Internet-of-things-based smart transportation systems for safer roads

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.

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Improved road safety through rapid incident detection

The motorway operator, SAPN, operates a 400 km network of interurban and suburban motorways in France, carrying traffic levels of up to 120,000 vehicles per day. This paper explores some of the variety of physical improvements and technology that SAPN has used to maximize road safety. SAPN regularly conducts reviews of accidents and of the safety of its infrastructure, a process that has identified three specific situations as particularly problematic: ghost drivers who enter the motorway driving in the wrong direction or drivers who turn around at mainline toll stations in an attempt to avoid paying the toll charge; spillback of queues at motorway exits onto the main roadway; and stopped vehicles in zones lacking a hard shoulder. The authors describe some of the solutions that SAPN is deploying to address these problems, including infrastructure redesign, modification of signals, reduction of speed limits, and improved signage. In addition, the SAPN has implemented a number of measures to reduce the danger of such events after they occur; these techniques are called FASTALERT, and are characterized by the rapid detection of the problem and transmission of warning messages to drivers.

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An empirical study of vehicle to infrastructure communications - An intense learning of smart infrastructure for safety and mobility

Vehicle-to-Infrastructure (V2I) communication is a communication framework for wireless sharing of data between vehicles. V2I connectivity is usually used in wireless technology as a bi-directional communication through a system of hardware, software and firmware to support systems like lane signs, road signs and lighting systems. V2I provides a broad range of protection, mobility and environmental benefits by collecting and sharing so much of the data. Automobile vehicles that have long been a dream come true. It's time to build an effective and safe autonomous vehicle that allows everyone to take part in this market. In order to make this revolution possible, the automotive ecosystem also needs to change. This will improve transport safety and quality and will offer infotainment in new flexible systems. In this chapter, huge potential efforts are made to study the complete intensive insights of V2I with the detail of how V2I made a contribution to communication. In the end, this chapter also highlights applications for V2I-driven wireless technology. The performance of the V2I involved in the study were evaluated by using different measures related to running time, data rate and resource management

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Development and testing of roads signs allot system using a smart mobile phone

Road traffic accident is a major problem worldwide resulting in significant morbidity and mortality. Advanced driver assistance systems are one of the salient features of intelligent systems in transportation. They improve vehicle safety by providing real-time traffic information to the driver. Road signs play an important role in road safety. To be effective, road signs must be visible at a distance that enables drivers to take the necessary actions. However, static road signs are often seen too late for a driver to respond accordingly. In this study, a system for alerting drivers about road signs has been developed and tested using a smart mobile phone. The study was carried out in Tanzania along an 80 km highway stretch from Arusha to Moshi town. The Haversine formula was used to measure and estimate the distance between two pairs of coordinates using the smartphone-based navigation application, Google Map. The application provides a voice alert to a needed action that enhances

driver's attention. We propose an alternative method that identifies and modifies a specific class of energy inefficiencies. According to the experimental results, the proposed methodology has the benefits of high accuracy within a user radius of 10 meters, minimum bandwidth, and low-cost application. Furthermore, the system application was secured by limiting access to the application program interface key to avoid unauthorized access to sensitive information.

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Digitalization of highways for vulnerable road safety development with intelligent IOT sensors

According to United Nations (UN) 2030 agenda, the transportation system needs to be enhanced for the establishment of access to safe, affordable, accessible, and sustainable transport systems along with enhanced road safety. The highway road transport system is one of the transport systems that enables to transits goods and humans from one location to another location. The agenda of UN 2030 for the transport system will be accomplished with the assistance of digital technologies like the internet of things (IoT) and artificial intelligence (AI). The implementation of these digital technologies on highways empowers to provide reliable, smarter, intelligent, and renewable energy sources experience to the users travelling along the highways. This study discusses the significance of the digitalization of highways that supporting and realizing a sustainable environment on the highways. To discuss the significance of digitalization, the study has categorized digitalization into five subcomponents namely smart highway lighting system, smart traffic and emergency management system, renewable energy sources on highways, smart display and AI in highways. An architecture-for smart highway lighting, smart traffic, and emergency management are proposed and discussed in the study. The significance of implementing smart display boards and renewable sources with real-time applications is also addressed in this study. Moreover, the integration of AI in highways is addressed with the perspective of enhancing road safety. The integration of deep learning (DL) in the edge-based vision node for predicting the patterns of traffic flow, highway road safety, and maintenance of quality roads have been addressed in the discussion section. Embedding the deep learning techniques in the vison node at the traffic junction and the highway lighting controller is able to deliver an intelligent system that provides sustained experience and management of the highways. Smart reflectors, adoption of renewable energy, developing vehicle-to-vehicle communication in vehicles, and smart lamppost are the few recommendations for the

implementation of digitalizing highways.

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An Intelligent Real Time Road Sign System

This paper presents an intelligent road sign that provides real time travel time and road conditions. The behavior of US Interstate 94 was modelled, where the typical road throughput was simulated and published to an MQTT broker for the embedded system to display the expected travel time to Ann Arbor, Michigan from the US23 junction. The embedded system additionally sampled a digital temperature and humidity sensor to note road conditions, where an external input allowed operators to provide a real time update when an unexpected event causes traffic (i.e. vehicle collision) or when the road has been cleared. System requirements, design, implementation details, and performance evaluation are included.

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