International Conference on Intelligent Technologies & Science - 2022
(ICITS-2022)

Optimized Multitasking Allocation for Underwater Vehicle Network

Shiva Mishra[1], Dr. Devesh Katiyar[2]
Dept. of Computer Science,
LIT, DSMNRU, Lucknow
Shivamishradeaf2000@gmail.com

Abstract: In the vicinity of multi agent device agreement internet protocol is widely used for the status quo of conversation among sellers. In my research I recognition at the running method of CNP. There are distinct areas like genetic algorithm, multi robotic challenge allocation, reservoir flood manage gadget, structural health tracking, underwater unmanned car system in which CNP works. Although, various algorithms are proposed to improve the performance of CNP and they are actual powerful but there's some region which is untouched for a while. In CNP, there are three tiers of venture allocations. Decrease the failure rate of CNP is the cause of this studies, in doing so ACO is use in biding level. For showing our research we use the prototype of UUV Swarm machine.

Keywords: Energy-based protocol, Underwater Wireless Sensor Network, Routing Protocol, Data-Based Protocol.

1. Introduction:

The underwater communications and technologies provide new opportunities for a more complete exploration of the oceans and the underwater environment in a variety of civilian and military applications. The recent advancement in sen- sor technology for underwater applications has led the way to the advent of the so-called Underwater Wireless Sensor Networks (UWSNs), where sensors are deployed underwater and leverage on a Distributed Antenna System (DAS) to get access to the terrestrial systems [1]. UWSNs are not only limited to the exploration purposes, but can also accomplish the demands of a multitude of underwater applications, which include collection of oceanographic data and natural disasters warning systems and support oil or mineral extraction, under-water pipelines or commercial sheries. A general UWSNs architecture is shown in Figure 1, where the multitude of underwater sensors, deployed at different depths throughout the area of interest, can communicate among each other, but also with a set of sinks that interact with terrestrial systems thanks to satellite communications.

2. Related Work:

The key to utilizing the potential of multirobot systems is cooperation. How can **[1] T. Fukuda,** achieved cooperation in systems composed of failure-prone autonomous robots operating in noisy dynamic environments? In this work, we present a novel method of dynamic target allocation for groups of such robots. **[1] T. Fukuda,** implemented and tested an auction-based target allocation system which we call MURDOCH, built upon a principled, resource centric, publish subscribe communication model. A variant of the Contract Net Protocol, MURDOCH produces a distributed approximation to a global optimum of resource usage. We validated MURDOCH in two very different domains: a tightly coupled multirobot physical manipulation target and a loosely coupled multirobot experiment in long-term autonomy. The primary contribution of this work is to show empirically that distributed negotiation mechanisms such as MURDOCH are viable and effective for coordinating physical multirobot systems.

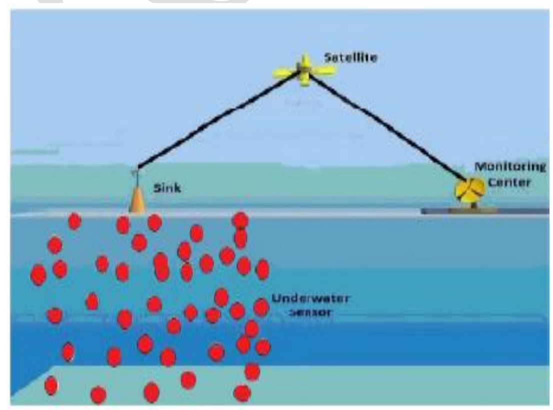

Fig 1: Architecture of underwater wireless sensor networks (UWSNs).

[2] L. Monostori, focused on interaction protocols and topologies of multisensor node agent systems (MASs) for target based task allocation, particularly in manufacturing application. Resource sensor node agents in manufacturing are members of a network whose possible logicaltopologies and governing interaction protocol influence the scheduling and control in the MAS. Four models are presented in this work, each having specific rules and characteristics for scheduling and target based task allocation. Two models out of the four use a well-known standard interaction method sensor communication protocol while the others are proposed in this work. The newly proposed models are based on ring topology and algorithms developed in the research. A Java-based MAS was also developed simulate different scenarios of target based task allocation and to compare the four models in terms of some scheduling performance indicators, using cases from manufacturing. The results produced meaningful differences between the four models, including their strengths and weaknesses. Two models, namely, modified ring and sensor communication protocol -based peer-to-peer, gave superior performance compared with the others. Furthermore, the proposed modified ring exhibits significant potential in handling manufacturing target based task allocation applications.

