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REVIEW ON TRAFFIC MONITORING SYSTEMS

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Abstract:

Designing and developing a Traffic signal violation system for Indian roads is a major issue. We studied the various existing technologies and techniques for signal monitoring such as RFID, DIP, camera sensor and embedded systems. However, these systems do not fulfill the constraints imposed by the roads and traffic situations in India. They were developed assuming the road infrastructure of a developed country. Traffic situations in India are very different. In India the road conditions are more varied, traffic is chaotic and unstructured; there is a lack of lane discipline, and a wide variety of vehicles. Additional constraint that we can impose is that our system should be low cost. There are many people violating the traffic signal rules. Hence alternative paths along with the existing systems are put forward through this technology.

Keywords: RFID, DIP, camera sensor and embedded systems.

I. Introduction

The road network of any city is its lifeline. There has been a tremendous growth in traffic with the growing urbanization, industrialization and pollution. During the past few years, traffic accidents and congestion has increased enormously. Even in our daily lives, we can come across problems caused due to traffic jams. These problems cause disturbance to the whole system, affecting the economy and many lives. So the problem given above will become the worst in future. In this paper we can have reviewed on various traffic monitoring and traffic rules violating systems. Various technical solutions like Digital Image processing, RFID Card System are provided. The Indian street traffic scenario is quite different from that of the developed world. With the help of this system, rate of corruption will enormously reduce. Several technology exist that aim to build complete traffic monitoring system. But most of this work has been done keeping requirements and considerations of the developed in mind. Popular technologies like magnetic loops are expensive to install, require digging up roads and assume laned traffic. Other technologies such as laser based system require overhead structures and assume some structure in the traffic. Techniques using microwave radars, ultrasonic detectors and infrared detectors need very specialized equipment. For example: ground penetrating radar based monitoring techniques need specialized vehicles and expensive equipment. Assumptions that current technologies make do not match with conditions that exist in a developing country like India. What we can plan to pursue is a similar system but with a different set of constraints and assumptions. The Indian street traffic scenario is quite different from that of the developed world. We can believe that a road condition and traffic monitoring system can only be feasible if its cost is low and it provides flexibility in deployment. Hence there is a need to reduce specialized equipment and reuse the existing infrastructure. It should be built using cheaply and easily available commercial off the shelf components. A system that can be rapidly deployed in a phased manner, is scalable and minimizes obstruction to traffic during installation is preferable. The cost of operation and maintenance should be low.

II. Existing systems

Many people have been working in various fields for improving the traffic system and working towards zero congestion. In these paper we have reviewed many papers where penalty is charged automatically on violation of various traffic rules.

1)AUTOMATIC PENALTY CHARGING FOR VIOLATION OF TRAFFIC RULES

In this technology the author is working towards of penalty charging on violation of traffic rules. The fine will be automatically incurred, and continuous monitoring of vehicles will be done using RFID transmitter, receiver and reader. Suspension of license takes place in case the driver fails to pay the fine and the car ignition won't start. This system also has 4 modules namely Car ignition module, Signal pole unit, Speed limit or parking unit and the RTO unit. RFID uses the principle of radio waves identification and tracking. the Driver details are to be recorded on a smart card which is scanned only then the ignition of the engine takes place. The breath of the driver is also checked for detection of alcohol using alcohol sensor. The second unit consists of the signal pole unit where the RFID tag is recorded with the penalty in case the vehicle crosses the traffic signal when it goes RED. The third module is the RTO unit wherein the fine was collected using the RFID card Reader. The various license expiry and PUC check were also an important part in such technology using RFID reader and RFID tag. Parking of vehicles in no parking zone and crossing the speed limits are also considered in this technology. This technology exhibits the advantages of taking into consideration all the traffic rules and automatic penalty is calculated.

2)RED LIGHT VIOLATION DETECTION USING RFID

Traffic systems are the heart of transportation. Red light violation is one of the rising problems. The road is properly divided into 8 readers where each lane consists of its own RF reader, every vehicle has a pin number Which helps in identification of the owner. Different types are detected on the basis of the priority. Each signal has its own RFID which will keep the track of the vehicles passing by the signal. RFID detection can be done using active tags or passive tags depending on the availability of the power supplies the main aim of this technology is to automatically detect the traffic density at the junctions where there is the maximum probability of congestion and violations of traffic rules due to traffic jams. Every vehicle has a unique identification number with which it is easy to track them in case of violations. The time of the vehicles passing by in the lanes is also recorded in the RFID reader. The database of the signal stores all the violator records permanently so as it becomes easy to extract them if needed. The author claims that RFID is more accurate than a camera when it comes to vehicle detection and proper monitoring can be done with the help of priority given to the vehicles.

