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Internet of Things-Enabled Smart Cities: State-of-the-Art and Future Trends

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Internet of Things-Enabled Smart Cities: State-of-the-Art and Future TrendsAmir H. Alavi^{a1}, Pengcheng Jiao^{b1}, William G. Buttlar^a, Nizar Lajnef^c^a *Department of Civil and Environmental Engineering, University of Missouri, Columbia, MO 65211, USA*^b *Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, PA 19104, USA*^c *Department of Civil and Environmental Engineering, Michigan State University, East Lansing, MI 48823, USA***Abstract**

The dramatic spread of urbanization in modern cities requires smart solutions to address critical issues such as mobility, healthcare, energy, and civil infrastructure. The Internet of Things (IoT) is one of the most promising enabling technologies for tackling these challenges by creating a massive worldwide network of interconnected physical objects embedded with electronics, software, sensors, and network connectivity. Arguably, IoT is becoming the building block for next generation smart cities owing to its potential in exploiting sustainable information and communication technologies. The rapid development of the IoT is impacting several scientific and engineering application domains. This paper presents a comprehensive literature review of key features and applications of the IoT paradigm to support sustainable development of smart cities. An emphasis is placed on concomitance of the IoT solutions with other enabling technologies such as cloud computing, robotics, micro-electromechanical systems (MEMS), wireless communications, and radio-frequency identification (RFID). Furthermore, a case study is presented to demonstrate how an affordable and suitable IoT-based working prototype can be designed for real-time monitoring of civil infrastructure. Finally, challenges and future directions for IoT-based smart city applications are discussed.

Keywords: Internet of Things; Smart Cities; Cloud Computing; Network Connectivity; Smart Infrastructure

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