Geophysical Research Abstracts
Vol. 13, EGU2011-10549, 2011
EGU General Assembly 2011

Use of Wireless Sensor Networks for landslide monitoring

Matteo Berti (1), Alessandro Corsini (2), Francesco Ronchetti (2), Guido Bernardi (3), Fabrizio Bertocchi (3), Alberto Rosi (4), and Franco Zambonelli (4)

(1) Dipartimento di Scienze della Terra e Geologico-Ambientali, Università di Bologna, Italy (matteo.berti@unibo.it), (2) Dipartimento di Scienze della Terra, Università di Modena e Reggio-Emilia, Italy, (3) CAE S.p.A., Bologna, Italy, (4) Dipartimento di Scienze e Metodi dell'Ingegneria, Università di Modena e Reggio-Emilia, Italy

Wireless Sensor Networks (WSN) consists in networks of small-scale, power-limited computer-based sensor nodes with a wireless communication module. The advantages of these systems include the connectivity to any possible sensor, the reasonable cost of components, the set up simplicity and the possibility of easy web integration. Sensor networks are attracting an increasing interest due to the potentials of application in a variety of monitoring scenarios, such as traffic flow, wildlife control, as well as the monitoring of geological objects like volcanoes and glaciers. Pioneer application on landslide areas are encouraging but the difficulties encountered in real field applications have so far hampered the spread of WSN technology in this field.
In the framework of the WISELAND research project (Integrated Airborne and Wireless Sensor Network Systems for Landslide Monitoring; Italian Ministry of Education, 2007) two WSN systems were designed and deployed in the field. The major problems of power consumption, long-term duration of the network, and reliability of the communication modules were addressed by dedicated hardware development. The specific objective of the designed were:
1) To develop a unified sensor interface suitable for all the most common sensors used in landslide monitoring (pressure sensors, load cells, borehole inclinometers, clinometers, wire extensometers, crackmeters)
2) To minimize power consumption by developing power-efficient WSN nodes
3) To design a versatile node packaging that allow quick installation/removal
4) To test the reliability of the WSN technology in real-field applications
The systems were deployed in 2010 in two complex earthflows of the Northern Apennines of Italy (Silla-Montecchi and Cà Lita landslides). The Silla-Montecchi WSN system consists of 10 autonomous nodes, 7 of which connected to a geotechnical sensor (3 tiltmeters, 2 crackmeters, 2 pressure sensors). The Cà Lita system consists of 9 autonomous nodes, 8 of which connected to a geotechnical sensor (1 crackmetrs, 1 surface wire extensometer, 2 pressure sensors, 2 tiltmeteres). In both cases, sensors were chosen to simulate the monitoring of scattered houses threatened by a reactivating landslide. Data are acquired every 30 minutes, routed through the network to a master node and send to a central server via radio (Silla-Montecchi) or GPRS (Cà Lita) transmission. The WSN systems work regularly since they were installed. The percentage of data successfully transmitted is higher than 95% and apparently it is not affected by meteorological conditions (at least during the test period from June to November 2010). Battery life is in the order of 3 months for WNS nodes which supply a sensor, and about 5 months for individual nodes that act as transmission bridge. WSN systems required very little field maintenance and seem to be an effective technology for landslide monitoring and early-warning.