Dynamic Management of Traffic Signals through Social IoT

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Traffic congestion is a major threat to transportation sector in every urban city around the world. This causes many adverse effects like heavy fuel consumption, increased waiting time, pollution, *etc.* and pose an eminent challenge to the movement of emergency vehicles. To achieve better driving we proceed towards a trending research field called Social Internet of Vehicles (SIoV). This holds as the aim of SIoV, to be beneficial for the drivers, in improving the road safety, avoiding mishaps, and have a friendly-driving environment. In this paper, we propose a Dynamic congestion control with Throughput Maximization scheme based on Social Aspect (D-TMSA) utilizing the social, behavioral and preference-based relationships. Our proposed scheme along with the various social relationship types allocates green signal to maximize the traffic flow passing through an intersection. Simulation results show that the D-TMSA outperforms the existing work by achieving high throughput, lowering the total travelling time and reducing the average waiting time to better the flow of traffic based on their social attributes with each other.

Digitalization of highways for vulnerable road safety development with intelligent IoT sensors and machine learning

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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). 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. 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.

Smart transportation system using IoT

Authors: P. S. Saarika; K. Sandhya; T. Sudha

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Nowadays the concept of smart cities became more popular. The evolution of internet of things (IoT) helps the idea of smart city more achievable. A major branch of smart city is smart transportation. Problems such as traffic congestion, road safety, accident detection, automatic fare collection and limited car parking facilities can be resolved by IoT. In this paper, an IoT based smart parking system along with an intelligent signboard is proposed. The smart parking system composed of intelligent sensors deployed on site and are used to monitor and inform the availability of parking spaces. A mobile or internet application can be provided to check the availability of parking slot. The sign board with embedded RF module and connected sensors working with solar energy as well as in battery will show the place, distance to that place, weather condition, temperature and different routes to those places.

Intelligence, security, and vehicular sensor networks in internet of things (IoT)-enabled smart-cities: An overview

Authors: FadiAl-Turjman, Joel Poncha Lemayian

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Security in Vehicular Sensor Networks (VSNs) is a critical subject that must be addressed in the emerging Intelligent Transport Systems (ITS). Users share confidential information that can be used against them by attackers. Popular attacks include Malwares and Spams, Black Holes, Wormholes, and Physical/Electronic Outages. Such VSN attacks can lead to loss of life due to road accidents and breach of privacy. In this paper, we overview the VSN concept in a vehicular IoT-based smart city paradigm, focusing on the security aspects. In addition, we discuss the design features of VSN, its robustness, and reliability. We also discuss relevant communication technologies and their security concerns. We highlight the main open research issues in literature and provide hints for overcoming them. This analysis concludes that VSNs play a key role in developing efficient ITS. Nevertheless, current VSNs security standards must be improved for a reliable, and safe transportation system. There are several security threats that must be addressed in order to enhance the current transport infrastructure. Future works of this paper entails further analysis of the overviewed open research issues and propose better systems to provide better quality of service in.

Sensor and network technology for intelligent transportation systems

Authors: Girma S. Tewolde

Published on: 2013

The current state of the art advancements in sensors, computation, and wireless communication technologies has made possible a vast range of emerging applications in large number of fields such as in civil and military transportation systems, personal communications, health care, industrial automation, smart grids, smart homes, etc. Even though the automobile does not seem to have changed much its mechanical image since its first introduction, the industry is currently adapting itself in response to the information technology revolution. Thus, today it is not uncommon to see GPS assisted navigation systems, driver assist technology for parallel parking, adaptive cruise control, and lane-departure warning. Technology is also making way into the transportation infrastructure such as in electronic toll collection, traffic monitoring, accident alert systems, etc. This paper reviews the current state of the technology deployed to support intelligent transportation systems and looks into the potential of wireless sensor network technology with the aim to reduce cost and power consumption, while at the same time enhancing flexibility as well as efficiency of service.

