An Energy-efficient redundant transmission control clustering approach for underwater sensor networks

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Underwater Sensor Network (USN) is an emerging technology with attractive applications. In such type of networks, the control-overhead and redundant inner-network transmissions management, and data-similarity are still very challenging. The cluster-based framework manages the control-overhead and redundant inner-network transmissions persuasively. However, the current clustering protocols consume a big part of their energy resources in data-similarity as these protocols periodically sense and forward the same information. In this paper, we design a novel two-level redundant transmission control cluster-based approach that ensures the data-similarity through some statistical tests with an appropriate degree of confidence. Later, the CH (Cluster Head) and the RH (Region Head) remove the data-similarity from the original data before forwarding data to the next-level. We also introduce a new spatiotemporal and dynamic CH role rotation technique which is capable to adjust the drifted field nodes because of water current movements. The beauty of the proposed model is that the RH controls the communications and redundant transmission between the CH and MS (Mobile Sink), while the CH controls the redundant inner-network transmissions and data-similarity between the cluster members and RH. The routes of the MS are optimal and it only stops at data collection points for a specific time to collect information from RHs. We execute simulations to examine the performance of our designed framework using different criteria like average end-to-end delay, the packet delivery ratio, and energy consumption of the network against the recent schemes. The presented results reveal that our design framework performs favorably against the existing schemes in all of the evaluation metrics.