ROAD SURFACE CONDITION DETECTION SYSTEM

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Abstract: The idea is to develop a Road surface monitoring System to Identify and Intimate the details to the specified user. This helps to know the current condition of the road based on the Vehicular movement. The road condition can be checked by the conventionally parameters such as potholes, bumps, slipperiness of the road and accident spot can be intimated to the user in advance. The traffic congestions can be avoided as the safe route is selected by the user to travel. The route is updated by RSU (Road Side Unit) and OBU (On Board Unit) using Fog computing. The user can select the route from the specified source and destination. The data which is sent to the server is encrypted to provide privacy over the data. The signcryption method is used to make sure the data is safe and reliable. The information from the user is collected using Fog Computing Technology.

Keyword: OBU (On Board Unit), RSU (Road Side Unit), FOGNODE, GPS (Global Positioning System), RISC (Reduced Instruction Set Computer).

I. INTRODUCTION

FOG computing technology helps in retrieving the road condition data from the user travelling on the particular road. This technology works on the basis of using the RSU (Road Side Unit), OBU (On Board Unit) and sensors. This System actually reduces the accidents due to sudden braking of vehicles. This System works based on the fog computing the data is transmitted to the server using the RSU (Road Side Unit). This is done as to update the next user using the same route for updating the road condition updates. The fog Node which sends the data to the cloud server which organizes based on the timing and sends the recent updates to the user based on request initiated. The OBU (On Board Unit) sensor collect each and every information from the user such as the seat belt, drunk, jerk level of the road by the suspension sensor. The RSU (Road Side Unit) are the towers which are placed in each and every area to update the data from the each and every OBU (On Board Unit) travelling along the route. The route is tracked by GPS (Global Positioning System), Geo-distribution tags is used for effective mobility of the system. The system collects the information provided by the other road users and also protects the privacy of the users by not revealing the user details. The Detailed working of user data collection to the cloud from the OBU (On Board Unit) and RSU (Road Side Unit) is described in Fig 1.

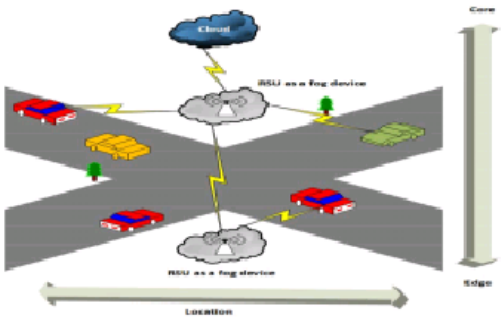

Fig 1 [6]

II. LITERATURE SURVEY

A literature survey contains existing reports of documents based on the same technology and various analysis of the related work based on the project to be executed as a reference.

***TITLE 1*:** Fog Computing and its Role in the Internet of things. [1]

***Author Name*:** Flavio Bonomi
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Abstract: Fog computing extends the Cloud Computing paradigm to the edge of the network, thus enabling a new breed of applications and services. Defining characteristics of the Fog are: Low latency and location awareness, Wide-spread geographical distribution, Mobility, Very large number of nodes, Predominant role of wireless access, Strong presence of streaming and real time applications, Heterogeneity. we argue that the above characteristics make the Fog the appropriate platform for a number of critical Internet of Things (IoT) services and applications, namely, Connected Vehicle, Smart Grid , Smart Cities, and, in general, Wireless Sensors and Actuators Networks (WSANs).

***Conclusion*:** The node RSU(Road Side Unit) receive the information from source region and then the received info will be encrypted before decrypting .The Fog node need to decrypt the info , on implementing OBU (On Board Unit) public key for FOGGING then verification starts for verifying the signature and decrypting the information because of signcryption vehicular safety promotes high predictability and strong presence of streaming these features are considered as highlights and high energy consumptions in considered as cons.

***TITLE 2*:** A Survey of Fog Computing: Concepts, Applications and Issues. [2]

***Author Name*:** Shanhe Yi, Cheng Li, Qun Li
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Abstract: Despite the increasing usage of cloud computing, there are still issues unsolved due to the inherent problem of cloud computing such as unreliable latency, lack of mobility support and location-awareness. Fog computing, also termed edge computing, can address those problems by providing elastic resources and services to end users at the edge of network, while cloud computing are more about providing resources distributed in the core network. This survey discusses the definition of fog computing and similar concepts, introduces representative application scenarios, and identifies various aspects of issues we may encounter when designing and implementing fog computing systems. It also highlights some opportunities and challenges, as direction of potential future work, in related techniques that need to be considered in the context of fog computing.

