Self-organizing method for energy-efficient pulse coupled oscillator (EEPCO) in wireless networks

ABSTRACT

Energy-efficient pulse coupled oscillators (PCOs) have recently gained significant research attention in wireless sensor network (WSN) synchronization and PCO, which uses firefly synchronization for attracting mating partners. However, the PCO model is unsuitable for sensor networks because WSNs are unable to afford simultaneous transmission and data reception. For most scenarios, battery replacement is impossible upon the exhaustion of a node's battery energy method (because of packet collision). To avert these limitations, this study proposes an energy-efficient pulse coupled oscillator (EEPCO), a new mechanism that uses the self-organizing method in WSN by combining biologically inspired network systems and non-biologically inspired network systems. The former systems employ phase-locking of the PCO model regarding sensor nodes as observed in the flashing synchronization behavior of fireflies. The latter systems utilize the anti-phase of the PCO model to counteract packet collision, obtain improved data gathering, and minimize the energy needs of the sensor nodes during transmission. From the simulation, it was found that the proposed EEPCO scheme attained a steady state after a number of cycles. It also showed superior performance compared to other mechanisms with a deduction on the total energy consumption by 15% . The results showed that the performance improved data collection by up to 100% when the number of sensor nodes is below 40. Based on the results, the proposed scheme avoids packet collision that occurs in the transmit state in WSNs and it increases the data collection throughout the transmission states in WSNs.

Keyword: Self-organizing method; Energy-efficient pulse coupled oscillator (EEPCO); Wireless network