Sii-Mobility: An IoT/IoE Architecture to Enhance Smart City Mobility and Transportation Services

Authors: Claudio Badii, Pierfrancesco Bellini, Angelo Difino and Paolo Nesi

Published on: 20 DECEMBER 2018

The new Internet of Things/Everything (IoT/IoE) paradigm and architecture allows one to rethink the way Smart City infrastructures are designed and managed, but on the other hand, a number of problems have to be solved. In terms of mobility the cities that embrace the sensoring era can take advantage of this disruptive technology to improve the quality of life of their citizens, also thanks to the rationalization in the use of their resources. In Sii-Mobility, a national smart city project on mobility and transportation, a flexible platform has been designed and here, in this paper, is presented. It permits one to set up heterogeneous and complex scenarios that integrate sensors/actuators as IoT/IoE in an overall Big Data, Machine Learning and Data Analytics scenario. A detailed and complex case-study has been presented to validate the solution in the context of a system that dynamically reverse the traveling direction of a road segment, with all the safety conditions in place. This case study composes several building blocks of the IoT platform, which demonstrate that a flexible and dynamic set-up is possible, supporting security, safety, local, cloud and mixed solutions

Vehicular Communication Networks in the Automated Driving Era

Authors: Shan Zhang; Jiayin Chen; Feng Lyu; Nan Cheng; Weisen Shi; Xuemin Shen

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Embedded with advanced sensors, cameras, and processors, the emerging automated driving vehicles are capable of sensing the environment and conducting automobile operation, paving the way to modern intelligent transportation systems with high safety and efficiency. On the other hand, vehicular communication networks (VCNs) connect vehicles, infrastructures, clouds, and all other devices with communication modules, whereby vehicles can obtain local and global information to make intelligent operation decisions. Although sensing-based automated driving technologies and VCNs have been investigated independently, their interactions and mutual benefits are still underdeveloped. In this article, we argue that VCNs have attractive potential to enhance onboard sensing-based automated vehicles from different perspectives, such as driving safety, transportation efficiency, as well as customer experience. A case study is conducted to demonstrate that traffic jams can be relieved at intersections with automated driving vehicles coordinated with each other through VCNs. Furthermore, we highlight critical and interesting issues for future research, based on the specific requirements posed by automated driving in VCNs.

IoT Based Intelligent Transportation System (IoT-ITS) for Global Perspective: A Case Study

Authors: S. Muthuramalingam, A. Bharathi, S. Rakesh kumar, N. Gayathri , R. Sathiyaraj & B. Balamurugan

Published on: 31 DECEMBER 2018

Big data analytics helps in analyzing a huge set of data whereas IoT is about data, devices and connectivity. Internet of Things (IoT) involves connecting physical objects to the Internet to build smart systems and universal mobile accessibility advanced technologies like Intelligent Transportation System (ITS). IoT solutions are playing a major role in driving the global IoT in Intelligent Transportation System. Communication between vehicles using IoT will be a new era of communication that leads to ITS. IoT is a combination of storing and processing sensor data and computing using data analytics to achieve and assist in managing the Traffic system effectively. IoT based Intelligent transportation system (IoT-ITS) helps in automating railways, roadways, airways and marine which enhance customer experience about the way goods are transported, tracked and delivered. A case study on Intelligent Traffic Management System based on IoT and big data, which will be a part of, smart traffic solutions for smarter cities. The ITS-IoT system itself forms an eco-system comprising of sensor systems, monitoring system and display system. There are several techniques and algorithms involved in full functioning of IoT-ITS. The proposed case study will examine and explain a complete design and implementation of a typical IoT-ITS system for a smart

city scenario set on typical Indian subcontinent. This case study will also explain about several hardware and software components associated with the system. How concepts like Multiple regression analysis, Multiple discriminant analysis and logistic regression, Cojoint analysis, Cluster analysis and other big data analytics techniques will merge with IoT and help to build IoT-ITS will also be emphasized. The case study will also display some big data analytics results and how the results are utilized in smart transportation systems.