***Conclusion*:** Promotion for oxymoron of switches called routers that has a capacity to become new servers and can reconstitute the operating System on our own style.

***TITLE 3*:** Towards vehicular Sensor Networks with Android Smartphone for Road Surface Monitoring. [3]

Author Name: Girts Strazdins
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14 Dzerbenes Str, Riga, LV 1006, Latvia.

Abstract: Road surface monitoring, including automated pothole and bump detection, is essential for both drivers and road maintainers. This paper presents preliminary results from an ongoing experimental study with the central question: is a smart phone with Android operating system capable of performing road

surface monitoring using participatory sensing approach? The test results with 3 Android models and several tracks are presented and demonstrate feasibility of the approach.

***Conclusion*:** Our paper has innovations have encouraged and improved the importance of cloud to provide reliable services to clients.

Fog computing is used and has its own real favor in a privacy-preserving protocol for Improving security in vehicular crowd sensing and enhancing the road surface condition by monitoring the system using fog technology. Sensing may consume high significant amount of energy on prolonged runs and limited confidence is a considerable drawbacks in Girt case.

***TITLE 4*:** Efficient and provably secure Certificate less Signcryption from Bilinear maps. [4]

Author Name: Wenjian Xie† Zhang Zhang
College of Mathematics and Computer Science Guangxi University for Nationalities
Nanning 530006, China.

Abstract: Signcryption is a cryptographic primitive that fulfills both the functions of digital signature and public key encryption simultaneously, at a cost significantly lower than that required by the traditional signature-then encryption approach. In 2008, Barbosa and Farshim introduced the notion of certificate less signcryption (CLSC) and proposed the first CLSC scheme [2], but which requires six pairing operations in the signcrypt and unsigncrypt phases. In this paper, aimed at designing an efficient CLSC scheme, we propose a new efficient CLSC scheme from bilinear maps, which requires only two pairing operations in the signcrypt and unsigncrypt phases and is more efficient than all the schemes available.

***Conclusion*:** This shows the way how the data is encrypted and decrypted using signcryption algorithm. The feature is to locate the data from the map using latitude and longitude.

***TITLE 5*:** An Efficient Message Authentication Scheme for Vehicular Communications. [5]

Author Name: Chenxi Zhang, *Student Member*, *IEEE*

Abstract: we introduce a novel roadside unit (RSU)-aided message authentication scheme named RAISE, which makes RSUs responsible for verifying the authenticity of messages sent from vehicles and for notifying the results back to vehicles. In addition, RAISE adopts the k-anonymity property for preserving user privacy, where a message cannot be associated with a common vehicle. In the case of the absence of an RSU, we further propose a supplementary scheme, where vehicles would cooperatively work to probabilistically verify only a small percentage of these message signatures based on their own computing capacity. Extensive simulations are conducted to validate the proposed scheme. It is demonstrated that RAISE yields a much better performance than previously reported counterparts in terms of message loss ratio (LR) and delay.

***Conclusion*:** Very simpler technology. New innovation in Road sensing technology.OBU and RSU are newly emerging nodes. A chance for user secrets can be effect. Attacker can able to insert faulty info in cloud.

III. EXISTING SYSTEM

The current system used for detecting the road surface condition is not user friendly, the updates of the road can't be intimated so soon as possible. The contractors check the quality of the road and relay the road if the entire stretch is damaged. The road updates can be known on an average of 2 weeks based on the major road incidents. The road condition is not intimated to the user as it can lead to more number of fatal

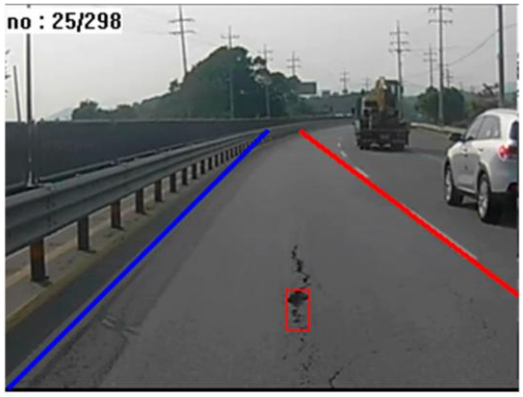

FIG 2 [6]

accidents. When the data is updated based on the user feedback then the privacy is not preserved. There could also be a wrong information updates given by the user feedback. Usually the road updates is done using the news papers and random monitoring of the road surface with sensing techniques. The data which is not updated using Fog computing as a result the large data in accumulated at once which causes distortion in the data and loss of information. This causes loss of information due to peak traffic in server.

