This research work explores the use of context information to improve upon wireless sensor networks performance by reducing the energy consumption rate during reprogramming processes. A software system that dynamically reconfigures wireless sensor network operational functionalities optimally based on evolving application context is developed. In order to demonstrate the benefits of the context based reconfiguration model, two contexts related input variables were used. The first variable is obtained using a metric tool (PDE) devised for extracting the delta of two files (application related context). The second variable entails the battery energy level state of the sensor node taken as an operational-demand related context. A robust inference engine was developed based on the inferred expert knowledge on memory related energy consumption pattern during the reconfiguration process. The resulting output from the fuzzy logic controller decides when and which of the reconfiguration approach is to be implemented in order to prolong the battery life. The model's performance was evaluated on an OMNet++ simulation platform using pilot data obtained from a test bed composed of Microchips' PIC32MX320F128H microcontroller and MRF24J40MB transceiver. In a network of six nodes,
two were equipped with the developed model capability and the others were not. The overall energy expended as read, erase and write were obtained from each node for the purpose of comparison. Results obtained show that 65% of energy expended during the erasure procedure is saved in nodes that adopt the context-based reconfiguration model. Similarly, 45% and 69% reduction in energy consumption were obtained for the read and write procedures respectively.

References


Index Terms
Keywords

Reprogramming, wireless sensor network, reconfiguration, fuzzy logic controller, Algorithm.