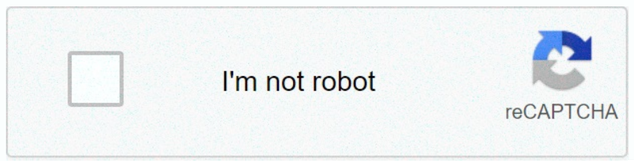

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Smart cities civil engineering

State-of-the-art reviews The Sarsmart City program offers a variety of technologies that can be implemented to solve infrastructure problems associated with outdated infrastructure and growing demands. The potential for infrastructure and urban reform, however, remains unconscious due to technical, financial and social constraints and criticisms that limit the implementation of concepts of smart cities for infrastructure management. The discussion presented here reviews smart technologies including sensors, crowdsourcing and citizen science, actuator, data transmission, Internet of Things, big data analytics, data visualisation and blockchain, which can be used for infrastructure management. Smart infrastructure programs are reviewed to explore how technologies have been enabled in the civil engineering domain, including transport systems, water systems, air quality, energy infrastructure, solid waste management, construction engineering and management, structures and geo-technical systems. Gaps are identified in the application of smart technologies to infrastructure systems, and we highlight how the civil engineering business can adopt new roles towards the development of smart cities applications. These roles are: (1) Master Designer: Civil engineers can identify ready applications enabling technologies to improve the delivery of urban resources and services; (2) Manager: Civil engineers should pay attention to both the environmental and social impacts of smart infrastructure applications; (3) Innovators and Integrators: Civil engineers should integrate into diverse fields and groups of experts to develop smart infrastructure programs; (4) Manager of Risk: Civil engineers should manage the current and growing risks of natural disasters, emergencies and climate change; They should manage new vulnerabilities in the privacy and security of individuals and households introduced through smart technologies; And (5) Leaders and decision makers: Civil engineers can play a leading role in smart infrastructure discussions and policy development. Access content Please select your options to explode the amount of data generated worldwide. It is available in quantity and unmatched quality in human history. And this is just the beginning: Some projections say that the digital universe — currently 3.2 zettabytes — will evolve to 40 zettabytes in just half a decade. (A zettabyte is about a billion terabytes.) Our citizen and environmental engineers are working to harness the potential of all this data with novel data harvesting techniques — from wireless sensors to unmanned aerial vehicles — while also creating new ways to process, analyze, visualize and access that information. Take, for example, our urban infrastructure, which is one of the most complex systems in the world. It's various Manufactured Mixes (Transportation, water, electricity and telecommunications, to name a few) with natural systems (oceans, wind, forests and more) as well as social systems that enable our societies to function (everything from schools and economy to justice systems and health care). The system modeling of these systems will require the management of data on an unprecedented scale. For some perspective, consider Forester Research's 2014 survey that asked businesses if they're actually using how much data they have. Most companies estimate just 12 percent. The remaining 88 percent may include significant insights. Or it could be noisy. Without the right tools to use it, data only means less. That's why CEEatGT researchers are imaging the unprecedented means of using the data we have – and the new forms of data we're exploring – for the betterment of humanity and the environment: we're monitoring how our transport systems perform and how people use them so that we can make better decisions about how we get to the place and what we do it. will be. We are effectively modelling future scenarios for the development of city and regional infrastructure to determine how and where we should develop as well as what will be necessary to meet the needs of future generations. We are creating our interconnected infrastructure system instrument so we can assess their health, correct weaknesses, catch up to problems before they happen and prioritise our limited repair and replacement expenditure. And we are capturing interdependence between systems for predicting widespread failures and implementing mitigation measures to reduce damage during disruptions and facilitate community recovery. Career: Decentralized monitoring and control for large-scale smart structures with wireless and mobile sensor networks - The research objective of this Faculty Early Career Development (Career) Award is to discover a range of decentralized substructure based monitoring and control approaches using wireless and mobile sensor networks. Sponsor: National Science Foundation Principal Investigator: Yang Wang Bicycle Atlanta - Bicycle Atlanta is an application for iPhone and Android that collects data about cyclists' routes, origins, destinations, demographics and features of note in the city of Atlanta. This