



Wireless sensor network: an aimless gadget or a necessary tool for natural hazards warning systems

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The purpose of the current study is to review the current technical and scientific state of wireless sensor networks (WSNs) with application on natural hazards. WSN have received great attention from the research community in the last few years, mainly due to the theoretical and practical efforts from challenges that led to mature solutions and adoption of standards, such as Bluetooth [2] and ZigBee [3].

Wireless technology solutions allows Micro-ElectroMechanical Systems sensors (MEMS) to be integrated (with all the necessary circuitry) to small wireless capable devices, the nodes. Available MEMS today include pressure, temperature, humidity, inertial and strain-gauge sensors as well as transducers for velocity, acceleration, vibration, flow position and inclination [4]. A WSN is composed by a large number of nodes which are deployed densely adjacent to the area under monitoring. Each node collects data which transmitted to a gateway. The main requirements that WSNs must fulfilled are quite different than those of ad-hoc networks. WSNs have to be self-organized (since the positions of individual nodes are not known in advance), they must present cooperative processing of tasks (where groups of nodes cooperate in order to provide the gathered data to the user), they require security mechanisms that are adaptive to monitoring conditions and all algorithms must be energy optimized.

In this paper, the state of the art in hardware, software, algorithms and protocols for WSNs, focused on natural hazards, is surveyed. Architectures for WSNs are investigated along with their advantages and drawbacks. Available research prototypes as well as commercially proposed solutions that can be used for natural hazards monitoring and early warning systems are listed and classified.

[1] I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, E. Cayirci, Wireless sensor networks: a survey, *Comput. Networks* (Elsevier) 38 (4) (2002) 393–422.

[2] Dursch, A.; Yen, D.C.; Shih, D.H. Bluetooth technology: an exploratory study of the analysis and implementation frameworks. *Comput. Stand. Interface.* 2004, 26, 263-277.

[3] Baronti, P.; Pillai, P.; Chook, V.W.C.; Chessa, S.; Gotta, A.; Hu, Y.F. Wireless sensor networks: A survey on the state of the art and the 802.15.4 and ZigBee standards. *Comput. Commun.* 2007, 30, 1655-1695.

[4] Arampatzis, T.; Lygeros, J.; Manesis, S. A survey of applications of wireless sensors and Wireless Sensor Networks. In 2005 IEEE International Symposium on Intelligent Control & 13th Mediterranean Conference on Control and Automation. Limassol, Cyprus, 2005, 1-2, 719-724.