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A Review: Smart and Innovative Techniques for Safe and Smooth Road Transport System

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Abstract
Traffic congestion and accident due to that congestion and improper road construction is the major problems for each and every citizen in world in present time. There are so many causes of these problems such as increasing number of vehicles, improper road management, etc. we all knows the road network system of a country is very important in Development and Growth of the country. Therefore we need to improve our transport system for better and rapid development of the country. That's why it is very important to solve this problem by implementing some alternative solution. Smart and Innovative Techniques in Transport system help for smooth and safe travelling on Roadways. The objectives of these study and review paper is find out, study the feasibility of some smart new techniques for smooth and safe traffic flow on roadways. Also the secondary aim of this study is to check the costing of this technologies and see that these are economical or not.

Keywords: *AI speed bumps, Shoulder line rumblings, electric road line, smart technique, IoT Parking, Interactive lights.*

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I. INTRODUCTION

Due to rapid increase in number of vehicles, unplanned road network system, low visibility due to weather, lack of street lamps, improper signals and sign boards & etc. there is increase in traffic congestion, accident, Travelling time & Transportation cost.

Vehicle and road automation can reduce the risk of accidents, increase safety, reduces traffic congestion, increase capacity, reduce fuel consumption. It has also been known that many of the accidents are due to human errors. Therefore, the conclusion has been that with a road automation system the risk of accident can be reduced. With the rapid increase in the number of vehicles another concern has been road capacity. Some kind of automation that can help to reduce traffic congestion problem is considered as one potential solution for the Congested roads a smoother cruise with an automated system can reduce fuel consumption and engine wear.

Also, some kind of automation transmit real time data and share information, making it easier and faster to get around, to find parking. Also, we can use roads to generate electricity. Beyond these technologies, new technologies are also improving more road issues.

II. LITRETURE REVIEW

2.1 Sajibk.mistry, R. karim, k.sakib& M.H kamal

This work is mainly focused on smart highway system (SHS) to ensure to reduce the road accident and let the people knows further condition of road by using road automation systems. The system (SHS) 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 reducing traffic congestion problem and will reduce risk of road accident [1].

2.2 Mr. Gunanithy.s, Prof. S.Nagarajan

This study is mainly focused on to give the detailed survey of power generation mechanism through renewable energy resources with the help of Roller mechanisms that will worker as a speed breaker. Some software's has also been used for modeling of mechanism and analysis of power production so that the cost will least and material is to be less weighted. The study gives an alternative way for generation of electricity by using roller mechanism without use of any fuel [2].

2.3 N. N. Ghuge, Aarti sathe, varsha patil, Anaghawarankar

This work is mainly focused on to generate electricity through speed breaker mechanism. That will help to reduces uses of non-renewable resources like fossil fuel, which are used for generation of electricity. In the place of speed breaker providing cylinder roller which will rotate when vehicle pass over through them and one end of the roller is connected motor. This mechanism helps to generate electricity [3].

2.4 AnshuAdwani, Kirti H. Madan, Rohit Hande

In this study, author suggested a system to deal with the current situation of road problem like Weather, increase in number of accidents, landslides, traffic congestion by using of digital sensors which will displayed acquired data on LED display with XBee and GSM technology. The case study proposed for monitoring the, traffic congestion, accident on road, Landslide and water overflow on bridge is detected with the help of this technique. So that road user can easily select fastest root [4].

2.5 Soham Sarda, JanhaviChavare, Rohit Bhosale, AkshayBirajdar, Shweta Andhale, Prof. S. S. Shastri

In this study author mainly focused on to give the detailed survey of traffic congestion problems in the Metro cities like Pune. The case Study proposed on the major factors for traffic congestion in Pune. Solutions for reducing the traffic congestion problem in the area are given. Traffic congestion due to Industrialization, IT parks, etc. has taken into account [5].

2.6 AnushthaBaberwal, Dr. A. R. Vasatkar

This study is mainly focused on the need of parking facility in the congested areas of Pune city. The questionnaire survey has been carried out to find out the parking problems in the current situation. The case study proposed on the factors causing traffic problem in Pune city and Solutions are put forward [6].

