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Disruption Tolerant Network Routing in Body Sensor Networks with Dynamic Postural Partitioning

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Abstract: Abstract - This paper presents novel store-and-forward packet routing algorithms for Wireless Body Area Networks (WBAN) with frequent postural partitioning. A prototype WBAN has been constructed for experimentally characterizing on-body topology disconnections in the presence of ultra short range radio links, unpredictable RF attenuation, and human postural mobility. On-body DTN routing protocols are then developed using a stochastic link cost formulation, capturing multi-scale topological localities in human postural movements. Performance of the proposed protocols are evaluated experimentally and via simulation, and are compared with a number of existing single-copy DTN routing protocols and an on-body packet flooding mechanism that serves as a performance benchmark with delay lower-bound. It is shown that via multi-scale modeling of the spatio-temporal locality of on-body link disconnection patterns, the proposed algorithms can provide better routing performance compared to a number of existing probabilistic, opportunistic, and utility based DTN routing protocols in the literature.