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SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFTY
LITERATURE SURVEY

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ABSTRACT

The Safe System (SS) approach to road safety emphasizes safety-by-design through ensuring safe vehicles, road networks, and road users. With a strong motivation from the World Health Organization (WHO), this approach is increasingly adopted worldwide. Considerations in SS, however, are made for the medium-to-long term. Our interest in this work is to complement the approach with a short-to-medium term dynamic assessment of road safety. Toward this end, we introduce a novel, cost-effective Internet of Things (IoT) architecture that facilitates the realization of a robust and dynamic computational core in assessing the safety of a road network and its elements. In doing so, we introduce a new, meaningful, and scalable metric for assessing road safety. We also showcase the use of machine learning in the design of the metric computation core through a novel application of Hidden Markov Models (HMMs). Finally, the impact of the proposed architecture is demonstrated through an application to safety-based route planning.

INTRODUCTION

From the beginning of civilizations, transportation has been one of the most important requirements for humans. Over the years, it has been evolved to modern transportation systems such as road, train, and air transportation. With the development of technology ,intelligent transportation systems have been enriched with Information and Communications Technology (ICT). Nowadays, smart city concept that integrates ICT and Internet-of-Things (IoT) have been appeared to optimize the efficiency of city operations and services. Recently, several IoT-based

smart applications for smart cities have been developed. Among these applications, smart services for transportation are highly required to ease the issues especially regarding to road safety. In this context, this study presents a literature review that elaborates the existing IoT-based smart transportation systems especially in terms of road safety. In this way, the current state of IoT-based smart transportation systems for safer roads are provided. Then, the current research efforts undertaken by the authors to provide an IoT-based safe smart traffic system are briefly introduced. It is emphasized that road safety can be improved using Vehicle-to-Infrastructure (V2I) communication technologies via the cloud (Infrastructure-to-Cloud – I2C). Therefore, it is believed that this study offers useful information to researchers for developing safer roads in smart cities.

Signalized traffic control has significant effect on reducing vehicle delays at intersections, balancing traffic flow, and improving operational efficiency of an urban street network. The intersection signal control systems can be largely classified into fixed-time or real-time adaptive signal control systems, such as SCAT and SCOOT. The modeling of the intersection signal control system is usually based on the changes of traffic volumes. In past days the use of fixed time traffic signal and vehicle actuated traffic signal is more. Now a days many other techniques are used to optimize delay and to control traffic flow, adaptive traffic signal controllers are one of them to optimize traffic signal, different types of algorithms are used to make best adaptive traffic signal controllers, different types of algorithms are highlights of this paper.

LITERATURE REVIEW

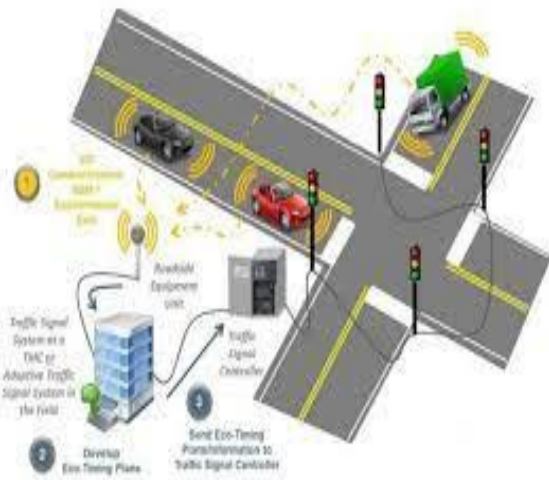
Reliable Smart Road Signs

In this paper, they propose a game theoretical adversarial intervention detection mechanism for reliable smart road signs. A future trend in intelligent transportation systems is “smart road signs” that incorporate smart codes (e.g., visible at infrared) on their surface to provide more detailed information to smart vehicles. Such smart codes make road sign classification problem aligned with communication settings more than conventional classification. This enables us to integrate well-established results in communication theory, e.g., error-correction methods, into road sign classification problem. Recently, vision-based road sign classification algorithms have been shown to be vulnerable against (even) small scale adversarial interventions that are imperceptible for humans. On the other hand, smart codes constructed via error correction methods can lead to robustness against small scale intelligent or random perturbations on them. In the recognition of smart road signs,