2.7 Jitesh Dhule, RutujaGawade, Amol Pawar, Swapnil, Borge, Nazim Ansari, ShadaabSayyed

This is a case study is on Accident's analysis and Black spot identification. In this study detailed survey of accidental spots and reason behind it. The detailed survey of different accidental locations and accident densities at the particular location. They use different methods for analysis of accidents and identification of different locations. Through this they find different reasons behind the accident problems at particular location and provide solutions to reduce the accident [7].

2.8 Aftab Mansoori, Chetan Achar

This work is mainly focused on use of IOT devices in roads to make it safe and smooth for transportation, Low-cost Innovative technologies for Smart Roads. Implementation of smart and advanced technologies like Light sensors, Camera, Motion Sensors, Solar Roads, Electric Charging Stations, Paint that glows at night etc. which will help to reduce the traffic congestion, Fuel Consumption, Accident, Travel Time [8].

III. STUDY OF VARIOUS SMART TECHNIQUES

3.1 Electric Lane.

Electric vehicles can charge their batteries by driving on the electric priority lane. In this system roads have magnetic field which can charge the electric vehicles on the electric lane. It ensures that there is no need of charging stations for the electric vehicles to get charged and can even charge vehicles while driving. The following show the detail working of that technique [8] [9].

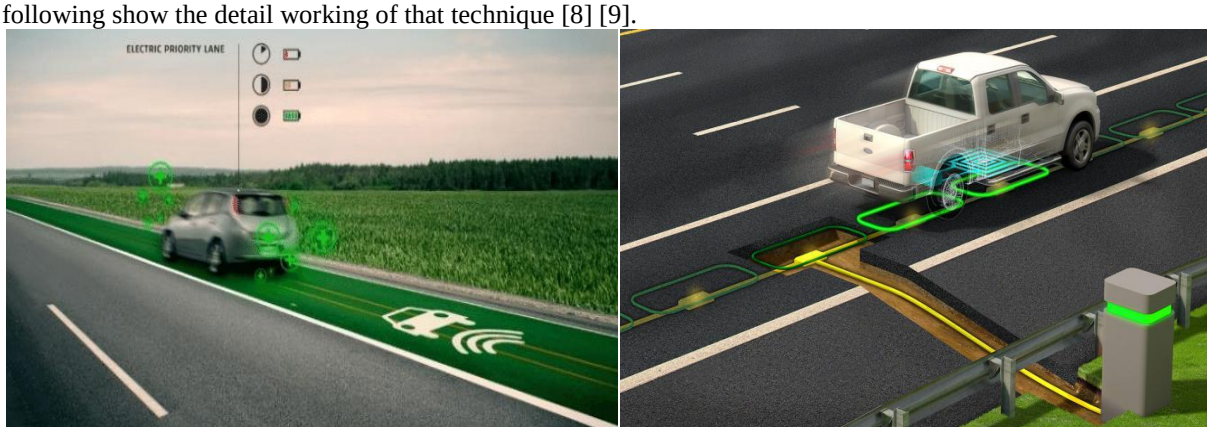

Figure 1: Details of Electric Charging Lane System [10] [11].

3.2 Interactive Lights.

sap tcejbo na nehw no hctiws hcihwsthgilteertseht era sthgiL evitcaretnIs by and fade out when the object pass by. By using this technique huge amount of electicity can be saved. This lights are more brighter than the lights which are used now. This can help to incresea visibility for drivers and will reduce the number of accidents. This technique is also cost efficient [8].

