

## **SENSORS: Self-configuration and Data Aggregation in Microsensor Systems**

### **Summary**

Any system, structure, or environment is vulnerable to malicious and hostile activities. Detecting malfunctions, failures, and natural disasters require constant real-time monitoring. The technical challenge is to replace human monitoring with sensors that detect and determine events that lead to safe operations of any enterprise. The reliability, security, and accuracy of these sensors and wireless devices can affect timely access to information used in decision making. When deployed in large numbers and embedded deeply with in large scale physical systems, microsensors gain the ability to measure aspects of physical environment in unprecedented detail. Wireless sensor networks are envisioned to consist of large number of devices, each capable of limited computation, communication, and operating in an unattended mode with limited energy. Sensors are characterized by severe energy constraints. A variety of sensors that detect temperature, pressure, electromagnetic fields, acoustics, optical, chemical, biological, radiation, humidity etc are have become available due to advances in electronics, physics, chemistry, and biology.

**Intellectual Merits** Our intellectual contributions are as follows:

- We will develop and investigate a new hierarchical sensor system architecture. Research will provide the design and evaluation of algorithms for data aggregation, self-configuration, and data-centric routing.
- The ideas of nearest neighbor routing tree, low energy localized clustering, and pattern identification for data aggregation will be investigated.
- The research will lead to new algorithms and experiments that will provide evaluation of schemes based on energy consumption.

**Broader Impact** Our proposed research will contribute to the safety of medical care environments, nuclear waste disposal, bio security and disaster management, and safety of chemical plants, dams, bridges, etc. Research will result in seminars, tutorials, and course enhancements at undergraduate level in mobile wireless database systems. Two minority women PhD students will participate in this research effort. The PI will involve undergraduate minority and women students in the project through the EPICS Program (Engineering Projects in Community Service). We will develop new simulation and experimentation infrastructure, to be used not only for research, but also for teaching and public access. The platform for simulation and experiments will be made available to other universities. A new laboratory will be set up to demonstrate the applications. Demonstrations will be given to visiting students from high schools.