Abstract— is collect the information, reporting to

Business

Abstract— This paper will discuss about Intelligence Pothole Detection Sensorand Monitoring System using smartphone technology which can alert all thedriver in avoiding potholes on the road by giving them warning throughsmartphone device and car sensor.

If the car approaching the pothole, thesensor will detect it and give warning alarm to driver so that driver can avoidit. Data from car sensor will then relate and transfer the information with anapplication in driver phone to restore the data about the pothole. Driver alsocan report the pothole to the right authorities using data collection usingthat application. It can be used in government sector for them to know aboutthe pothole that occur in certain area. Keywords—pothole; car sensor; style; pothole detection system; government

I. Introduction With the increasing number of vehicle inthe road, there has been increasing load on infrastructure such as road and thetraffic is growing day by day too.

In cities across the world, ministries, department and agencies are concerned with road maintenance. They had to spendhuge amount of money yearly in maintaining and repairing the road such aspotholes. Worsened road condition are one of the increasing problem that roadhas facing. This is because of disruption in thesurface of a roadway where a portion of the road material has broken away, leaving a hole 1.

Rains, oil spill and industry lorry which is big areone of the reason causing the pothole and because of this road condition, itcan cause an accident too. These become very important to get the informationfor the bad road

condition which is collect the information, reporting to theauthorities, distribute to other drivers so that it can be warn and monitoringthe pothole using the system. It is important to make the system is attractiveand user friendly so that system can be accepted by wide user community.

II. problem background The system consist two component which isone is mobile device and other is the sensor on the car. Mobile device usingthe application will store the data on the database.

Government had always havean issue with this pothole. Sometimes, they didn’t know that the pothole hasbeen there for a long time. With this system, user can report the pothole thathas been detect by them to the government and authorities.

At the same time, when car sensor detecting the pothole, user or driver can avoid it and it mightsave them from any incident. This device or sensor are responsible to forwarning the driver about occurrence of the pothole.

III. research backgroundThe current and past trend on thisresearch area are the evolution from installing the device or sensor invehicles to using the sensor and data in smartphone. Post processing to realtime detection, machine learning approaches and threshold based detection havebeen using for this research about pothole detection system. 2.

The rise ofmobile and sensor technology has been inspired by all this and this research isto aim that everyone can use it and introduces the improved

techniques. Basedon Mohan, P. et. al in 3, he was the first to document a system usingsmartphone sensor.

Together with data from the accelerometer alone, it use toimplement a virtual re orientation and in addition made use of the magneticvector values obtained from the magnetometer sensor. In 4, it stated thatpioneer in real-time detection of road conditions and this was made possibleand effective with their classification algorithms: Z-Diff and Z-Tresh. Accelerometerand GPS for data collection are mostly use for this method.

Some of this methodtoo are using machine-learning algorithm.
IV. Literature reviewA. Method using Specialize Sensor There are several research and methodthat are using specialize sensor that put in the vehicle. Below table arerefer.

Research Model / Propose System Description Distributed mobile sensor computing system called Cartel 5. · Collecting and process data will be send to portal based upon the continuous queries which are processed by continuous query processor on remote nodes and it’s include a set of sensors installed in vehicles. · Use sensors like GPS for monitoring the movements of vehicles. · CarTel includes, CafNet a networking stack that uses opportunistic connection (e. g. Wi-Fi, Bluetooth) to transfer information between portal and remote nodes.

· currently does not offer a way to aggregate information gathered across different users and it does not include machine learning; it just replies to the queries based upon the data stored in relational database Pothole Patrol system 6 · 3-axis accelerometer and GPS mounted on the

dashboard to monitor road surface · Also differentiate potholes from other road anomalies. · collects the signals using accelerometer and use machine-learning algorithms to identify potholes · signals are then passed through a series of signal processing filters, where each filter is designed in such a way that it will reject one or more non-pothole events (manholes, expansion joints, railroad crossing) RCM-TAGPS System 7 · Collects the sensor data using three-axis accelerometer and GPS · Sensor data has 4-tuples: current time, location, velocity and three direction accelerations. · Cleaning the data before processing or analyzing it to deal with technical challenges like GPS error, and transmission error · Analyses the Power Spectral Density (PSD) to detect pavement roughness using Fourier transform. · The International Roughness Index (IRI) is calculated based upon PSD. The pavement roughness is then classified in four levels (excellent, good, qualified and unqualified) according to, the Technical Code of Maintenance for Urban Road CJJ36-2006, one of the industry standards in the People’s Republic of China. · The system provides the evaluation of a section of road based upon its roughness.

However, this system does not provide the proper location of pothole, bump or manhole. B. Method Using Smartphone SensorThere are someresearch using the method of smartphone sensor too. Below table are refer.

Research Model / Propose System Description Rich monitoring of road and traffic conditions using mobile smartphones 2 Detect potholes, braking, bumps and honks using accelerometer, microphone, GSM radio and GPS sensors present in smartphones. Triggered sensing where a high energy-consuming sensor e. g.