Nanogenerators for smart cities in the era of 5G and Internet of Things

Authors: XunZhao, HassanAskari, JunChen

Published on: 6 JUNE 2021

5G has taken off at a brisk speed over the years, bringing significant benefits to the Internet of Things (IoT) devices and wireless sensor nodes. The launching of 5G technology provides an excellent opportunity for the faster development of smart cities. Nanogenerators (NGs) have been widely demonstrated as sustainable power sources and self-powered active sensors. The last 15 years of research on NGs have revealed that it can contribute to the digitalization of smart city services, such as localized renewable energy supplies, intelligent transportation, smart vehicles, and digital healthcare applications. The integration of novel NG technology in smart cities will solve problems pertinent to sustainable power sources for decentralized IoT devices and provide pathways for realizing self-powered active sensing systems. In this review, we will provide a comprehensive review of current research on NGs' applications in different sectors of a smart city. More importantly, we will show how NGs can be a game changer in the development of smart cities under 5G services and how the usage of NGs can boost the convenience of city dwellers. Our aim is to draw more attention to NG applications in the digitalization of smart cities and provide a guideline for applying smart concepts in future urban planning.

Internet-of-Things-Based Smart Transportation Systems for Safer Roads

Authors: Mohammad Derawi; Yaser Dalveren; Faouzi Alaya Cheikh

Published on: 13 OCTOBER 2020

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.

Automated driving: Safety blind spots

Authors: Ian Y.Noy, DavidShinar, William J.Horrey

Published on: FEBRUARY 2018

Driver assist technologies have reached the tipping point and are poised to take control of most, if not all, aspects of the driving task. Proponents of automated driving (AD) are enthusiastic about its promise to transform mobility and realize impressive societal benefits. This paper is an attempt to carefully examine the potential of AD to realize safety benefits, to challenge widely-held assumptions and to delve more deeply into the barriers that are hitherto largely overlooked. As automated vehicle (AV) technologies advance and emerge within a ubiquitous cyber-physical world they raise additional issues that have not yet been adequately defined, let alone researched. Issues around automation, sociotechnical complexity and systems resilience are well known in the context of aviation and space. There are important lessons that could be drawn from these applications to help inform the development of automated driving. This paper argues that for the foreseeable future, regardless of the level of automation, a driver will continue to have a role. It seems clear that the benefits of automated driving, safety and otherwise, will accrue only if these technologies are designed in accordance with sound cybernetics principles, promote effective human-systems integration and gain the trust by operators and the public.

IoT Based Regional Speed Restriction Using Smart Sign Boards

Authors: P. Madhumathy, H. K. Nitish Kumar, Pankhuri & D. S. Supreeth Narayan

Published on: 11 APRIL 2021

Major cause for fatal accidents on the road is over speeding. Accident risk increases with an increase in speed. The judging ability of upcoming events also gets declined while moving at higher pace, which causes judgment mistakes and leads to a crash. Around 30% of road accidents are due to over speeding. There have been various ways to avoid accidents due to over speeding, but none of them can automatically control the speed and customize the regional speed limit together. An IoT-based smart solution is discussed to overcome this, limiting the vehicle's top speed to a particular region even though people are unwilling to use control stations, smart signboards, and speed control unit in the vehicle.

Connected Vehicles in the IoV: Concepts, Technologies and Architectures

Author: Zaigham Mahmood

Published on: 14 JANUARY 2020

A connected car is an essential element of the Internet of Vehicles (IoV) vision that is a highly attractive application of the Internet of Things (IoT). The underlying technologies include Internet of Everything (IoE), artificial intelligence, machine learning, neural networks, sensor technologies, and cloud/edge computing. The connectivity between vehicles is through inter communication between sensors and smart devices inside the vehicles, as well as smart systems in the environment as part of the Intelligent Transportation Systems (ITS). In this chapter, the focus is on underlying concepts, architectures and relevant technologies. Types of connectivity and inter communication are also discussed. State of the art is articulated and, in the last sections of the chapter, future vision of vehicles' connectivity is outlined and conclusions presented. The aim is that this chapter serves as a basis and sets the scene for detailed presentations on various aspects of connected vehicles that appear later in this book.