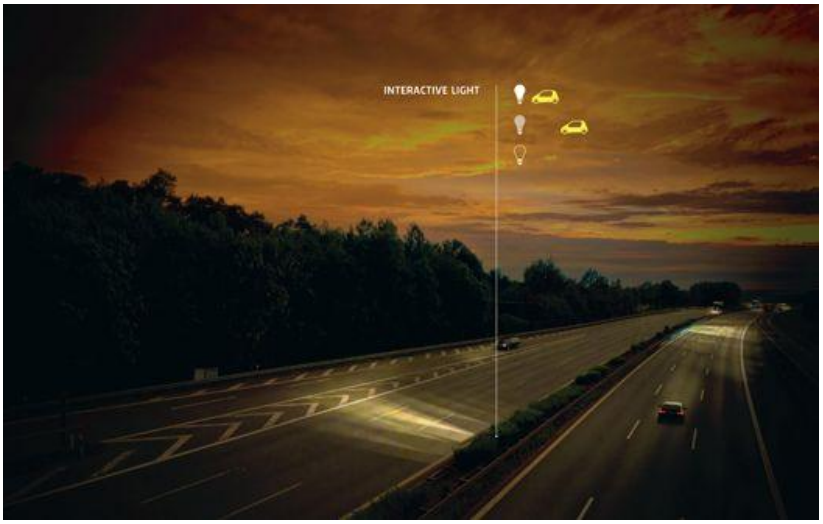

Figure 2: Interactive Lights [8].

3.3 Traffic Adaptive Road Signs.

Due to the world's population and the number of cars being used everyday across the globe,traffic jams are common and tedious. The road signs are dynamic. They can be changed according to the current traffic situation. When there is heavy traffic the dotted lines can behanged to continuous lines to prevent cars from switching lanes.

Figure 3: Traffic Adaptive Road Signs [12].

3.4 Self Honking Smart Pole.

"Roads that Honk" technology used as Smart Life Poles just before sharp turns and sudden bends. These poles use wireless communication system with each other and exchange data on incoming traffic. They identify the speed of the vehicles and alert the drivers of approaching traffic by sounding a horn, as shown in the figure aside. This product is called Smart Life Pole. The detail working is as given below [13].

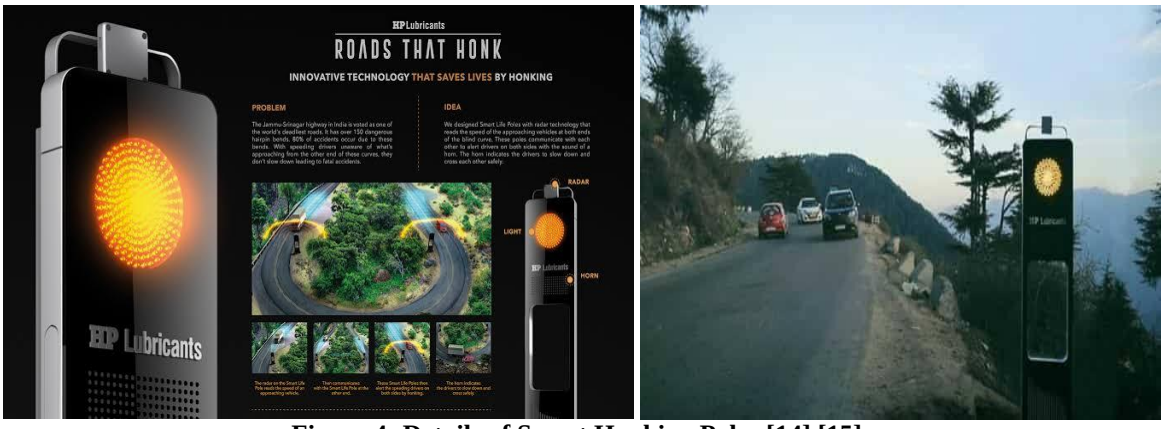

Figure 4: Details of Smart Honking Poles [14] [15].

3.5 Smart Phone Parking Applications.

Parking guidance systems has design to connect with smart phone parking applications to provide real time information and places of available parking. Allowing cars and bikes to better plan their destination and make more informed decisions about where and when they park. While a number of applications have been developed to provide instant information about available parking spaces. There are also opportunities to use smart pho**ne** technology to pre-booking street or especial parking spaces to pay for and top-up parking remotely.

Figure 5: Smart Phone Parking Application [16] Empty Parking show on mobile [17].

3.6 Smart Pavement Technology.

The Smart Pavement road system uses high-resolution fiber optic sensors and other technologies inside the pavement to detect vehicle positions in real time as well as roadway conditions. Beyond roadway conditions, sensors can also detect accidents and notify emergency responders automatically. The main components of this smart pavement, which is made up of precast concrete embedded with smart electronics, are shown in the figure below.