IV. IMPLEMENTATION SYSTEM

1) ***WHAT IS OBU?***

OBU-On Board Unit

The OBU (On Board Unit) consists of the sensors to detect the Junk level, driver seat belt, drunken status of the driver and send the information to the server. The OBU (On Board Unit) collects all the data from the user and send the details in an encrypted format to the RSU (Road Side Unit) to preserve the privacy of the users sharing information.

- ***Seat belt detection*** **:**

The seat belt detection system detects the lock of the driver seat to insure safety for the user. This works based on the principle of Hall Effect of magnetic sensors placed in the lock pad. The seat belt buckle presence sensing hall device is used to find the lock is placed or not.

- ***Drunk detection*** **:**

The drunk detection which helps the user not to drive the vehicle as the Breathometer is used identify the user is drunk or not. When the vehicle starts it air while breathing and intimates the user such that accidents can be avoided.

- ***Jerk detection*** **:**

This jerk detection is the data recorded from the suspensions of the vehicle. Based on the hydraulic actuated suspensions the details of the jerk level can be calculated, as the movement of the normal level of the sensor to the new level and changes in position is used to detect the jerk.

2) ***WHAT IS RSU?***

RSU-Road Side Unit

The RSU (Road Side Unit) which is a type of signal towers placed in a each and ever area to transmit the data received from the user using the OBU (On Board Unit).The Fog Computing Technology is used to send the repeated data and the important data to the sever and the rest of information is stored in the OBU (On Board Unit).The information is stored based on the lantitude and longitude of a the OBU (On Board Unit).The data is encrypted and transmited to cloud to preserve the privacy of the sent information of the particular user and the location of the user.

3) ***WORKING MODULES***

This project is based on Fog computing technology to avoid crowding of data at the server side. The Road surface Condition Monitoring System Uses traditional OBU (On board Unit) and RSU (Road Side Unit) as

Fog Node. In General OBU (On Board Unit) is Responsible to monitor the road condition and forward the content to the cloud. While uploading the information to the cloud OBU (On Board Unit) must encrypt the Information by using signcryption algorithm. The RSU (Road Side Unit) uses Key generation method to make sure the data to be encrypted and uploaded into the server. The data can be retrieved by the user

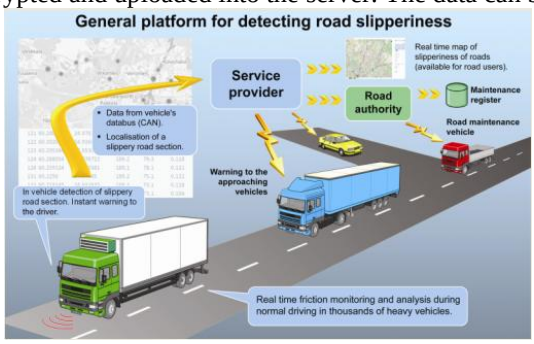

FIG 3 [6]

based on the request made for the particular route. Fog Node is Responsible for Verifying the truthfulness of a message and forwards the information to the cloud.

a) ***Network formation and sign generation:***

The Fog node is the one used to generate the key for encrypting the data from the sender side to the cloud. The data collected from the RSU (Road Side Unit) is a unique id. This is generated to know the location and to update the data. The details from the OBU (On Board Unit) are collected such as the driver details and the licence number. The Fog node is created on each and every area and location to make the updates faster such that user can get information as soon as possible. Each OBU (On Board Unit) generates a key for encrypting the data and decrypting the data by using signature.

b) ***Path generation:***

The OBU (On Board Unit) generates the signature to encrypt and decrypt the data from the server. The user has to select the source and destination to be travelled. The system monitors and checks all the safety parameters and sends those details to the server. The OBU (On Board Unit) also collects the information such as the jerk level from the suspensions, seat belt lock sensor to know the driver has used it or not, speed sensors are used to detect the motion of the vehicle. All the details collected are encrypted and forwarded to the cloud to protect the privacy for users. The OBU (On Board Unit) sends the data to the nearest RSU (Road Side Unit) by signcryption. The RSU (Road Side Unit) will collect the information based on the unique id and reverse the process to get the decrypted information from the user.

c) ***Path updates:***

The information received from the RSU (Road Side Unit) (Fog node) are found in encrypted formats these data are decrypted to get the actual data, the process of decrypting the data of OBU (On Board Unit) using

