A Review on Smart Highway System to Ensure Road Accidents & Traffic Flow

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Abstract: *The highway network system & design of highway of a country plays very crucial or vital roles in development & growth in various field like economic, social, cultural etc. So for better & rapid growth for any country we must focus on road condition, design of road, facilities for user & bad road network survey because there are many problem faces by residue people in their daily routine life. Some modern innovative technique and method are previously introduce to make or construct road smarter and resolve all problem likes traffic jams, accidents, injuries & delay due to bad road condition etc. In this paper we are working on those methods and techniques that previously introduce but not get so much of helpful as we accepted. So there is need of improvisation in previously techniques and methods and introduce some more techniques to get out of all problems as much as possible.*

Keywords: 3d Speed Breaker, Photoluminescence, Power Generation, Smart Highway.

Introduction:

Smart Highway system, whenever we hear these word, the first thing that strike in our mind is that the road should be free from traffic, it should be free from accident, it shouldn't have any damage or trench on surface, it provide good facilities to road user, traffic flow intensity should be good, it should have proper marking with road indicators and proper sighting of street. As we know very well the condition of Indian road, a survey says that in 2013, over 1,37,000 people were killed in road accidents, that means 16 people die on Indian roads every hours or 377 people die every day in which 16 children die daily on roads accident and 25 % of accident is of two wheeler. These statics was 4 year old so there is no doubt that the ratio is get increased by huge amount. Only one factor i.e. accident causes that much impact lets imagine other factors occur on road and how much they cause problem to a country. Although the road getting modernize day by day but still we have limited techniques and technology to ensure road safety & smooth traffic flow in our developing country. Road safety system could have significant impact on our economic growth. Following are the factors affecting road system; improper design of road pavements, low visibility due to heavy fog, improper marking of road, sight distance, speed breaker, lack of street light, road user behavior or mentality, banking of road, and many other which cause traffic jams, delays, and accidents. Speed breaker are used to slow down the vehicles speed and prevent accident by providing jerk to vehicles but we shall be able to use breaker as a power generation as well as to slow down speed also. Marking on road and road indicator is use to show the direction and edges of road. They are mainly important on cities roads and intersections as there is the maximum chance road accident and increase in traffic volume value and also promote road safety and

bring out smooth and harmonious flow of traffic along guided paths of travel but due to lack of street lights; the visibility of road marking is very low at night time. So its need to be improves by using fluorescent or photoluminescence. Now days in India, speed breaker is replace by 3D painting speed breaker which give effect of illusion from long distance and helps to slow down the speed of vehicles without any reflex action. But the illusion effect is not long lasting for residue people, after some time people will know there is no jerk so let the vehicle maintain the speed and chance of accident get increased. The use of newly emerging sensor technologies in traditional roadway systems can provide real time traffic services to drivers through telemetric. This paper introduces a smart roadside system that utilizes various sensors for driver assistance and traffic safety warnings. This paper shows two road application models for a smart roadside system and sensors: a red-light violation warning system for signalized intersections, and a speed advisory system for highways. Evaluation results for the two services are then shown using a micro-simulation method. In the given real time applications for drivers, the framework and certain algorithms produce a very efficient solution with respect to the roadway type features and sensor type use.

Review of Literature:

While working on this case study there are many paper had been gone through, here are some of them which describe the categories and some of the factors which are mostly responsible for the accident and traffic jams and helps to reduce their effect. This work is mainly focused on to give the detailed survey of power generation mechanism through renewable energy resources by making an analysis on the Roller mechanisms that will worker as a speed breaker. Some software is also used for modeling of mechanism and analysis of power generation so that the cost will low and material is to be low weighted. The study gives an alternative way to generate electricity by using roller mechanism (as a speed breaker) without any fuel or fossil fuel consumption. This case study is based on smart highway system (SHS) to ensure road accident and let the people knows further condition of road by using wireless sensor network. The smart highway system is design on the basis of wireless sensor network with three main components' vehicle detector/ indicator sensor, information passing sensor and a station/ sink node. The mechanisms help us to reduce road accident. This work will help in the growth of country by reduce traffic jams and road accident. The aim is to generate electricity through speed breaker mechanism. That will help to reduces uses of non-renewable resources like fossil fuel, which are used for generating electricity. A speed breaker is replace by cylinder roller which will rotate when vehicle pass over through it. And one end of roller is connected motor with connecting. This mechanism helps to produce electricity. In this study, author proposed a system to deal with present situation of road problem like W.A.L.T (Weather, accident, landslides, traffic) by using of digital sensor that will displayed acquired data on active LED display with XBee and GSM technology. The case study proposed for monitoring the accident on road. Landslide and water overflow on over bridge is detected with the help of different sensors. So that road user will easy selected fastest root without any delay. This study is to analyze the health and social consequences of road traffic accidents. The selected