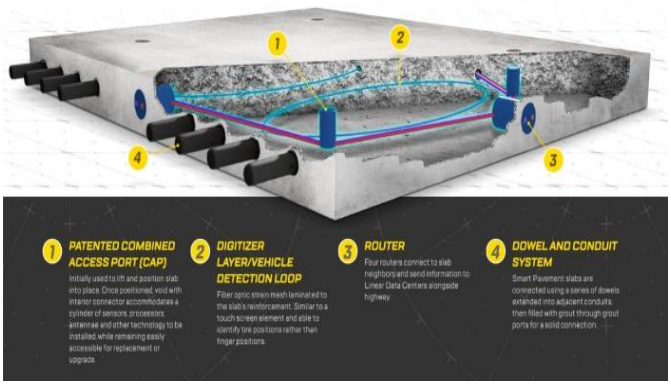

Figure 6: Smart Pavement Technology [18].

3.7 Quick-change Moveable Barriers.

The QMB is a new smart system that prevents tail-backs at road exits. Allowing fast movement of the safety barrier limited motorway deviations and lanes. In the US, the QMB system is used for both construction lane and fixed lane, where the flow of traveler traffic is in different directions in the day and night. The system contains a machine that shift the barrier sideways at a rate of 9 to15 km/h.

Figure 7: Quick change Moveable Barriers [19].

3.8 Solar Road Pavement.

Solar pavement are generates the energy electric energy from the sunlight. The solar panels consist of photovoltaic cell which converts the light to the electricity. This technology is very use full in toll plaza, check post, road rest house, gas stations. Due to that method we can reduce the electricity bill. The photovoltaic cell can be installed on shoulder for less ware and tare. Also we can use this power for the street lights on the roads.

Figure 8: Solar Roadways [20].

3.9 Hydraulic Shoulders.

Hydraulic Shoulder the shoulder or footpaths are equipped with a hydraulic system to move the section of roads in vertical direction. The footpaths are takes in use when the there are emergency situation occurs. The footpaths are taking down with the help of hydraulic system to the road level and then vehicles are easily passes through on it [22].

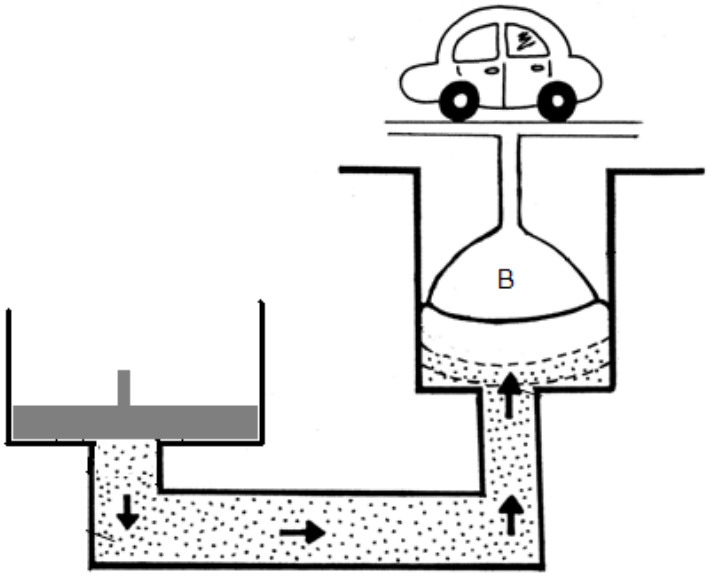

Figure 9: Hydollic equiped footpaths [23].

IV. CONCLUSION

There are some inherent challenges in transportation system like road congestion, accident, inadequate parking space, inadequate and irregular public transport, transport emission etc. In this work we study some smart and innovative techniques which are useful for smooth and safe movement of traffic. After this study we our conclusion is this technique are very helpful in road transport system. So we put this techniques and method in this review paper and we have suggested smart and Innovative Techniques to overcome the above problems. We can also use roads to charge electric vehicles and power generation.

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