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Fault-Resilient Iterative Localization Scheme for Internet-of-Underwater Things

Abstract: The geographic coordinates of the target nodes in the Underwater Acoustic Sensor Networks (UASNs) are essential for the majority of applications of the Internet-of-underwater Things, such oceanographic research, offshore oil and gas exploration, etc., to draw meaningful conclusions, the geographical coordinates of the target nodes in the UASNs are crucial. However, this approach is challenging because to the particular obstacles that UASNs poses, such as insufficient bandwidth, a hostile environment, poor sight, and non-availability of GPS. Owing to node mobility, the core issue with event detection and monitoring is localization. Although autonomous underwater vehicle based anchor nodes' quantity and placement help to improve accuracy, they also raise the network's overhead, complexity, and expense. Poor precision and a shorter network lifetime are brought on by the anchor nodes failing and the node's energy continuously being depleted. Many methods have been presented to increase accuracy by using numerous anchor nodes, very few works have addressed energy-efficient fault tolerance. To decrease complexity and improve network lifetime and localization accuracy, a moth flame optimization approach is put forward. The set of ideal autonomous anchor nodes for the fault-resilient localization process was determined using the proposed scheme included fitness value with three parameters as inputs: modified anchor-target distance, number of connected nodes, and residual energy. The result for choosing the best anchor nodes is probability. Using a metaheuristic technique based on moth flame optimization, the localization accuracy between the estimated and original coordinates of the nodes will be increased. Based on simulation data, the suggested technique achieves a convergence time of 7.6 seconds and a localization accuracy gain of 40–48%. Therefore, the results show that it is better than the modern methods.

Keywords: Fault-resilient, localization, Underwater acoustic sensor networks, Movement prediction, Moth-flame scheme, Autonomous underwater vehicles.

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Biography: Sangeeta Kumari, an Associate member of IEEE, she currently serves as an Assistant Professor at Bennett University (Times of Group) in Greater Noida, Uttar Pradesh, India, within the School of Computer Science Engineering and Technology. Previously, she held a teaching faculty position in the Department of Computer Science and Engineering at Motilal Nehru National Institute of Technology in Allahabad, India. She earned her Ph.D. from the National Institute of Technology, Raipur, India, in 2020. Prior to that, she obtained her M.Tech. degree from the National Institute of Technical Teachers' Training and Research in Bhopal, India, in 2015. Her research interests encompass Underwater Wireless Sensor Networks, Cloud Computing, Optimization Techniques, Artificial Intelligence, Machine Learning, and Internet of Things. She has contributed as a conference organizer, Technical Program Committee (TPC) member, Session Chair, reviewer, and keynote speaker at numerous international springer/IEEE conferences. Additionally, she has authored several research papers and book chapters published in esteemed conferences and journals. Recently, working on an underwater application project proposal.

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