

The Investigation of the Use of Advanced Sensing Technologies for Protection Suits

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The monitoring of hazardous environments, along with the people working within them, is an area which lends itself to applications involving wireless and body sensor networks. The field is rich with potential applications in detecting hazards, providing feedback to observers and other critical tasks that can increase the safety and overall working conditions of people operating in these environments.

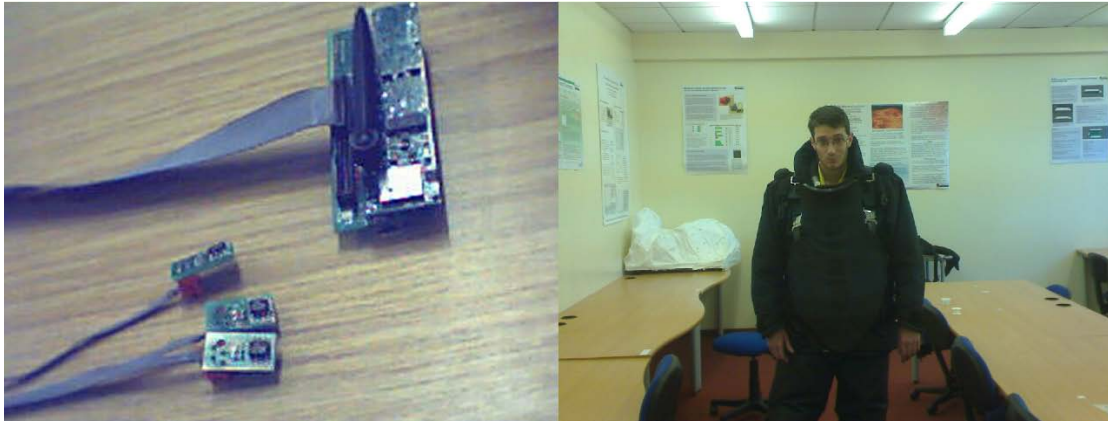
The goal of the project here is to develop a wearable wireless sensing system suitable for deployment in manned bomb disposal missions. During these missions, in which very thick and heavy protective clothing is worn, operatives often experience high, uncomfortable, and potentially dangerous temperatures. The system will be capable of making in-network autonomous decisions related to the actuation of the cooling system within the suit to increase the comfort of the wearer. In addition, it will allow an external observer to remotely monitor the health and comfort of the operative. A prototype of this system will be implemented.

In pursuing the goal, the following questions must be answered:

- Which physiological parameters must be measured in order to effectively allow this monitoring?
- Which parameters are required for the resulting control action to be effective in providing actuation towards a specified level of comfort for the wearer?
- Which parameters can be used to refine this control?
- Can the system be implemented in a way that is not intrusive to the wearer's tasks?
- How should the autonomous decision-making engine be designed to fulfill the requirements of safety-critical applications?

Answering these questions involves several areas of research: Body sensing systems; Modeling systems; Autonomous decision-making systems; Remote monitoring.

To date, an initial prototype sensing system has been implemented for testing and experimentation purposes, with a further more advanced prototype currently in the design stages. In addition, an algorithm for translating skin temperature readings into local and overall comfort levels has been extracted from the literature and is in the process of being tested in order to evaluate its suitability for the purpose.



A visualisation application has been developed for the purpose of testing and experimentation with the prototype sensing system in order to guide its development toward fulfilling the goals presented earlier. In the future this application will form the basis for the remote monitoring component of the final system.

The future work planned involves research into appropriate decision-making engines, further investigation of modeling engines, as well as the design and implementation of hardware and software components to accommodate overall system operation, i.e. the appropriate application of cooling to the wearer of the suit.