Convergence of Blockchain and IoT for Secure Transportation Systems in Smart Cities

Authors: Khizar Abbas, Lo'Ai A. Tawalbeh, Ahsan Rafiq, Ammar Muthanna, Ibrahim A. Elgendy, and Ahmed A. Abd El-Latif

Published on: 27 APRIL 2021

Smart cities provide citizens with smart and advanced services to improve their quality of life. However, it has been observed that the collection, storage, processing, and analysis of heterogeneous data that are usually borne by citizens will bear certain difficulties. The development of the Internet of Things, cloud computing, social media, and other Industry 4.0 influencers pushed technology into a smart society's framework, bringing potential vulnerabilities to sensor data, services, and smart city applications. These vulnerabilities lead to data security problems. We propose a decentralized data management system for smart and secure transportation that uses blockchain and the Internet of Things in a sustainable smart city environment to solve the data vulnerability problem. A smart transportation mobility system demands creating an interconnected transit system to ensure flexibility and efficiency. This article introduces prior knowledge and then provides a Hyperledger Fabric-based data architecture that supports a secure, trusted, smart transportation system. The simulation results show the balance between the blockchain mining time and the number of blocks created. We also use the average transaction delay evaluation model to evaluate the model and to test the proposed system's performance. The system will address residents' and authorities' security challenges of the transportation system in smart, sustainable cities and lead to better governance.

Design of Smart Roads - A Vision on Indian Smart Infrastructure Development

Authors: Sai Deepthi Bhogaraju; Veera Rajesh Kumar Korupalli

Published on: 9 MARCH 2020

India is laying its steps rapidly towards Smart India, adopting technological advancements and implementations to make India more sustainable and citizen-friendly. Smart City's mission launched in the year 2015 to make cities smarter it ultimately makes India smarter and reliable. Infrastructure when adopts advance technologies enlighten the way of living, in this context, we designed a vision for smart roads. Though India is developing at full pace, the graph of road accidents per year due to bad road conditions has a very positive slope from the past two decades. The number of accidents due to potholes increased in the past few years, Integrating advanced technologies to the current road's infrastructure helps us to cut the number of accidents. Artificial Intelligent, Internet of Things, Machine Learning, Deep Learning, Cloud, Fog and Edge computing technologies help to design an accident prevention system further improves the safety and security of citizens.

An IoT based Smart Monitoring System for Vehicles

Authors: Christy Mary Jacob; Nikhil George; Amul Lal; Roshan Jacob George; Merin Antony; Jineeth Joseph

Published on: 17 JULY 2020

There is increased adoption of penalty and fine for traffic rule violators in the public sector but there is a tendency for people to evade from those imposed fines and restrictions for their own safety. Our system will completely monitor all the traffic violations namely over speeding, rash driving, drunken driving, driving without a seat belt, and so on right from the starting of the car. There is an increasing demand to develop a system to check passengers without coming out of the vehicle. A new system for the police force to check the vehicle's details with a smart device placed in the vehicle. The device is equipped with speed monitoring, Alcohol detection, Seat belt checking, etc. If any violation is detected the controller sends an emergency data to the cloud, thus the vehicle is in continuous monitoring mode, and RTO will get updates about the vehicles which are violating rules. Alcoholic breath sensor will continuously monitor the driver's breath, speed sensor will be connected with the speedometer and checks for over speeding, Seat belt sensor will warn the driver if he/she is not using the seat belt, vehicle details including license, pollution details, insurance, etc. will be uploaded to the server or cloud. If any of the above things are violated, automatically defaulter will be imposed fines and the details will be sent to the Motor vehicle department.

