Design of an energy efficient body area network based on Bluetooth 4.0 low energy for medical applications

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Medical personnel and institutions focus much of their effort on treatment of people who are ill or in need of emergency treatment. Existing systems are likely to undergo radical changes due to the shift towards an increasingly ageing society. One of the expected developments is a move towards a more proactive and monitored approach to healthcare. Advances in miniaturization and wireless communication technologies have made medical monitoring more comfortable for patients as well as providing enhanced data on their health for medical staff.

With the ever-increasing number of smart phones owned by individuals, data capture, analysis and diagnosis is no longer restricted to medically trained personal. Current mobile technologies are still heavily battery and lifetime constrained. Context awareness can be utilized to optimise workload and communication, that in turn, prolongs battery lifetime. The object of this dissertation is to develop an approach for intelligent wireless communication based on Bluetooth 4.0 low energy. The targeted

context for this approach is that of Body Area Networks (BAN).

Based on circumstances energy efficient wireless communication is achieved by adaptive changes to connection parameters for Bluetooth 4.0 low energy connections. An initial design was based on a connectionless approach utilising the Bluetooth low energy advertising mode. However, implementing this proved beyond the scope of this dissertation due to the complexities of the system. The revised approach utilised a connection based communication with a dedicated GATT service to configure the behaviour of embedded sensor devices. The embedded prototype included the dedicated GATT service as well as adaptive behaviour to detected outliers in the measured sensor data. An Android application acted as a central data sink and a controlling entity handling transmitted data and enabling the user to manually configure connection parameters.