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Some Problems in Sensor Networks and Our Solutions
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Abstract

Strong adaptability, comprehensive sensing coverage, and high fault tolerance are some of the unique advantages of sensor networks. Sensor networks consist of large amounts of wireless sensor nodes, which are compact, light-weighted, and battery powered devices that can virtually fit in anywhere. Wireless sensor nodes are usually deployed in extreme environments, which are too hostile for maintenance. Therefore, sensor nodes must conserve their scarce energy by all means and stay active until their batteries can be replaced or recharged.

Most of the energy in a sensor node is consumed by its radio transmitting unit and the amount of energy consumed is proportional to the transmission distance. To reduce energy consumption, sensor nodes are organized into clusters. Organizing the sensor nodes into clusters can greatly reduce long distance transmissions and therefore conserve energy. However, clustering will also introduce tremendous delays in the data collecting process. A tree-based delay-aware network structure and its formation algorithm are proposed. Simulation results show that the proposed network structure can shorten the delays in data collection significantly, while keeping the total transmission distance at low values. High redundancy of sensing power can greatly enhance the sensing resolution and make sensor networks robust to the rapidly changing environment. The use of excessive sensing power, however, may cause unnecessary energy consumption in sensor nodes. An energy efficient soft deployment scheme for wireless sensor networks is proposed. Simulation results show that, when comparing with other generic soft deployment schemes, the proposed scheme can significantly reduce energy consumption and improve the target hit-rate.

About the Speaker

Chi-Tsun Cheng received the B.Eng. degree in Electronic and Communications Engineering in 2004, and the M.Sc. degree in Electrical and Electronic Engineering in 2005, both from the University of Hong Kong, Hong Kong. He is currently pursuing the Ph.D. degree in Electronic and Information Engineering at the Hong Kong Polytechnic University, Hong Kong. His research interests include wireless sensor networks, bio-inspired computing and meta-heuristic algorithms.

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