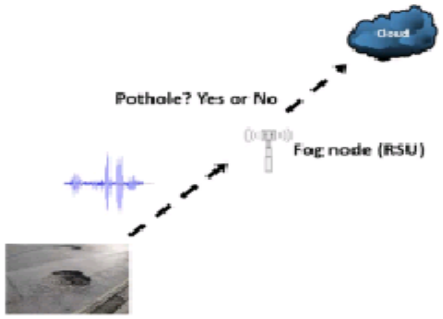

FIG 4 [6]

a public key Ensures the received data is matched with the RSU (Road Side Unit) present in that location. The signature and the key are matched if unmatched the data can't be received. If the key matches with the

public key then the data is forwards the information to the cloud server admin. The admin controls the information to be sent to the user based on the request made. The main responsibility of the admin is to monitor the entire process of updates and provide the best safe path to the user. The user can give a request based on the application created to provide the source and destination by the user.

d) ***User Requests:***

The user can login by creating a login id. The login id is a unique for each user registered. An application is created to make sure the user request is obtained and the safest route is displayed back to the user based on the given source and destination. The route also shows the user the number of hospitals, petrol pumps and the accident spots in advance to make sure the user can plan and travel safe. The user gets information about the public transportations present in that Route. The application is provided with the IP address so as to retrieve the data from the server and display it to the user.

V. SYSTEM ARCHITECTURE AND REQUIREMENTS

A. HARDWARE REQUIREMENTS

1) SYSTEM HARDWARE REQUIREMENTS

The following system requirements are required for the process of the entire project execution such as an Android mobile for the user to navigate and to get the route information and also know the live updates of the road condition. The system required to process the program requires hard disk of about 500 GB or above, ram of about 4 GB or above, processor of about I3 or above. The system is used for the user to have a user interaction with the android mobile by using CSS for style sheet and html for web page development. The user can have links to access the data and also update the details of the user. The OBU (On Board Unit) kit is used to collect all the information of the user based on the road condition and the user safety is also taken into consideration.

2) EXTERNAL HARDWARE ARCHITECHTURE:

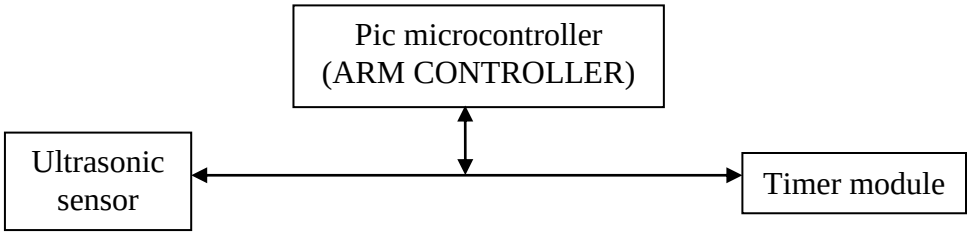

FIG 5

a) ***Pic microcontroller:***

The Pic microcontroller is used to get all the information from the sensor module and pass those data to the server. The ARM Processor is developed based on RISC (Reduced Instruction Set Computer).The ARM is a multi-core processor it could process MIPS Instruction with High speed data The ARM which has the entire control over the data transfer from the OBU (On Board Unit) to the server.

b) ***Ultrasonic sensor:***

The Ultrasonic sensor has two major operations such as trigger and echo. Trigger is the part where the signals are sent and echo is the part which receives those sent signals. Based on the time the distance is calculated. If in case there is no signal received by the echo then there is a problem detected on the surface is detected.

c) ***Timer module:***

The timer module is used to make sure the time could be pre-set well in advance, to measure the distance between the road and the vehicle.

B. SOFTWARE REQUIREMENTS:

The following software system requirements are required for the process of the entire project execution such as language used to develop the software is Java, The system operating System requirement is of about Windows 7 or above, The software packages are run and executed using Net bean 1.8 and JDK 1.8, The storage is done using Mysql 5.0 to have a collection of values to run the system, The overall connection to run the data is done by using apache tomcat 6 server.