Internet of vehicles: From intelligent grid to autonomous cars and vehicular clouds

Authors: Mario Gerla; Eun-Kyu Lee; Giovanni Pau; Uichin Lee

Published on: 24 APRIL 2014

Traditionally, the vehicle has been the extension of the man's ambulatory system, docile to the driver's commands. Recent advances in communications, controls and embedded systems have changed this model, paving the way to the Intelligent Vehicle Grid. The car is now a formidable sensor platform, absorbing information from the environment (and from other cars) and feeding it to drivers and infrastructure to assist in safe navigation, pollution control and traffic management. The next step in this evolution is just around the corner: the Internet of Autonomous Vehicles. Pioneered by the Google car, the Internet of Vehicles will be a distributed transport fabric capable to make its own decisions about driving customers to their destinations. Like other important instantiations of the Internet of Things (e.g., the smart building), the Internet of Vehicles will have communications, storage, intelligence, and learning capabilities to anticipate the customers' intentions. The concept that will help transition to the Internet of Vehicles is the Vehicular Cloud, the equivalent of Internet cloud for vehicles, providing all the services required by the autonomous vehicles. In this article, we discuss the evolution from Intelligent Vehicle Grid to Autonomous, Internet-connected Vehicles, and Vehicular Cloud.

Survey on the Internet of Vehicles: Network Architectures and Applications

Authors: Baofeng Ji; Xueru Zhang; Shahid Mumtaz; Congzheng Han; Chunguo Li; Hong Wen; Dan Wang

Published on: MARCH 2020

The vehicular ad hoc network (VANET) has been widely used as an application of mobile ad hoc networking in the automotive industry. However, in the 5G/B5G era, the Internet of Things as a cutting-edge technology is gradually transforming the current Internet into a fully integrated future Internet. At the same time, it will promote the existing research fields to develop in new directions, such as smart home, smart community, smart health, and intelligent transportation. The VANET needs to accelerate the pace of technological transformation when it has to meet the application requirements of intelligent transportation systems, vehicle automatic control, and intelligent road information service. Based on this context, the Internet of Vehicles (IoV) has come into being, which aims to realize the information exchange between the vehicle and all entities that may be related to it. IoV's goals are to reduce accidents, ease traffic congestion, and provide other information services. At present, IoV has attracted much attention from academia and industry. In order to provide assistance to relevant research, this article designs a new network architecture for the future network with greater data throughput, lower latency, higher security, and massive

connectivity. Furthermore, this article explores a comprehensive literature review of the basic information of IoV, including basic VANET technology, several network architectures, and typical application of IoV.

An Overview on the Current Status and Future Perspectives of Smart Car

Authors: Fabio Arena, Giovanni pau, Alessandro Severino

Published on: 30 JUNE 2020

In recent years, the smart car sector has been increasing enormously in the Internet of Things (IoT) market. Furthermore, the number of smart cars seems set to increase over the next few years. This goal will be achieved because the application of recent IoT technologies to the automotive sector opens up innovative opportunities for the mobility of the future, in which connected cars will be more and more prominent in smart cities. This paper aims to provide an overview of the current status and future perspectives of smart cars, taking into account technological, transport, and social features. An analysis concerning the approaches to making smart a generic car, the possible evolutions that could occur in the coming decades, the characteristics of 5G, ADAS (advanced driver assistance systems), and the power sources is carried out in this paper.

Internet of Things-Supported Smart City Platform

Authors: Raman Kumar, Harish Kumar Banga and Harpreet Kaur

Published on: 4 SEPTEMBER 2020

The modern Internet of Things (IoT) technologies are facilitating projects from smart cities around the world. The IoT offers the ability to track, handle, and operate machines remotely and to create new knowledge and actionable information from vast real-time data sources. Robust and practical approaches to smart cities already faced obstacles. The latest information and communication technology (ICT) implementations for smart cities are focused on specialized structures that are not fully compliant, compact, extensible, or economical throughout cities. This paper highlights how diverse firms are working jointly to diminish the barriers in the way of smart city resolutions, and potential gains along with IoT related problems for cities are addressed. There will be a debate on the needs of intelligent cities, the role of IoT technology to make cities more stylish and better, and the best wireless technology for smart cities. The examples of five cities are shown as cities measured according to several research criteria, including smart grid systems, smart lighting, and the application of digital technologies for traffic, wireless internet, mobile penetration, and app landscape. Secured and trusted smart cities and core security objectives are also presented. Inside a community of IoT technology, large-scale implementation aims to make city operations effective while recovering the quality of life for urban residents.