[3] Leaver, R. Greg, developed MV3204 to teach new students how to author 3D graphics for the Web. This course receives strong and increasingly enthusiastic support from computer-graphics students as well as students in a variety of other NPS curricula. It is an allowed alternative for MV4202, INTRODUCTION TO 3D GRAPHICS. Further innovations continue. Through my efforts with the Extensible 3D (X3D) Graphics specification and together with staff support, I have developed the software for a new authoring tool (X3D-Edit) that has significantly enhanced student productivity.

[4] Bailey, introduced a physics-based and control-oriented underwater system model for near-surface operations. To construct the model, we follow an energy-based Lagrangian approach, where the presence of the free surface is incorporated using a free surface Lagrangian. This effectively modifies the system energy commonly used to derive the Kirchho equations, which govern underwater system motion in an unbounded ideal uid. The system Lagrangian is then used to derive the 6-DOF equations of motion for an underwater system maneuvering near the free surface in otherwise calm seas.

3. Methodology:

Collective natural bio-systems like ant and bee colonies, flocks of birds and swarms, as well as systems of cells and molecules are composed of multi- ple bio-entities residing in the physical environment and engaged in complex collective and organized behaviors, interactions and processes according to the laws of nature. There is a certain level of abstraction at which behav- ior of such systems can be modeled as distributed computational processes resulted from the interaction of artificial computational entities. Thus, we would expect distributed computing to have a lot of potential for the practical application of nature-inspired computing – i.e. computing inspired by behaviors of natural bio-systems.[3]

Most of the works related to distributed ACO do not provide an intuitive and straight- forward mapping of ACO algorithms onto distributed computing systems. Rather, existing approaches rely on adapting the classical sequential algo- rithms for parallel and high-performance computing architectures without a careful and in-depth consideration of the intrinsic distributed nature of ACO. In this context, we support the idea that ACO should allow a more straightforward mapping onto existing distributed architectures, including multi-sensor node agent systems middleware. Therefore, to take advantage of the full potential of nature inspired computational approaches, we have started the in- vestigation of new distributed forms of ACO using state-of-the-art multisensor node agent technology. The focus of our research is to propose a better computational architecture and programming for the implementation of ACO algorithms utilizing available state-of-the-art distributed multi-sensor node agent middleware. We foresee two potential benefits of our work: (i) first, it contributes to the engi- neering of ACO algorithms using distributed computing architectures, with the potential of obtaining more scalable and efficient algorithms; (ii) second, as a byproduct, our work contributes to better understanding of new forms of sensor node agent-based distributed ACO.

In particular, Ant Colony Optimization (ACO hereafter) [1] is inspired by collective behavior of colonies of natural ants when they explore the environment searching for food. During their search process, ants secrete pheromone on their way back to their anthill. Other ants of the colony sense the pheromone and are attracted to the marked paths; the more pheromone is deposited on a path, the more attractive that path becomes. The pheromone is volatile and disappears over time. Evaporation erases pheromone on longer paths as well as on less interesting paths. Shorter paths are refreshed more quickly, thus having the chance of being more frequently explored. Intu- itively, ants will converge towards the most efficient path due to the fact that it gets the strongest concentration of pheromone.

According to Sorin Ilie and Costin B˘adica the configurable distributed architecture called ACODA that provides a novel and more intuitive way of distributing ant-based nature inspired computational processes onto state-of-the-art multi-sensor node agent middleware. Moreover, we realized an initial experimental evaluation of this architecture by applying it to solve the TSP problem. The main innovations introduced by our approach are:

(i) The physical environment of the ants is conceptualized, represented and implemented as a distributed multi-sensor node agent system.

(ii) Ant management that is responsible with ant migration in the physical environment is represented as messages exchanged asynchronously between the sensor node agents of the problem environment.

Proposed Work:

Localization in Underwater Sensor Networks have attracted significant interests in recent years [1].Position information are vital to monitoring activities. The simplest straightforward way to determine location is using Global Positioning System (GPS). But they are not suitable for underwater environments. Wave has good propagation in waterand hence suitable for underwater communication but suffer from multi-path propagation and Doppler effect.The method filters out malicious node signals on the basis of the Ant colony optimization (ACO) approach among multiple parameters of nodes. This method hence tolerates malicious node signals by adopting an iteratively refined selection scheme without any high number based explosion of search combinations with minmum effect of grid size and solution time delay. This algorithm is simple but has robustness and improved accuracy. The methods help for eliminating or ignoring malicious nodes for positioning even under complexity of underwater environment and applicable for three-dimensional environment. Moreover this work performs elimination of malicious nodes in by detection malicious localization signals errors and identifies malicious anchors thus avoid false detection and revoke malicious anchors. The ACO follows concept of giving weightage to trusted nodes having lower localization error determined by averaging the data transmitted by refrence sensor node to all the anchors obtained after the final fusion result. This method has a good detection ratio for detecting malicious nodes with lower complexity even in the higher number of malicious nodes due to fusion result and the weighted sensor node parameters.