VI. WORKING OF ROAD SURFACE CONDITION DETECTION SYSTEM ARCHITCURE

The outline of the project is to collect the information from the user and process the data. The request is

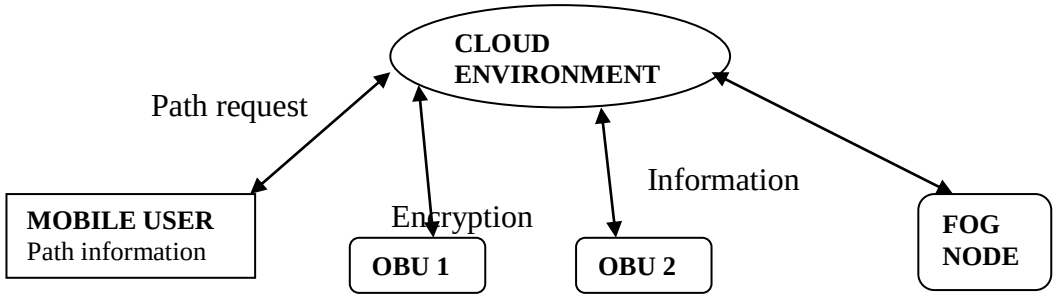

FIG 6

is obtained from the user device and the data is collected from the cloud server, the data from the FOG Node gets the data from RSU (Road Side Unit). Each time when a user starts to travel then the route updates are done using the RSU (Road Side Unit) and OBU (On Board Unit). The user who is moving in a particular path will get all the updates of route information in advance as the regular usage of the route for specific persons. The Fog Node (RSU) (Road Side Unit) collects all the information from the OBU (On Board Unit) about the user, the route updates and the road condition data is also updated. The information from the OBU (On Board Unit) is sent to the RSU (Road Side Unit) by encryption and signature is used to prevent user privacy leak. The data once is sent to the server then these data are organized based on the GPS (Global Positioning System) location and retrieved to the user based on the route updates.The FIG 6 shows the data transfer from the user to the server and the data could be requested from the server to user.FIG 7 shows the detailed transfer from the car to the node's present in each area to update the information to the server.

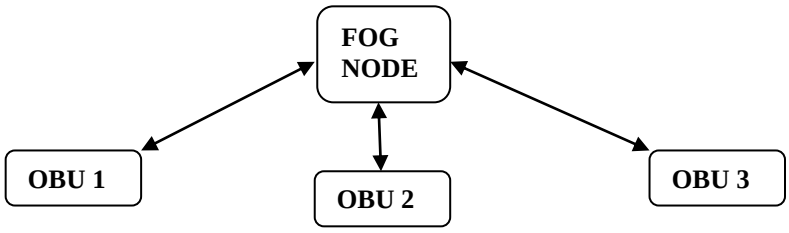

FIG 7

VII. WORKING RESULTS

The module which actually explains the detailed interaction with the user based queries to update the server about the road condition and to make sure the other user is updated about the condition to have a change of route information. The selection of the area is required as to update the data into the server.

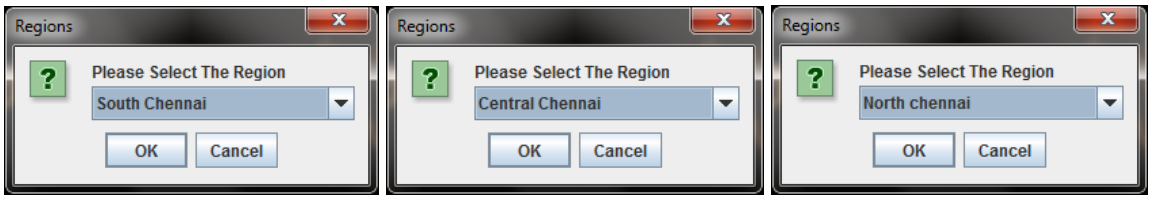

FIG 9

The selection of RSU (Road Side Unit) based on the request of the user location is selected. The user updates are processed and the OBU (On Board Unit) sends the information to the RSU (Road Side Unit) and the Road condition update is done to intimate the next user. The User Vehicle information and the credentials of the user is also know to the RSU (Road Side Unit) by the storing the data in the database.

FIG 10

The user ID, Name, Contact Number,Liscence Number Are updated even with the car Details.The user can also select the Source and Destination.The Route is updated based on the information of the user from the server.The Route can be selected based on user's request such as Fast, Comfortable, Safe.

VIII. ADVANTAGES

The position of the vehicle can be identified as the movement of vehicle can be checked by using the GPS. The Road condition live updates show the user safe way to travel and have a smooth travel. The data is made sure it preserves the security as the signcryption make sure the data is made secure. The accurate location of the vehicle can be found and theft can be avoided.

IX. CONCLUSION AND FUTURE WORK

The System ensures the road condition is good and safe to travel by the user. The System also updates the live tracking of the road condition and gives the response to the user when requested. The updating of data from sensors should be done in a regular time interval or else the data can't be used. The rout should also inform the users about any change in route by some notification so that the users are updated as early as possible.

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