3)REAL TIME TRAFFIC LIGHT CONTROL USING IMAGE PROCESSING

Nowadays many traffic systems are being installed which work on the principle of image processing. Identification of the vehicle is done with the help of a video camera count and Data of the passing vehicles is kept. The control and monitoring of the traffic system is done using image acquisition is done using a camera first a reference image is to be selected, this image is taken into consideration when there is no traffic. The acquired image is converted into gray scale and gamma correction is calculated which is considered as the reference image and kept aside to be compared with images in the busy hours. Whenever we need to detect a particular vehicle image processing is said to be the most efficient technique. There is a lot of scope in improvement in such system to achieve accuracy of detection without any percentage of error. The road conditions being very dynamic and continuously changing hence it is a bit difficult to apply any algorithms for real time processing. These systems are very expensive and their maintenance is also a major issue. Hence more work should be done in making the camera and image processing based systems more efficient in detecting the state of the traffic.

4)ADAPTIVE TRAFFIC SIGNAL CONTROL SYSTEM USING CAMERA SENSOR AND EMBEDDED SYSTEM

This technology uses Beagle Board for image processing to capture images. This technology comments on cameras being used only for monitoring the traffic situation but does not play any role in congestion control or traffic rule violation reduction. Detection of vehicle and counting can be done with the help of video camera.

III. Statistics

•Emergence of Road Traffic Injuries (RTIs) a leading cause of Deaths & Disabilities.

•India: 2011 •Accidents 4.97 lakh (annual) (1 every minute)

•Deaths 1,42,485 (one death every 3.7 minutes)

•Accidents impose significant costs, 3% GDP for India (1999-2000), 1% GNP for low income countries, 1.5 % GNP for middle income countries, 2% GNP for high income countries.

•Was 9thleading cause of death in 2004 and expected to be 5th leading cause of death by 2030 worldwide.

Table 1:Accident Severity : No. of Persons Killed per 100 Accidents

Number of Accidents and Number of Persons Involved: 2002 to 2011					
Year	Number of Accidents		Number of Persons		Accident Severity*
	Total	Fatal	Killed	Injured	
2002	4,07,497	73,650 (18.1)	84,674	4,08,711	20.8
2003	4,06,726	73,589 (18.1)	85,998	4,35,122	21.1
2004	4,29,910	79,357 (18.5)	92,618	4,64,521	21.5
2005	4,39,255	83,491 (19.0)	94,968	4,65,282	21.6
2006	4,60,920	93,917 (20.4)	1,05,749	4,96,481	22.9
2007	4,79,216	1,01,161 (21.1)	1,14,444	5,13,340	23.9
2008	4,84,704	1,06,591 (22.0)	1,19,860	5,23,193	24.7
2009	4,86,384	1,10,993 (22.8)	1,25,660	5,15,458	25.8
2010	4,99,628	1,19,558 (23.9)	1,34,513	5,27,512	26.9
2011	4,97,686	1,21,618 (24.4)	1,42,485	5,11,394	28.6

Chart 1: Number of Road Accidents, Number of Persons Killed and Number of Persons Injured Per Lakh Population: 1970 –2011

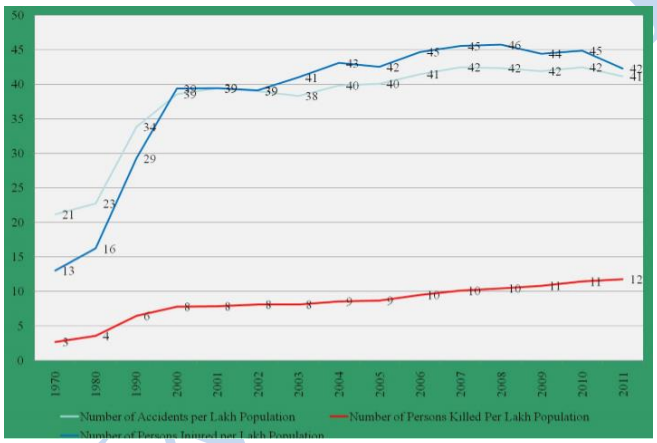


Chart 2: Number of Road Accidents, Number of Persons Killed and Number of Persons Injured Per Ten Thousand Vehicles: 1970 –2011

