Energy harvesting based routing protocol for underwater sensor networks

ABSTRACT

Underwater sensor networks (UWSNs) are ad-hoc networks which are deployed at rivers, seas and oceans to explore and monitor the phenomena such as pollution control, seismic activities and petroleum mining etc. The sensor nodes of UWSNs have limited charging capabilities. UWSNs networks are generally operated under two deployment mechanisms i.e localization and non-localization based. However, in both the mechanisms, balanced energy utilization is a challenging issue. Inefficient usage of energy significantly affects stability period, packet delivery ratio, end-to-end delay, path loss and throughput of a network. To efficiently utilize and harvest energy, this paper present a novel scheme called EH-ARCUN (Energy Harvesting Analytical approach towards Reliability with Cooperation for UWSNs) based on cooperation with energy harvesting. The scheme employs Amplify-and-Forward (AF) technique at relay nodes for data forwarding and Fixed Combining Ratio (FCR) technique at destination node to select accurate signal. The proposed technique selects relay nodes among its neighbor nodes based on harvested energy level. Most cooperation-based UWSN routing techniques do not exhibit energy harvesting mechanism at the relay nodes. EH-ARCUN deploys piezoelectric energy harvesting at relay nodes to improve the working capabilities of sensors in UWSNs. The proposed scheme is an extension of our previously implemented routing scheme called ARCUN for UWSNs. Performance of the proposed scheme is compared with ARCUN and RACE (Reliability and Adaptive Cooperation for efficient Underwater sensor Networks) schemes in term of stability period, packet delivery ratio, network throughput and path loss. Extensive simulation results show that EH-ARCUN performs better than both previous schemes in terms of the considered parameters.