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Body Posture Identification using Hidden Markov Model with Wearable Sensor Networks

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Abstract: This paper presents a networked proximity sensing and Hidden Markov Model (HMM) based mechanism that can be applied for stochastic identification of body postures using a wearable sensor network. The idea is to collect relative proximity information between wireless sensors that are strategically placed over a subject?s body to monitor the relative movements of the body segments, and then to process that using HMM in order to identify the subject?s body postures. The key novelty of this approach is a departure from the traditional accelerometry based approaches in which the individual body segment movements, rather than their relative proximity, is used for activity monitoring and posture detection. Through experiments with body mounted sensors we demonstrate that while the accelerometry based approaches can be used for differentiating activity intensive postures such as walking and running, they are not very effective for identification and differentiation between low activity postures such as sitting and standing. We develop a wearable sensor network that monitors relative proximity using Radio Signal Strength indication (RSSI), and then construct a HMM system for posture identification in the presence of sensing errors. Controlled experiments using human subjects were carried out for evaluating the accuracy of the HMM identified postures compared to a na?ve threshold based mechanism, and its variations over different human subjects.