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Transmission Power Assignment with Dynamic Link Quality Inference for On-Body Wireless Communication

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Abstract: This paper presents a novel transmission power assignment mechanism for on-body wireless links formed between severely energy-constrained wearable and implanted sensors. The key idea is to develop a measurement based framework in which the postural position as it pertains to a given wireless link is first inferred based on the measured RF signal strength and packet drops. Then optimal power assignment is done by fitting those measurement results into a model describing the relationship between the assigned power and the resulting signal strength. A closed loop power control mechanism is then added for iterative convergence to the optimal power level as a response to both intra and inter posture body movements. This provides a practical paradigm for on-body power assignment which cannot leverage the existing mechanisms in the literature that rely on localization which is not realistic for on-body sensors. Extensive experimental results are provided to demonstrate the model building and algorithm performance on a prototype body area network. The proposed mechanism has also been compared with a number of other closed loop mechanisms and an experimental benchmark.