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Adaptive Dynamic Routing protocol For Wireless Body Area Networks

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Abstract

Wireless Body Area Networks (WBANs) are composed of wireless sensor nodes deployed on, in or close to a human body. They are employed to collect and convey data gathered to monitor the bodys physiological state. The nodes are battery-powered, and usually have a limited supply of energy. Moreover, they may have a small transmission range due to limited transmission power and attenuation of their signal by the human body. So, In order to save transmission power while extending the network's area, multi-hop communication is necessary. However, the IEEE 802.15.6 standard for WBANs is concerned with hop-by-hop communication at the physical and medium access layers. Therefore, routing protocols need to be developed to operate over IEEE 802.15.6. In WBANs, traffic from/to nodes is routed through a special node; the sink, which acts as a network gateway. Communication may thus occur in the downstream direction from the sink to a node, or the upstream direction from a node to the sink.

This thesis surveys routing methodologies for WBANs, and proposes a bi-directional routing protocol that enables multi-hop communication in both downstream and upstream directions. The protocol builds a tree topology rooted at the sink. Parent nodes at the tree, i.e., non-leaf nodes, act as routers that relay traffic originating at the sink to their children nodes. They also relay traffic originating from their descendant nodes to their parents in order to finally reach the sink. A node that joins the tree chooses its parent based on several metrics, namely the strength of signal received from parent, the number of hops from the sink to the parent, the residual energy in the parent's battery and the number of children already associated with the parent or a fuzzy logic combination of all previous metrics. Each metric aims at achieving some objective, for instance, the number of hops metric, aims at building shortest-path routes. Also, the residual energy metric aims at extending the network's lifetime, i.e., a node avoids joining parents with low energy levels. The protocol is simulated and simulation results shows around a fifty percent improvement in network lifetime over similar protocols.