In this framework for all sensor node ACO maintains trust measurement which adds on past behavior nodes and inherent aspect in present behavior. Based on this model proposed priority is higher for trusted nodes and low rank is automaticalley allotted to malicious nodes. Referring to the idea of confidence value and weight on the basis of nodes parameter with respect to given target and considering the parameters suitable for dynamic three-dimensional underwater localization, we propose a robust and cooperative algorithm that finds best nodes as per multiple targets even in the presence of some malicious anchor nodes. The proposed localization algorithm takes advantage of parametric based selection method within one-hop neighboring reference nodes to detect and remove malicious anchors.Moreover, position-unknown sensor nodes use MMSE (Minimum Mean Squared Error) based iterative positioning algorithm to make the just positioned sensor node become new reference node,thus help to localize other sensor nodes that do not know their locations.

The main contributions of this work are summarized as follows:

(1) Providing an ACO based malicious node detection and elimination mechanism within 1-Hop neighborhood; and (2) design an iterative and distributed 3D localization algorithm in the existence of malicious anchors. To the best of our knowledge, this is the first report to design robust and iterative localization for three-dimensional underwater sensor networks in the existence of malicious anchor nodes.

4. Result and Discussion:

To examine my work, the 7 loops of 30 iterations is implemented. In every loop the wide variety of duties is increasing like two hundred, four hundred, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000. In every loop the failure fee at various nodes is decreasing in superb way. Nodes at which the failure rate is calculate are 30,60,120, 240,480,960,1920. At the node 30,60, and 120 the failure rate is comparable as iterated sensor communication protocol [1] however at the node 240,480,960,1920 is failure rate is decreasing in comparison to iterated sensor communication protocol [1] the table beneath defined the distinction in ACO based sensor communication protocol .

As shown in fig. 2, the graphical representation of the failure rate at different nodes compared with the iterated sensor communication protocol and when the target based task number is increasing the new version of sensor communication protocol with ACO works well.

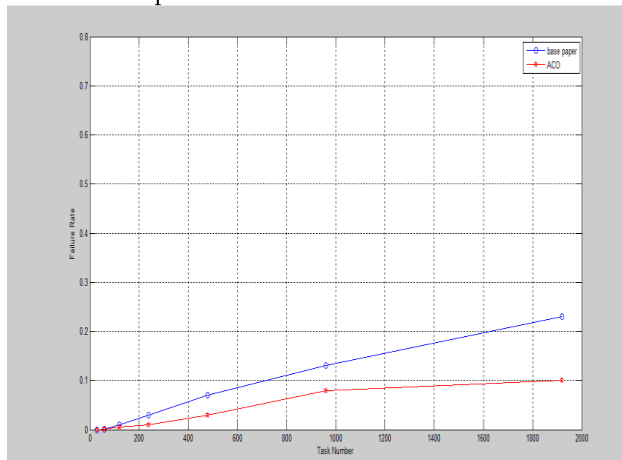

Fig 2: Failure rate with respect to number of target based tasks

5. Conclusion:

This research work suggests the mission allocation manner in underwater automobile system is a extensive location for research. UWSN gadget brings the drastic adjustments in lots of fields like marine hydrology, underwater warfare, oceanography, seafloor survey, and existence underwater survey. sensor communication protocol installed the verbal exchange in UWSN gadget. Targets are allocated by one-of-a-kind technique but every technique shows distinct results. Some technique decrees the execution time, some methodology increases the accuracy.

References:

[1] H. Luo, K. Wu, R. Ruby, Y. Liang, Z. Guo, and L. M. Ni "Softwaredefined architectures and technologies for underwater wireless sensor networks: A survey," IEEE Commun. Surveys Tuts., vol. 20, no. 4, pp. 2856–2888, 4th Quart., 2018.

