Biometric Monitoring in Team Sports Using Wireless Ad-Hoc Networking

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Sudden Arrhythmic Death Syndrome (SADS) is a condition that affects people during physical activities such as team sports. It causes erratic rhythms of signals from the brain to the heart, this is known as arrhythmia. We can detect SADS by looking for this arrhythmia while the individual is partaking in physical activities while connected to an Electrocardiography (ECG) device. An ECG device is able to monitor the electrical signals that are sent from the brain to the heart. These devices are used to detect irregularities in these signals during physical stress testing and early detection is necessary to prevent death. However, SADS can occur suddenly which is why a wearable device is needed to continuously monitor biometric signals of the individual.

At present these devices have become wearable due to the recent development of small sensors and embedded devices. This led to such devices being used to monitor biometric data, such as the detection of SADS. Although these devices exist they currently implement a design that requires either relays or a direct communication back to a base station. However, these designs require extra infrastructure and energy usage. Some devices do not send biometric data, rather they write the data to non-volatile storage which is attached to the device and is later analysed. This means real time biometric data cannot be analysed during players' physical activities. These designs are inadequate and less adoptable because more cost is associated with high levels of infrastructure and extra power usage causes the devices to increase in size.

In order to create the smallest and most energy efficient device two possible protocols could be used in its development. These are Ad hoc On-Demand Distance Vector (AODV) Routing and a Gossip based protocol. Upon further research it is believed that Gossip protocol would be the most effective for use in team sports. Results from a simulation using Gossip protocol will be evaluated to create a prototype of the device. The results from the prototype can then be fed back into the simulation to create more realistic circumstances and lead to improved development of the device.

This dissertation also presents some future work to enhance the efficacy of Gossip protocol which we have used in the design and implementation.