SIGNS WITH SMART CONNECTIVITY FOR BETTER ROAD SAFETY

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Abstract—The way of providing the end user with an accurate data regarding the current road conditions is one of the very important components in the area of Intelligent Transportation Systems (ITS). The most important issue in the process of building the trust between the road signalling infrastructure and the end user is the information significance and its value. The proposed system typically consists of a few road signs communicating with each other and exchanging measured data: weather conditions, road surface condition, traffic volume, avg. vehicles speed, detected road events, etc. On the basis of the information exchanged between road signs, each of them runs the autonomous algorithm to process that data and computes the current status of road section driving conditions. The process of the speed limit determination is often complicated and in many cases it is defined by numerous legal standards. In general, speed determination should take into account not only the technical aspect, but also social and legal aspects, which makes this process especially difficult. As a result, advanced conceptually products for increasing road safety for which there is a market demand are being prepared for future implementation.

A range of products is being developed, including intelligent road signs displaying the speed limit that is determined automatically, through an embedded electronic module, enabling multimodal measurement of traffic conditions. Solving a number of research and construction problems, such as: effective and independent of weather conditions traffic monitoring based on simultaneous analysis of several types of data representation, development of a method of calculating gradients and histograms of vehicle speed for various types of road situations or traffic topologies. Moreover, creating a platform for self-organizing reliable wireless connections among road signs equipped with innovative displays and power supplies and carrying out prototype tests are carried out.

INTRODUCTION

Nowadays, speed limits are mostly defined by experts taking into account qualitative and quantitative parameters of the considered road. The whole process should take into account not only technical but also local society expectations and existing law regulations, which complicates this process enough, even without considering dynamic aspects of traffic and weather conditions variations. The proposed approach in the project is based on the determination of speed limits using the rule system. It enables the determination of a variable speed limit on the basis of e.g. weather conditions and properties of the road section - road class, road characteristics (e.g. the number of lanes, intersections, junctions, exits, entrances),

surface quality, and geometric parameters (the size of the arc, the slope of the road). One of the key aims of the project is to create an Intelligent Road Sign, equipped with various sensors constantly monitoring the current road conditions in terms of weather, surface and traffic volume and based on the embedded logic to provide drivers with accurate road information and safe speed limit accordingly. To make the concept more reliable and driver-supporting, instead of a single road sign, the project assumes that intelligent road signs should be grouped into road sign chains. Such a group could exchange measured values of monitored parameters among signs and introduce smooth traffic management e.g. by notifying drivers in advance about traffic congestion or icy surface a few kilometres before it takes place. In order to achieve this goal an intelligent road signs group should be able to communicate and propagate information. Thus, the key aspect of the project is the introduction of reliable communication among all system elements: intelligent road signs of variable displayed content, weather stations, road management entity, I2V (infrastructure to vehicle) messages generator, drivers and system administrator.

LITERATURE SURVEY

Smart vehicle connectivity for safety applications
U. D. Gandhi, A. Singh, A. Mukherjee and A. Chandak, "Smart vehicle connectivity for safety applications," *2014 International Conference on Reliability Optimization and Information Technology (ICROIT)*, 2014, pp. 262-266, doi: 10.1109/ICROIT.2014.6798327.

An IoT Architecture for Assessing Road Safety in Smart Cities, November 2018 Wireless Communications and Mobile Computing 2018:1-11 by Abd-Elhamid M. Taha proposed Safety Road system to transport network originated with the “Safe Road Transport System” model developed by the Swedish Transport Agency.

Development and Testing of Road Signs Alert System Using a Smart Mobile Phone by Ramadhani Sinde proposed Road traffic accidents (RTA) are defined as accidents that occurred or originated on a way or street open to public traffic. These collisions result in injury or death between automobiles or humans. RTA is a major problem worldwide resulting in significant morbidity and mortality. According to the World Health Organization road safety report of 2018, the number of road traffic deaths increased to 1.35 million in 2016.

Reliable Smart Road Signs Muhammed O. Sayin, Chung-Wei Lin, Eunsuk Kang, Shinichi Shiraishi, and Tamer Bas¸ar, e 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

Communication system for Intelligent Road Signs network
J. Gozdecki et al., "Communication system for Intelligent Road Signs network," 2019 6th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), 2019, pp. 1-6, doi: 10.1109/MTITS.2019.8883382.

Aravinda B, Chaithralakshmi C, Deeksha, Ashutha K from their report, it is concluded Accident prevention in U-turn, S-turn, hilly Ghats and mountain roads using modern sensor technology, which uses Aurdino UNO, Ultrasonic sensor, RF module LED etc.
R.Saranya, R.Arun Kumar : This paper conclude that, JAC : A Journal Of Composition

Theory Volume XIV, Issue VIII, AUGUST 2021 ISSN : 0731-6755 Accidents may takes place in various factors drunk and driving, Texting while driving, Speeding, Distractions, Sleeping while driving. Among Drowsiness is reason for most of the accidents. While driving at the speed of 100km/hr. Driver falls sleepy within 4 seconds the buzzer will enables.

Ranga Sreedhar Galla has studied the basic aim of their paper is to reduce accidents on hilly and slippery roads. In curve roads the other road end of vehicle cannot seen by driver. At night time accidents may happen by intensity of head light from opposite side of vehicles. Also, the light intensity problem occurs both curved roads and mountain roads; Thousands of people lose their lives. The solution for this problem is alerting the driver about the vehicle coming from opposite side. This is done by keeping an ultrasonic sensor in one side of the road before the curve and keeping a LED light after the curve, so that if vehicle comes from one end of the curve sensor senses and LED light glows at the opposite side.

Kartik Venkata Mutya, Sandeep Rudra has studied that road traffic accidents are being recognized as a major public health problem in numerous countries with alarmingly increasing fatalities in developing countries. Careless driving as a result of excessive waiting and blind corners is attributed as one of the most important factors for all road accidents. An estimated 1.2 million people lose their lives in road traffic crashes every year, and another 20 to 50million are injured. A docile, economical mechanism to prevent these road accidents is the need of the hour. It is hoped that the mechanism presented in this article would help in alleviating this concern especially in correspondence with large vehicle accident.

CONCLUSION

Introduction of intelligent road sign groups in real life scenarios could have great impact on increasing the driving safety by providing the end-user (car driver) with the most accurate information regarding the current road and traffic conditions. Even displaying the information of a suggested
driving speed and road surface condition (temperature, icy, wet or dry surface) could result in smoother traffic flows and , what is more important, in increasing a driver’s awareness of the road situation. Future work involves exploring further applications, especially in the context of raising driver awareness of the road safety conditions during their trips.

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