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Connected bicycles: Potential research opportunities in wireless sensor network

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Abstract

In the area of high-performance cycling, cyclist-performance monitoring system can be considered one of the most important applications. Wireless sensor networks (WSNs) have been identified as one of the technology candidates to meet the mobility model, energy model, and real-time monitoring of a cyclist. A few key WSN technologies that have been utilized are Bluetooth, ZigBee, Wi-Fi, and advanced and adaptive network technology (ANT). By utilizing the infrastructure of the mobile and Internet networks, the cyclist parameters can be transmitted to a remote location via a framework system that consists of the WSN protocol and the mobile phone device. The previous research works and commercial products on methods of measuring cycling performance focus on how to transfer the cycling parameters from the bicycle sensor nodes to the monitoring device. With the advanced development of the sensors technology, wireless communication technologies, and cloud computing, the bicycle wireless sensor network is expected to join the Internet of Things (IoT) hype. This chapter provides an overview of bicycle wireless sensor network (BWSN) for connection between the cyclist and a remote monitoring location. BWSN comes with a number of challenges such as limitation of energy resources, limitation of size and weight for mounting of the sensor node on the bicycle as well as varying distances and channel conditions between the cyclist and the monitoring node. A few methods to address these challenges focusing on energy-efficient techniques are proposed such as sleep/wake strategy, radio optimization, energy-efficient routing, and energy harvesting. The latest development and potential research topics related to the Internet of Bicycles are also highlighted in this work.

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