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Impulse-based Wireless sensor network

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Wireless sensor networks are now widely adopted in various application fields as one of fundamental technologies of IoT. However, energy consumption, device cost, and management cost remain impediment to deployment and long-term operation of a considerable number of sensors. To solve the problem, we propose a novel architecture of a wireless sensor network by being inspired from communication and computation in the brain. A neural network consists of very simple devices, i.e. neurons. Neurons only receive and emit a series of impulses or spike trains on a randomly connected network. Despite the simpleness, communication and computation in the brain are known effective, adaptive and robust. Our impulse-based WSN performs all of sensing, signal processing and communication by using impulse. A sensor node is equipped with a simple binary sensor, which generates impulses when an observed value exceeds a certain threshold. Next, impulses from a sensor and neighbor nodes are processed by a simple circuit as a living neuron does. Then, a node broadcasts impulse signals to neighbors. In our impulse-based WSN, each node does not have an identifier. In addition, there is no energy-consuming control such as topology management and routing. However, by using brain-inspired algorithms, we can derive information about an event observed by sensors, i.e. when, where and what happens. We introduce our impulse-based WSN which enables easy deployment and long-term monitoring with high spatial resolution and show some examples of application.

Biography

Naoki Wakamiya completed PhD at Osaka University in 1996. He is now a Professor at Graduate School of Information Science and Technology, Osaka University. His research interests include “Bio-ICT (Biologically-inspired Information and Communication Technology) and self-organizing network control”. He received the 2nd IEEE ComSoc Asia-Pacific Young Researcher Award in 2005.

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