method of data processing was textual analysis of documents. The theme of the consequences of road traffic accidents has been, and still is, on the front burner. Despite the fact that many states have gradually introduced harsher sanctions and measures to reduce traffic accidents, many people continue to die in traffic accidents and even more people suffer permanent consequences. Finally, a road traffic accident is a burden on the economy of a state. According to the literature, health consequences can be generally defined as all injuries associated with traffic accidents that result in long-term or permanent harm. Social consequences of accidents include the change of the quality of life of an individual, and the change in the social, family and professional life of an individual after a traffic accident, including changes in attitudes towards life.

Power Generation Through Speed Breaker: Present breakers are design in semicircular or semi oval shape in upward direction but for power generation we are designing a breaker in downward direction with long cylinder shape steel bars with specific diameter. A breaker contain five steel bars (shaft) whose both side is joint with bears for providing relative motion to steel bar when vehicles passes over the circular shaft (steel bars) its tends to rotated on their axis of rotation due to friction between tires and circular shaft. Each shat (steel bars) is interconnected with connecting belt for maintaining rpm (rotation per minute) throughout the breakers. The depth depend on minimum base clearance of most used vehicles and the length is carried out by the size of tires of most used vehicles of that area with considering factor of safety, and the arrangement of shafts (steel bars) in a such way that design length and depth will appear automatically.

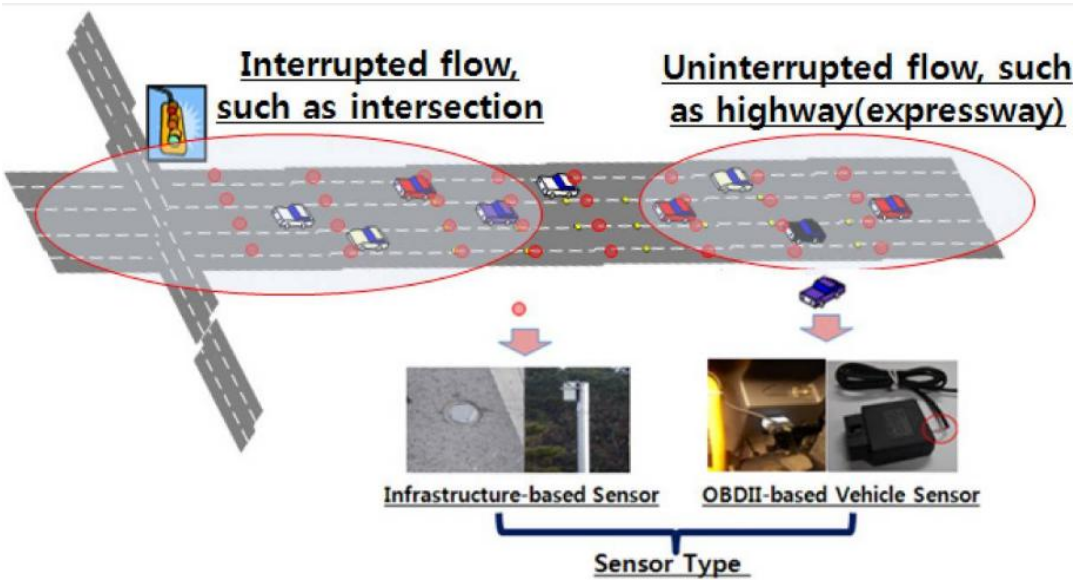
3D Speed Breakers: This concept is totally new and innovative to provide long distance illusion without any jerk to vehicles. But the effect of illusion is not long lasting for residue people, so need to be design well. Instead of replacing speed breaker with 3D painting we will reduce the height of breaker in such way that low base clearance vehicle pass through it easily with les jerk and provide 3D paint on it so that it give illusion height of breaker. When a road user is going to pass breaker they will able to visualize height of breaker and will reduce speed. Basically it's an intermediate stage of 3D painting speed breaker and normal speed breaker which give effective illusion as well as minimum jerk.

