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MICRO-MOBILE SENSOR NETWORKS

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Abstract:

Micro-mobile sensor networks, including body wearable sensor networks, have a wide range of practical applications. These sensor networks can be effectively used for real-time (or near real-time) monitoring in applications ranging from defense, to health monitoring, and costal monitoring. A well-architected sensor network has four independent functional components: the sensor component, the data collection component, the sensor data processing component, and the communications component. The major difference between sensor applications is the sensor component. In bio/medical applications, the sensor monitors health-related parameters like body temperature and heart rate. For coastal monitoring, the sensor selection would depend on the objective of the monitoring, like wind velocity, temperature, or hand held water analysis.

Most sensor networks transmit their collected data to a central server where users monitor the incoming data in real-time. Typically the central server can be remotely accessed so that its user can view the data and generate reports from any location. In a mobile network, connectivity to a back end (or central) system is not assured. Thus "roaming algorithms" are required to deal with situation where the sensor moves/roams outside the range of the network radio. In bio/medical applications where patients use wearable sensors outside of hospitals, clinics and even their homes; the networks require complex algorithms to assure that data is collected 24x7, even when the patient moves freely outside of the range of the network. These sensor and network components incorporate on-board intelligence and control software to recognize "roaming events" and to take preventative actions if a network loses connectivity to its sensors or backend system.

Another important consideration in micro mobile sensor networks is the power source – specifically the batteries. The design must be developed to provide efficient power consumption as well as the intelligence to take corrective action when the battery power fluctuates or runs low. To accomplish this, AI techniques and software agents are required to perform specific tasks, such as power management and connectivity management, and to take corrective actions when an "event" is identified. Since low power events can corrupt a sensor's on-board memory, early identification and correction is necessary to ensure uninterrupted monitoring.

Any type of sensor -- whether analog or digital, biomedical or environmental -- can be upgraded to be a "smart sensor" when integrated with an on-board microprocessor to manage the sensor's operation. And further, to design an effective and efficient micro mobile sensor network, the intelligence of the system must be distributed throughout the network components: in the sensor

units, the communication components, the network controllers, and the central server. All components need to be situationally aware – able to identify events and take corrective actions.