Microcontroller Unit-Based Wireless Sensor Network Nodes: A Review

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Abstract

In this paper, a detailed review of microcontroller unit (MCU)-based wireless sensor node platforms from recently published research articles is presented. Despite numerous research efforts in the fast-growing field of wireless sensor devices, energy consumption remains a challenge that limits the lifetime of wireless sensor networks (WSNs). The Internet-of-Things (IoT) technology utilizes WSNs for providing an efficient sensing and communication infrastructure. Thus, a comparison of the existing wireless sensor nodes is crucial. Of particular interest are the advances in the recent MCU-based wireless sensor node platforms, which have become diverse and fairly advanced in relation to the currently available commercial WSN platforms. The recent wireless sensor nodes are compared with commercially available motes. The commercially available motes are selected based on a number of criteria including popularity, published results, interesting characteristics and features. Of particular interest is to understand the trajectory of development of these devices and the technologies so as to inform the research and application directions. The comparison is mainly based on processing and memory specifications, communication capabilities, power supply and consumption, sensor support, potential applications, node programming and hardware security. This paper attempts to provide a clear picture of the progress being made towards the design of autonomous wireless sensor nodes to avoid redundancy in research by industry and academia. This paper is expected to assist developers of wireless sensor nodes to produce improved designs that outperform the existing motes. Besides, this paper will guide researchers and potential users to easily make the best choice of a mote that best suits their specific application scenarios. A discussion on the

wireless sensor node platforms is provided, and challenges and future research directions are also outlined.