Road Marking and Indicator: Road markings are used as a means of controlling and guiding traffic. They are highly important on urban roads and intersections as they promote road safety and bring out smooth and harmonious flow of traffic along guided paths of travel.

In winter season, fogs are very heavy hence the visibility of road marking is very low which causes increment in traffic volume and promote chances of accident and same case appear also in night time. To make road marking more visible during winter season and night time, we should replace normal paint (thermoplastic paint) with fluorescent paint that will glow in when light reflect on it. This technique will increase visibility of road marking an ensure road accident and traffic flow.

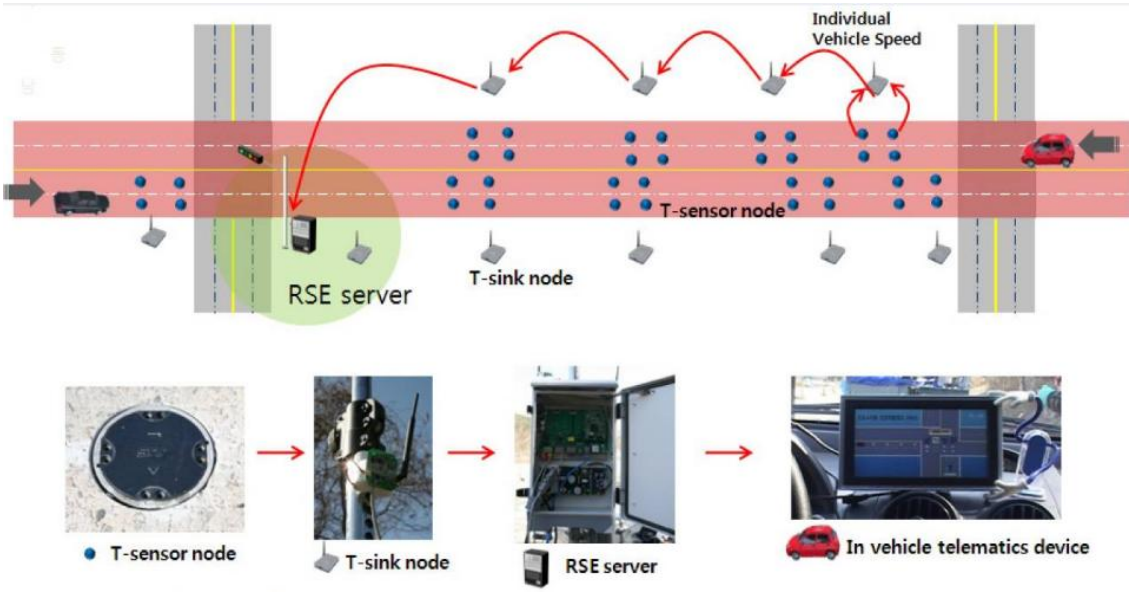
Road System and ITS Technology:

The goals of ITS strategies are reducing travel time, easing delays and congestion, improving safety, and reducing pollutant emissions without the need for new roadway construction. ITS strategies that contain electronic surveillance, communications, and traffic analysis and control technologies bring about benefits to transportation system users and managers. ITS sensors often serve as data-gathering elements of an ITS, and therefore dictate ITS operating characteristics, types of data provided, and installation requirements. In particular, ITS and Telemetric departments have gradually increased their interest in vehicle data through access to industry-standardized in-vehicle interfaces. This attempt to gather vehicular information and access can be determined differently depending on the type of roadway and collecting sensors used in the service. As shown in figure, roadway types are classified into two categories of flow: uninterrupted and interrupted. Uninterrupted flow facilities have no fixed elements, such as traffic signals, that are external to the traffic stream and may interrupt the traffic flow. Traffic flow conditions result from interactions among vehicles in a traffic stream, and between vehicles and the geometric and environmental characteristics of the roadway. Interrupted flow facilities have fixed elements, such as traffic signals, stop and yield signs, and other types of controls, which may interrupt traffic flow. To capture vehicle movement in real-time, a road sensor is required at each type of facility. There are two popular categories of sensors: infrastructure-based sensors and OBDII-based vehicle sensors. Infrastructure-based sensors include pressure detectors, inductive loop detectors, magnetic detectors, ultrasonic detectors, microwave detectors, infrared detectors, and image detectors. These types of sensors utilize a part of the signal control and traffic operation in an ITS. In contrast, vehicle sensors include GPS, automatic vehicle identification (AVI) using radio frequency identification (RFID) tags, and on-board diagnostics II (OBD)-based vehicle sensors, which are connected to an in-vehicle network.



