Abstract

One of the major challenges to design efficient Wireless Sensors Networks (WSN) is the scarcity of energy and computational resources. We address this problem with particular reference to algorithms for efficient source and channel coding.

Distributed source coding (DSC) is a general framework which applies to highly correlated signals that are coded separately and decoded jointly. In WSN, DSC schemes provide closed loop algorithms that exploit the correlation of data sensed by the nodes to reduce the amount of information that each node transmits, thus saving energy. A study is herein carried out along with an implementation of the aforementioned algorithms with the Matlab environment. The stability of the closed loop algorithms is then tested by means of simulations.

Minimum energy coding schemes can be superimposed on top of the previous DSC algorithm to achieve further gains. In our work, we investigate and extend two existent energy-efficient minimum energy coding schemes [31][24]. In this context, we analyze the performance of the WSN in terms of power consumption and bit error probability, where a detailed wireless channel description is taken into account. We characterize the problem of efficient coding by means of stochastic optimization problems. This more accurate model of the system (compared to those previously existent [31][24]) allows us to propose new solutions to reduce power consumption while ensuring adequate bit error probabilities.

As a relevant part of our work, a test-bed has been set up by using the Berkeley Telos Motes, along with a Matlab application interface, for the adaptive source coding algorithm. According to the results obtained by the

experimental work we have carried out, the energy consumption can be effectively reduced.