

WINSOC

WINSOC is a European Commission funded research project that focuses on *Wireless Sensor Networks with Self-Organization Capabilities for Critical and Emergency Applications*. WINSOC is composed of eleven academic and industry partners based in Europe and India who are developing a novel new method of wireless sensor networking that mimics biological systems. This new two level hierarchical system is composed of a lower level of low cost sensors which collect environmental data and generate locally reliable decisions, and an upper level which forwards the information on to a remote analysis station.

Landslides are responsible for the deaths of hundreds of people every year around the world. Amrita University is developing a landslide detection system using the above new sensor network and deploying the network in real life landslide prone areas in India. The actual deployment site (shown in Figure 1) is in the Idukki district of the southern state of Kerala, India. This region experiences numerous rainfall induced landslides during every monsoon season. The primary cause of these landslides is human development and encroachment in the form of clearing hill sides for agricultural purposes and cutting into the hills for housing and roads.



Figure 1: Actual Deployment Site, Anthoniar Colony, Munnar, Idukki, Kerala, India

The network architecture is as follows: the lower level of wireless network nodes are connected to a column of geological sensors. These low level network nodes are then wirelessly connected to a hierarchy of upper level wireless nodes that forward the data on to a Gateway. The data is

then sent via a directional Wi-Fi link to a Field Data Management Center (FMC). The data is then forwarded over a satellite link to Data Management Center (DMC) which has sophisticated landslide data processing and modeling capability, located at Amrita University, Amritapuri campus.

Amrita is developing a self configurable wireless sensor network with adaptive variable spatial and temporal data granularity. In addition the network will be optimized for low energy consumption. The network will be optimized by determining the maximum practical fan out in both the upper and lower levels and by employing innovative new energy saving schemes that enable neighbor to neighbor wakeup through adaptive positive feedback algorithms.

The WINSOC wireless sensor network will enable new methods of broad scale environmental and hazardous situation monitoring in which relatively large amounts of inexpensive sensor nodes will collect data and couple together automatically to aggregate data in a reliable local decision making process. The relevant information will then be forwarded onto more sophisticated data analysis centers, where alerts and warnings can be created.

Successfully deployed Amrita's Wireless Sensor Landslide Detection test set up on March, 2008. Figure 2 two shows the deployment of one sensor column and one relay node



Figure 2: Field deployment of one sensor column and one relay node

Data from the field has been successfully received as shown in Figure 3 and the analysis of the data is progressing.

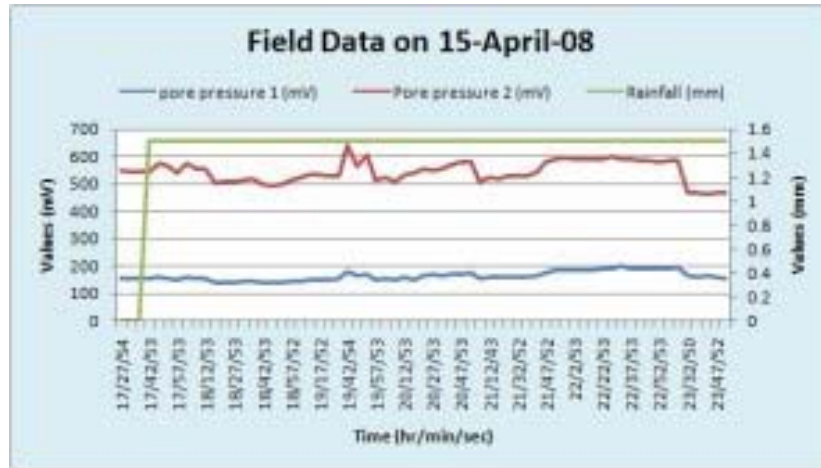


Figure 3: Field data

A new small scale and medium scale laboratory set up (shown in Figure 4) for landslide detection are under the final stages of construction. They have the capability to be tilted at any angle less than 45degree. So the tests can be conducted by keeping the set up at the same slope angle as of the mountains under consideration. The laboratory set up also includes a seepage simulator and a rainfall simulator which are also under construction.



Figure 4: Medium scale laboratory set up