Infrastructure Based Sensor:

In general, infrastructure based sensors have certain strengths and weaknesses depending on their features, operation, and installation types. However, due to their cost-effectiveness in installation and operation, recent trends in other IT technologies include special traffic sensors for traffic detection. For example, sensors in the form of T-sensor nodes are randomly deployed around a target area where approaching lanes cross at an intersection. In other words, T-sensor nodes can acquire surrounding data, which they transmit to a roadside server through their neighbors based on a predetermined automatic mechanism; the user can then access a database to create a new service. As shown in Figure 2, these types of sensors consist of in-lane T-sensor nodes, T-sink nodes at roadsides, and local roadside equipment (RSE) servers. An RSE server located at the center of a crossroad gathers vehicular information from sensor nodes and transmits the gathered data to approaching vehicles. Using this collection and processing procedure, each vehicle that approaches the crossroad can be provided a new real-time service for avoiding potential traffic accidents.



OBDII-Based Vehicle Sensor:

An OBDII-based vehicle sensor is a device within a vehicle that senses the conditions inside the vehicle every second. Data from a vehicle sensor include the speed, revolutions per minute (RPM), battery voltage, coolant temperature, coordinates, direction, distance travelled, Diagnostic Trouble Codes (DTC), and fuel consumption, which are supplied by the controller area network (CAN) bus. Through a vehicle sensor placed in each vehicle, vehicle sensor data can be formatted as probe data or messages, which are processed, formatted, and transmitted to a Smart Highway server for further processing to create a clear understanding of the driving environment.

Framework of Smart Highway Server and Sensor System:

The framework consists of five parts: infrastructure-based sensors, vehicle sensors, smart roadside server, wireless communication, and traffic service providers. A series of processes for a road and vehicle system consists of data collection, data fusion and processing, and information provisioning. In data collection, not

only do infrastructure-based sensors collect certain obstacle data, work zone data, incidents, and traffic signal times, but vehicle sensors also collect emission data as well as vehicle speed, location, and RPM. These data can be transmitted to a smart roadside server using infrastructure-to-infrastructure (I2I) and V2I communication networks such as DSRC and Wireless Access for Vehicular Environments (WAVE). At a roadside server, these data undergo appropriate processing such as data fusion. The optimal information is then provided to drivers through a Telemetric The framework of a Smart Highway server and sensor system should have the following capabilities and requirements:

- Real-time context-aware computing and event stream processing.
- Interoperability of various road sensors and vehicle data sensors.
- Wireless and seamless communication (V2I) such as DSRC, WAVE, or Wi-Fi.
- Distributed data sharing and transmitting to center server.
- Optimal database design and policy.
- Connection to Telemetric and mobile phones.
- Authentication, authorization.
- Open standard platform.

Conclusion:

In this paper, we introduce an innovative idea or concept and methods to minimize the road accident, traffic volume and road casualties with utilizing road for electricity generation and other factor and also improvisation and give attention to pervious method and concept. This paper has presented a framework for a smart roadside system and sensors such as infrastructure-base sensors and OBDII-based vehicle sensors. As application cases for this system, new real-time road services for two road types, signalized intersections and highway roads, were developed and applied to service algorithms for driver assistance and safety information services. The main services for the two road types are a red-light violation warning system at signalized intersections and an advisory speed provisioning system on highways. In this paper, the evaluation results of the simulation method are shown and applied to a real road and vehicle system for driver assistance and safety warnings.

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