GPS, microphone, is activated by a low energy-consuming sensor e. g. accelerometer, or cellular radio making the system energy efficient. Relevant location can be tagged with sensed information such as honking or bump, and the researchers employed GSM radios for energy-efficient localization by using strongest signal (SS)-based localization algorithm This system uses an algorithm based upon Euler angles for reorientation. The sensor is virtually rotated along the vehicle’s axis using pre-rotation, tilt and post rotation angles (Euler angles). Real time pothole detection using android smartphone with accelerometers 4 Detects events in real-time and collects the data for off-line post-processing.

Data is collected using 3-axis accelerometer sensor present in Smartphones Four algorithms to detect a pothole. The first two algorithms (ZTHRESH and Z-DIFF) are for real-time detection and the other two (STDEV (Z) and GZERO) are used for off-line post-processing of data. This system gives a true positive result of 90% (approx.). Wolverine 8 Uses smartphone sensors for traffic state monitoring and detection of bumps.

It uses accelerometer sensor to collect the data. The device (phone) is to be reoriented as it can have any arbitrary orientation when kept inside the vehicle. This system reorients the phone in two steps using accelerometer and magnetometer. Phone’s axes are aligned with geometric axes. A rotation matrix is formed using Gravity Vector given by accelerometer and Magnetic Vector given by magnetometer. This rotation matrix represents the angles of rotation of device’s axes to align with geometric axes.

This system detects two events i. e. braking and bump.

The bump event is detected by the standard deviation on window of one-second duration with sampling rate of 50 readings per second over the z-axis value. The braking event is detected by using the difference between the maximum and minimum value within a window for y-axis value. This system gives 10% false negative rate for bump detection and 21. 6% false negative rate and 2. 7% false positive rate for braking detection. Mobile phone sensor to detect driving behavior 9 Mobile phone application that uses GPS, accelerometer and microphone to collect the data. Detects road and traffic conditions along with driving behavior. This application is used to detect various events based upon the patterns observed and does not use machine learning.

Completely based upon the patterns obtained from the sensor data. CAse studyA. Intelligent Smart Selangor byMBI Throughcollaboration between Selangor local authorities and Google Asia Pacific underthe Waze Connected Citizen Programme, since 2016, Selangor Motorist can file acomplaint about pothole via Waze. Menteri Besar Selangor Incorporated hasdevelop Intelligent Smart Selangor 12 local council in Selangor. It tracks theworkflow of local councils, down to the officer in charge. Dr Fahmi Ngah, fromSmart Selangor Delivery Unit said that, collaboration with Waze as good becauseit leveraged on reports submitted by Waze user. Through Selangor’s Intelligent Responsesystem, the Mayor and the President of the Municipal and District Council nolonger need to roam along the road to monitor if there is a pothole on the road, because user can directly report it through the Waze and officer in charge willget a notification about the

report. With this system, a problem regardingpothole can be solved more effectively and quickly.

It is user friendly so thatuser able to use it without any problem since all user are using the Waze andthey are familiar with the application. According to Dr Fahmi, almost a yearlater since its inception, the response has been really great and repairefficiencies have improved more since the system start to use by user. Whenuser saw a pothole on the road, user will directly report the pothole usingtheir Waze. The report will go through into this Intelligent System Selangor, and officer will get notified using this system or application that theyinstall in their mobile device. They figured that from Feb 2017 to July 2017, 5173 valid reports were received.

About half were resolved within 5 days. Theirchallenge now are to extract that data from Waze in an automated and regularmanner, process it and pass it to the local council and subsequently, theperson who is in charge of the patching job11. Intelligent Response Selangor Interface suggestion on future directions Moreexperience with variety of the scenario will be propose in the future. On thenext step, sensor will be attach on a real vehicles and measure their response. Different scenario like pothole on the slopes, turns will be apply and to seehow the sensor readings such condition. Simulation for this will be apply tooto check if this is okay to use for the future.

Based on the implementation ofIntelligence Pothole Detection Sensor and Monitoring System using SmartphoneTechnology in Malaysia, the following recommendation are made:· More representative and larger data need

to be collectedconcretely.· Traffic exposure data had to be obtain accurately as thecurrent challenge of road traffic anomalies accident.· More efficient tool for representing traffic flow andvisualize traffic on specific routes that have a pothole so it can be avoidearlier. discussion The future use on the intelligence potholedetection sensor and monitoring system using Smartphone technology in Malaysiais the system can enable the car sensor to detect, predict and share data. Thisthe intelligence pothole detection sensor and monitoring system usingSmartphone technology will make user vehicle to collect the data about thepothole location and status of potholes, manhole covers and broken drains andwill also enable the vehicles to send and receive the warning then will make adriver slow down or the car adjust its suspension setting to smooth the rideand reduce the impact.

It will then can reduce the potential for punctures andvehicle damage. When a driver avoided the pothole, it will make the care moresafety. From the sensor, it will connect to user smartphone to report on thepothole and share date to others driver too so that others know about thepothole. Authorities then will get a report from the request and will do the necessary. Conclusion This paper studied on an application ofthe mobile for pothole detecting system, detecting and reporting the surfacecondition of the road and report it to the right authorities. This method areusing sensor that place on the car that detect the pothole and data from thesensor integrated with mobile phone application. This can be used to help thegovernment on how they manage the pothole using this system.

Moreover, apothole detection approach are to make them easier to manage and immediatelyrepair the pothole using this apps. It can reduce the accident that occurbecause of the pothole.