



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010



THREE-TIER WIRELESS SENSOR NETWORK FOR ENVIRONMENTAL MONITORING

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CSBE101270 – Presented at 8th World Congress on Computers in Agriculture (WCCA) Symposium

ABSTRACT Three-tier wireless sensor networks were designed and deployed in several experimental sites to remotely monitor sediment concentration and movement in real time. Sensor nodes, gateways, repeater stations, and central stations were strategically deployed to insure reliable signal transmissions. Radio signal strength was tested to analyze effects of distance, vegetation, and topographical barriers. Omni- and directional antennae with different gains were tested to achieve robust, long-range connection in a wireless-hostile environment. Sampling times of sensor nodes within a local sensor network were synchronized at the gateway station. Error detection algorithms were developed to detect errors caused by interference and other impairments of the transmission channel. Both GSM and CDMA modems were used at different locations based on cellular coverage. Procedures for selection of solar power components were developed and tested. Data were analyzed to verify the design principles.

Keywords: Wireless sensor network, mote, radio transceiver, antenna, GSM, CDMA, cellular modem, environmental monitoring, networking