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Electromagnetic signals monitoring by smartphones and 3G wireless networks

D. Cavouras (1), P. Georgiadis (1), K. Ninos (1), C. Nomicos (1)

(1) Technological Educational Institute of Athens, Ag. Spyridonos Street, Aigaleo, GR 12210, Athens, Greece

The aim was to design and develop a mobile wireless application for monitoring of Electromagnetic (EM) precursor signals and Seismic Events (SEs), employing smartphones and third generation (3G) wireless technology, for immediate access of seismic activity data by experts, irrespective of their location. A 3G enabled smartphone (Qtek 9000) and Microsoft's Embedded Visual C++ version 4.0 were employed to develop the prototype application that could connect to the FTP server of the Institute of Geodynamics of the National Observatory of Athens (NOAIG) and receive, store, and display EM signals at 4 receiver frequencies (3 KHz (E-W, N-S), 10 KHz (E-W, N-S), 41 MHz and 46 MHz). Signals may originate from any one of the 16 field-stations scattered around the Greek territory. Additionally, it could download the list of SEs stored at the NOAIG and display them according to their location of origin on the map of Greece as spots of different colours and diameters according to the events' magnitudes. It took about 5 seconds for the transmission of one day's EM signals (˜129 KB compressed), including the servers' overhead and general network additions, and less than a second for receiving information for 50 SEs (˜3 KB compressed). System's efficiency was evaluated by an expert who reviewed 1) multiple EM-signals, up to 18 days prior to corresponding past seismic events, and 2) online EM-activity. The expert found the system easy to use and comparable to a similar desktop application. In conclusion, state-of-art smartphone technology may be employed for remote monitoring of electromagnetic signals and seismic events efficiently. The proposed system can minimize the time required for initial consultation, as it enables experts to access critical data while being geographically independent from the data source.