[2] Z. Zeng, S. Fu, H. Zhang, Y. Dong, and J. Cheng, "A survey of underwater optical wireless communications," IEEE Commun. Surveys Tuts., vol. 19, no. 1, pp. 204–238, 1st Quart., 2017.

[3] B. Benson et al., "Design of a low-cost, underwater acoustic modem for short-range sensor networks," in Proc. OCEAN IEEE SYDNEY, Sydney, NSW, Australia, 2010, pp. 1–9.

[4] I. F. Akyildiz, D. Pompili, and T. Melodia, "State-of-the-art in protocol research for underwater acoustic sensor networks," in Proc. 1st ACM Int. Workshop Underwater Netw. (WUWNet), vol. 11, no. 4, Nov. 2006, pp. 7–16.

[5] M.-A. Khalighi, C. Gabriel, T. Hamza, S. Bourennane, P. Léon, and V. Rigaud, "Underwater wireless optical communication; Recent advances and remaining challenges," in Proc. 16th Int. Conf. Transparent Opt. Netw., Graz, Austria, 2014, pp. 2–5.

[6] S. Jiang, "On securing underwater acoustic networks: A survey," IEEE Commun. Surveys Tuts., vol. 21, no. 1, pp. 729–752, 1st Quart., 2019.

[7] M. Stojanovic and J. Preisig, "Underwater acoustic communication channels: Propagation models and statistical characterization," IEEE Commun. Mag., vol. 47, no. 1, pp. 84–89, Jan. 2009.

[8] N. Li, J.-F. Martínez, J. M. M. Chaus, and M. Eckert, "A survey on underwater acoustic sensor network routing protocols," Sensors (Switzerland), vol. 16, no. 3, p. 414, 2016.

[9] A. Khan et al., "Routing protocols for underwater wireless sensor networks: Taxonomy, research challenges, routing strategies and future directions," Sensors (Switzerland), vol. 18, no. 5, p. 619, 2018.

[10] N. Ismail and M. M. Mohamad, "Review on energy efficient opportunistic routing protocol for underwater wireless sensor networks," KSII Trans. Internet Inf. Syst., vol. 12, no. 7, pp. 3064–3094, 2018.

[11] I. F. Akyildiz, D. Pompili, and T. Melodia, "Underwater acoustic sensor networks: Research challenges," Ad Hoc Netw., vol. 3, no. 3, pp. 257–279, 2005.

[12] P. Ögren, E. Fiorelli, and N. E. Leonard, "Cooperative control of mobile sensor networks: Adaptive gradient climbing in a distributed environment," IEEE Trans. Autom. Control, vol. 49, no. 8, pp. 1292–1302, Aug. 2004.

[13] J.-H. Cui, J. Kong, M. Gerla, and S. Zhou, "The challenges of building mobile underwater wireless networks for aquatic applications," IEEE Netw., vol. 20, no. 3, pp. 12–18, May/Jun. 2006.

[14] G. Han, J. Jiang, N. Bao, L. Wan, and M. Guizani, "Routing protocols for underwater wireless sensor networks," IEEE Commun. Mag., vol. 53, no. 11, pp. 72–78, Nov. 2015.

[15] M. Ahmed, M. Salleh, and M. I. Channa, "Routing protocols based on node mobility for underwater wireless sensor network (UWSN): A survey," J. Netw. Comput. Appl., vol. 78, pp. 242–252, Jan. 2017.

[16] M. Khalid et al., "A survey of routing issues and associated protocols in underwater wireless sensor networks," J. Sens., vol. 2017, May 2017, Art. no. 7539751.

[17] M. Fazeli and S. N. Basharzad, "A survey on underwater wireless sensor networks routing algorithms," in Proc. IEEE 4th Int. Conf. Knowl. Based Eng. Innovat. (KBEI), Tehran, Iran, 2017, pp. 373–378. [18] S. M. Ghoreyshi, A. Shahrabi, and T. Boutaleb, "Void-handling techniques for routing protocols in underwater sensor networks: Survey and challenges," IEEE Commun. Surveys Tuts., vol. 19, no. 2, pp. 800–827, 2nd Quart., 2017.

[19] M. Ahmed, M. Salleh, and M. I. Channa, "Routing protocols for underwater wireless sensor networks based on data forwarding: A review," Telecommun. Syst., vol. 65, no. 1, pp. 139–153, 2017.

[20] A. Datta and M. Dasgupta, "Underwater wireless sensor networks: A comprehensive survey of routing protocols," in Proc. Conf. Inf. Commun. Technol. (CICT), Jabalpur, India, 2019, pp. 1–6.