allows transport planners to see which roads are avoided and which are popular and later use this information to inform decisions about where infrastructure is needed to create bike-friendly routes through the city. Sponsor: Georgia Tech GVU Center, Georgia Tech Institute for People and Technology, Atlanta City, Southeastern Transportation Research Innovation Development and Education Center, Georgia Department of Transportation Principal Investigator: a drive-by bridge inspection system with wireless BWIM+ NDE devices Watkins Field Verification - - The project, a wireless sensor network will record the truck's dynamic response to the installation on a heavy truck as it is checked to cross the mounted bridge with BWIM+ NDE equipment. Sensors installed in the vehicle include accelerometers to measure vibrations and gyroscopes to catch vehicle pitching speed. As soon as the instrumented vehicle approaches the bridge, the BWIM + NDE system establishes communication with wireless sensors on the vehicle to wirelessly synchronize time and start data collection. As soon as the truck crosses the bridge, wireless sensors on the truck transmit vibration and pitching data to wireless BWIM+ NDE servers for automatic integration with pull response data. Experimental verification of the proposed wireless system will be carried out both in laboratory and area. Sponsor: National Center for Transportation System Productivity and Management, Department of Transportation, Alabama Department of Transportation Principal Investigator: Yang Wang, Laurence Jacobs Low-cost self-powered self-operated wireless nanosensors to monitor real-time structural integrity steel bridges — representing nearly 34 percent of nearly 600,000 highway bridges in the United States with steel bridges, continual monitoring and early detection of the decline in these structures is crucial to prevent costly repairs or catastrophic failures. Developing a solution for autonomous crack monitoring aims to sponsor: Federal Highway Administration Principal Investigator: Yang Wang Multi-Physics Coupled Wireless Antenna Sensor for Structural Health Monitoring -- An Innovative, Battery-Free Wireless Antenna Sensor to Achieve High Fidelity Tension/Sensors Highly inter-disciplinary multi-physics modeling, simulation, and experimentation with coupled electromagnetic and mechanics. Sponsor: Air Force Scientific Research Principal Investigator of youth investigator research program: Yang Wang Multi-scale flexible interdependent modeling framework for control of critical infrastructure system - This project will assess a novel modeling framework and build an assessment and control of interdependent critical infrastructure systems (ICIs). Infrastructure systems are vital to the functioning of our society, and they provide the backbone of our nation's health, safety, and safety as services. These systems are complex, including many interdependent components. Furthermore, these systems are dependent on performance, with the performance of one system one or more of the other dependent on performance. This leaves ICIs vulnerable to both natural and man-made threats. The project will study how to improve the flexibility of these systems, with the recognition that achieving flexibility will be a shared responsibility among stakeholders. Sponsor: National Science Foundation Investigator: Iris Tien Vanbuwe – OneBusAway is an open-source coded, real-time transit information system for riders now available in nearly a dozen cities. The primary use is to provide the next vehicle countdown information via SMS interface for smartphone applications, a website, phone number, and text messages. The underlying goal is to reduce the burden of using public transport and thus increase rider satisfaction and increase transit ridership. Sponsor: Georgia Tech GWU Center, Georgia Tech Institute for People and Technology, National Center for Transportation Systems Productivity and Management, Woodruff Foundation, Sound Transit Principal Investigator: Kari Watkins Flexible Other Dependent Infrastructure Processes and Systems: Partnership Modeling of Complex Urban Infrastructure Systems (Model Urban Systems) - This project is designed to develop the principle that infrastructure systems , with their many other dependent and complex adaptations, there are many similarities to ecosystems. Insights will be useful in the future development of tools and methods for designing and evaluating urban infrastructure systems and their resilience under stresses such as climate change, urban development patterns and extreme weather events. Sponsor: National Science Foundation Principal Investigator: John Crittenden SRN: Integrated urban infrastructure solutions for environmentally sustainable, health and livable cities - This National Science Foundation is working to visualize sustainability research network infrastructure - energy grids, road networks, green spaces, and food and water systems - to create cities that are highly functional , who promote the health of residents and the environment, and who have an abstract vibe that makes them desirable places to live and work. Sponsor: National Science Foundation Co-Principal Investigator: Armist Russell Russell