however, humans are out of the loop since they cannot see or interpret them. Therefore, there is no equivalent concept of imperceptible perturbations in order to achieve a comparable performance with humans. Robustness against small scale perturbations would not be sufficient since the attacker can attack more aggressively without such a constraint. Under a game theoretical solution concept, they seek to ensure certain measure of guarantees against even the worst case (intelligent) attackers that can perturb the signal even at large scale. they provide a randomized detection strategy based on the distance between the decoder output and the received input, i.e., error rate. Finally, they examine the performance of the proposed scheme over various scenarios.

Smart Road Accident Detection and communication System:

The number of fatal and disabling road accident are increasing day by day and is a real public health challenge. Many times, in the road accidents, human lives will be lost due to delayed medical assistance. Hence road accident deaths are more prominent. There exist many accident prevention systems which can prevent the accidents to certain extent, but they do not have any facility to communicate to the relatives in case accident happens. In this paper, the authors made an attempt to develop a car accident detection and communication system which will inform the relatives, nearest hospitals and police along with the location of the accident. In the last they concluded that, Smart Road accident and communication system has been developed. Experiments have been conducted by implementing the system in a toy car. It is observed that the system is working properly. The system sends the message to the stored emergency numbers successfully when the car is collided and toppled or tilted by more than 30 degrees and if the reset button is not pressed in the stipulated time interval. Future scope: An android app can be developed for this in which instead of just receiving the co-ordinates of the location, it can be exactly pin pointed on the map. The heart rate can also be continuously monitored by the app to determine the driver's condition till the medical help arrives.



Rongrong Tian, Xu Zhang suggested to use the TRANSYT traffic modeling software to find the optimal fixed-time signal plan and VISSIM micro-simulation software to affirm and evaluate the TRANSYT model and to help assess the optimal signal plan; build an adaptive frame signal plan and refined and evaluated the plan using VISSIM with VS-PLUS emulator. Through micro-simulation, it was shown that delay in the adaptive signal control was shortened noticeably than that in the fixed time control. Jianhua Guo et al introduced a new method for area-wide traffic signal timing optimization under user equilibrium traffic. The optimization model was formulated as a multi-dimensional search problem aimed to achieve minimized product of the total travel time associated with urban street network and the variance of travel time for unit distance of travel. A genetic algorithm was developed to derive the model solution. A simulation control protocol embedded in PARAMICS software tool capable of conducting area-wide micro simulation is adopted to design the logic frame and function module of the area-wide traffic signal control system. His results shown that mobility improvements are achieved after applying the proposed model along with the genetic algorithm for area-wide signal timing optimization, assessed by extended capacity ratio, and reductions in through and turning movement delays, as well as average and variance of travel time for unit distance of travel. The results demonstrated that the proposed algorithm was better than genetic algorithms and fixed-time settings, indicated that the proposed algorithm was an effective solution method for traffic signal optimization problems.



Advantages of Traffic Signals

Advantages of traffic signals are as follows:

1. Traffic signals help for movement of traffic securely without any collision.
2. They can reduce the number of accidents on roads like pedestrian accident and right-angle collision of two cars
3. Signals can increase the capacity of traffic handling at the intersection.
4. The traffic signals help for the safe movement of slow-moving traffic by interrupting heavy traffic at regular intervals.

Disadvantages of Traffic Signals

1. They delay the traffic by stopping the vehicles at the intersection during peak hours.
2. During signals breakdown, there are serious and wide-spread traffic difficulties during peak hours.