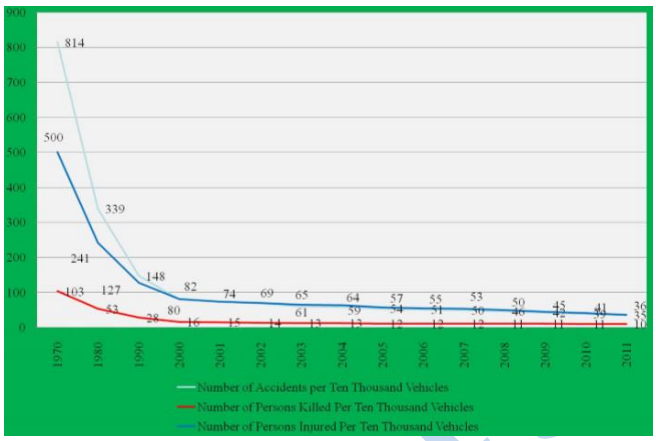


Chart 3: Number of Road Accidents, Number of Persons Killed and Number of Persons Injured Per Ten Thousand Kilometres of Road Length: 1970 –2011

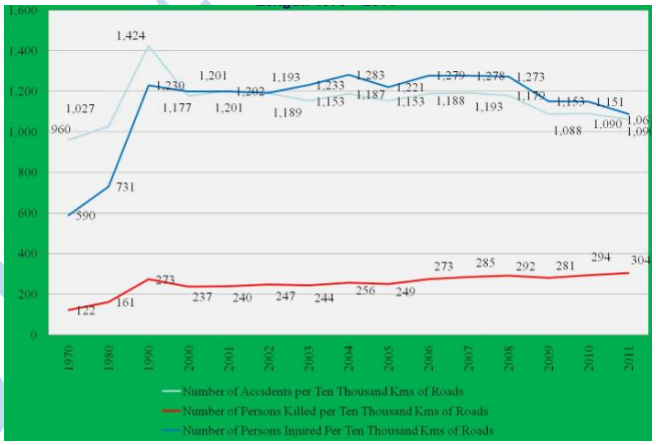


Table 2: Number of Accidents, Persons Killed & Injured as per Road Classification

Number of Accidents, Persons Killed & Injured as per Road Classification (2011)			
Road Classification	National Highways	State Highways	Other Roads
No. of Accidents	149,732 (30.1)	122,239 (24.6)	225,715 (45.3)
No. of Persons Killed	52,924 (37.1)	39,033 (27.4)	50,528 (35.5)
No. of Persons Injured	156,008 (30.5)	133,435 (26.1)	221,951 (43.4)
Note: Figures within parentheses indicate share in total accidents, killed and injured in the respective road categories.			

Chart 4: Road Accidents victims (other than Drivers) by Age Group: 2011

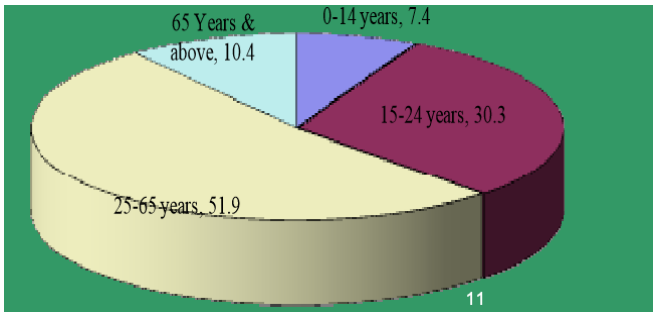
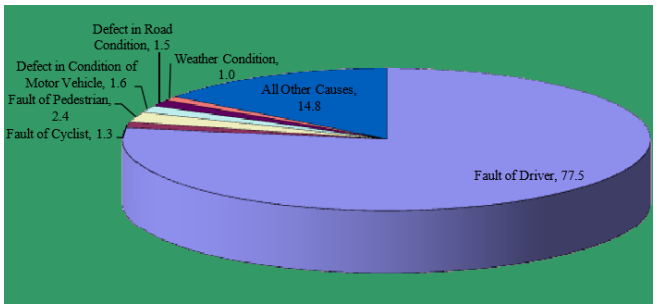


Chart 9: Causes of Road Accidents: 2011



IV. Future Scope

We can design the best of the systems by considering the advantages in all the technology mentioned above. Technology in discuss should be linked with "Internet of things" where all the data can be shared among the RTO offices and proper penalty can be charged to the driver no matter he moves anywhere in the country. We can also link the traffic systems by vehicle to vehicle communication and RFID communication more efficiently. Security of the data is also considered, so that no one can hack this data and spoil it. Care should be taken that the systems installed do not fail in case of accidents and proper backups are maintained and the information should not lost. Efforts are being made in designing a flawless traffic monitoring system with high efficiency and accuracy at the same time.

V. Conclusion

Such systems keep the data of all the vehicles passing the signals and making it easy to study the traffic conditions in that area. It also helps in automatic calculation of proper penalty to be laid on the signal violators. Detection and monitoring of the traffic also becomes easier and efficient. But maintenance and installation cost is a problem which we can overcome. Every systems has some gaps which should be filled in to design a flawless and efficient traffic monitoring systems using all the techniques like RFID detection, image processing , embedded sensors .

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