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Energy Efficient Data Acquisition Techniques Using Context Aware Sensing For Landslide Monitoring System

Abstract

Real- Time wireless sensor networks is an emerging technology for continuous environmental monitoring. But real world deployments are constrained by resources such as power, memory, and processing capabilities. In this paper, we discuss a set of techniques to maximize the lifetime of a system deployed in south India for detecting rain-fall induced landslides. In this system, the sensing subsystem consumes 77.5%, the communication subsystem consumes 22%, and the processing subsystem consumes 0.45% of total power consumption. Hence, to maximize the lifetime of the system, the sensing subsystem power consumption has to be reduced. The major challenge to address is the development of techniques that reduce the power consumption while preserving the reliability of data collection and decision support by the system. This research work proposes a wavelet based sampling algorithm for choosing the minimum sampling rate for ensuring the data reliability. The results from the wavelet sampling algorithm along with the domain knowledge have been used to develop context aware data collection models that enhance the lifetime of the system. Two such models named Context Aware Data Management (CAD) and Context Aware Energy Management (CAE) have been devised. The results show that the CAD model extends the lifetime by six times and the CAE model does so by 20 times when compared to the Continuous Data Collection (CDC) model, which is the existing approach. In this work, we also developed mathematical modeling for CAD and CAE, which have been validated using real-time data collected