle which is going to come in our way.

In this physical level communication within the vehicle is through BASN (body area sensor network) this sensor can communicate every minute details of the processes of vehicle in hip-hop manner and we are communicating to the outside world with the help of WI-FI internet, wireless networks, GSM to share the information with the other devices or vehicle. By using GPS/GSM devices driver can reduce their time on the road.

In the last layer, the sensors which are deployed gives the information about the temperature pressure and security context of the vehicle. Then in the next level, we are collecting raw data (low level data and high-level data) from the sensor layer, in the third level whatever data is collected that information goes to the processing unit

After that context awareness is concerned with the particular data circulation and handling of the data. Finally, it gives the accurate output for the vehicle whether the vehicle is overspeed, slowdown or stopped

Tire2: Communication level

Due to the tremendous growth of the internet of things and cloud computing, it becomes flexible for the user of the vehicle to communicate with the outside world. Communication-based service in real time mainly consists of different services which will be obtained through wireless technology. in tier2 communications proceed with the vehicle to vehicle, the vehicle to cloud communication links, a vehicle to any pedestrian, vehicle to infrastructure, within vehicle and vehicle to mobile.

V. OBJECTIVE

The main goal to achieve in the project is to deploy the IOT and cloud computing concepts in the vehicle, therefore, we started with the vehicle location identification module and using raspberry pie 3 with inbuilt WI-FI and Bluetooth LE and sim 800 GSM modem module with SMA antenna. Sim 800 provides the location information of the connected vehicles and update that information on the cloud.
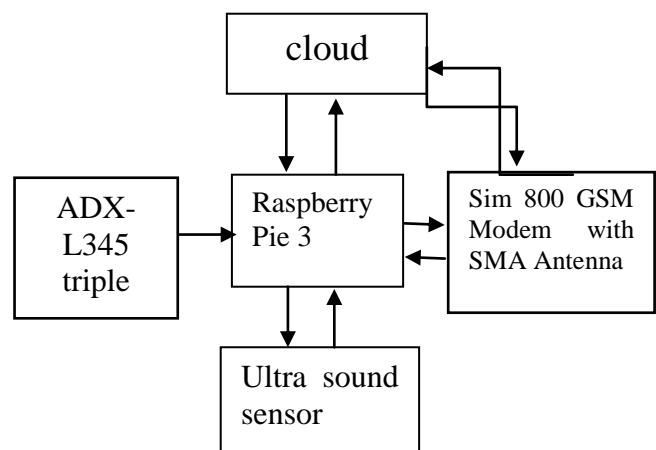

Fig3.circuit diagram of hardware

ADX-L345 triple access accelerometer module gives you previous information of any vehicle if any vehicle has gone through ditch it will give you information about that ditch and also indicate the road condition and traffic on that particular road is heavy or not. Then ultrasound sensors provide you with sound signature or ultrasound signatures of a road and that all information will be updated on cloud and other connected vehicles.

VI. HARDWARE COMPONENT

Raspberry pi 3:

It is a mini computer you can plug to TV, keyboard, monitor, LAN cables.it has broad com BCM2387 chipset and 1.2 GHz Quad-core ARM Cortex. 64-bit processor dimension of raspberry is 85*56*17mm. 40 GPIO pins are there and each is identical to its predecessor,27GPIO, UART,3.3 and 5v sources are enable this great hardware.it also support external USB device the only thing which is advanced in this system is connectivity with inbuilt Bluetooth Low Energy and wi-fi on board. It is easy to handle and there is no power button to this model if you switch on, the power is applied to a system and to turn off simply remove the power

Ultra sound sensor:

It is important in measuring the distance between object this sensor has two modes first is a sender and second is a receiver and they transmit the ultrasonic waves in the air to get the object verified and at the same time, it reflects back toward the sensor.
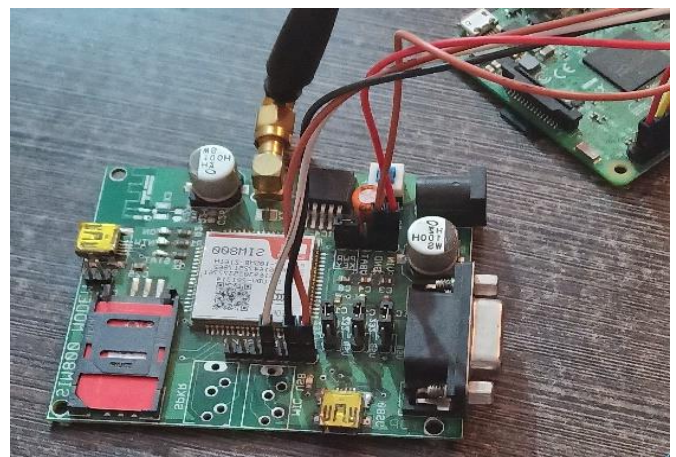

It is used to detect any obstacles and map that obstacles surrounding the sensor by rotating in the way of a vehicle and gives you the result.it also measure the depth of ditch and pits.it can be used with both microcontroller and microprocessor here, we are using with raspberry pi. The trigger and echo pins are both input pins to start the measurement the trigger pins have to make 10 uS and then you can turn it off. This process starts the ultrasonic wave at the frequency of 40Hz and receiver start giving you the result.

SIM 800 GSM modem module with SMA antenna:

SIM 800 GSM module which is having inbuilt GPRS system was designed to fulfill the needs of the global market. It is a device which measures the change on the velocity of an object and while working the frequency of this modem is 850MHz.it gives you near about all space requirement for the user as it is the priority to cover the needs of the users. moreover, there are 68 SMT pads which are used as an interface between the customer and the module.

The most important feature of this module is the Bluetooth function which was not there in SIM 900 module. This module is designed in such a way that power should be safe up to 1.2mA. lastly, it provides the TCP/IP protocol and extends the AT commands which are useful for the data transfer.

SIM 800 GSM modem module with SMA antenna

ADX L345 triple axis accelerometer module: It is a small and thin module with low power supply and the consumption

of power is also low. ADX is well versed in a measurement of static data of gravity as well as dynamic acceleration is resulting from any shock its support 3.3 voltage input. This module gives you information of inclination of changes upto1.0 here some advance sensing is introducing which are top sensing and free-fall sensing.

Top sensing detects single and double taps whereas the free-fall detects if the module of the device is falling, they are following the FIFO mechanism i.e. (First in first out) to store data apart from this it is also having communication interface 12c/SPI which recall the size of 20 * 15mm. its sensitivity ranges from +/-2G to +/- 16G. and finally output data rates from 10Hz to 3200Hz.

ADX L345 triple axis accelerometer module (google image)

VII. CONCLUSION

This paper will try to provide you some solution for the common problem that we have outlined and defined as the platform of cloud computing as the vehicle industries has drastically enhanced so we have introduced the concept of cloud computing in real time service that successfully overcomes the problem of traffic information, collision avoidance, smoothness of road and many more.

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