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Artificial Intelligence for Robotic Communication

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ABSTRACT: This paper is primarily based on current research on the control and operation of a greater number of robots in collaboration towards a standard goal that is growing rapidly. Communication between members of a robot team and even humans is becoming essential in many real-world applications. The survey focuses on AI techniques for robot communication to strengthen multi-robot team communication ability, performing more complex activities, making an appreciated decision, taking coordinated actions, and performing your tasks efficiently. We present a comprehensive review of smart solutions for robotic communication that have been proposed within the literature in recent years. This survey contributes to a better understanding of artificial intelligence techniques to improve robot communication and sheds new light on the direction of future research within the discipline.

KEYWORDS: Robotics, Artificial Intelligence, Integrated systems, Ad-hoc network, wireless network, Autonomous systems

I. INTRODUCTION

Artificial intelligence (AI) is used to improve science and technology due to its incredible ability to deal with big data, complexity, high precision and fast processing. Artificial neural Network, fuzzy logic, neuro-fuzzy interference system, genetic algorithm, pattern recognition, clustering, machine learning, particle swarm optimization, etc., are the familiar tools of AI. AI has been used in several areas such as engineering, science, medicine, computing, finance, economics, etc. It's more; it has been used to make machines smarter. Smart machine means the ability to make a machine work intellectual tasks in an environment similar to or close to a human would do. Therefore, AI is part of the computer. Science and also possibly the most existing field in robotics. With a view to using AI and robotics approaches became an emerging technology at a rapid pace, offering many possibilities for automation tasks in many application areas, such as household services, and space explorations, medical and military procedures operations, air pressure data collection, temperature, weather, wind, etc. Therefore you can find robot functions not only at work but also in home and industry, replacing many tasks that are dangerous and tiring. Robots can be classified in two main types which are service robots and field robots.

II. LITERATURE SURVEY

The development of nano-antennas provides us with a new version of wireless communication called nano wireless communication. Nano-wireless communication is very important for communication between small things. One of the applications of nano communication is communication between micro-robots. Always the communication between robotics uses ad hoc network technologies due to independent nodes. Robot communication protocols are used to ensure wireless connection between robots. AI is difficult to define precisely. However, John McCarthy, known as the father of AI, defined AI as "the science and engineering that make intelligent machines." Thus, AI refers to the ability of robotic systems to process information and produce results similar to how humans do in learning, decision-making, and problem solving. Furthermore, AI is continually growing to make machines increasingly intelligent. AI is used to make machines smarter, and machine intelligence is the ability of a machine to perform any intellectual task in any environment that a human would do. Robots serving humans or collaborating with humans are expected to meet human

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needs with minimal communication from humans. To this end, artificial intelligence techniques were used to enable modelling and understanding of human intentions simply by observing human physical movement.

III. COMPARATIVE ANALYSIS

The intelligence space is intended to build an intelligence environment that can monitor what is happening in the environment and communicate with people. Intelligent space robots were built within a specific space using network layout, sensors, actuators, and processors. Communication between the environment and the functionalities of the robots plays a key role in characterizing the ubiquitous robotic space. Smart devices that are mapped in space were called distributed smart network devices.

Today, machines are getting smarter and capable of collecting data without human intervention. The reason behind this is to use artificial intelligence and machine learning technologies. Robotic communication with a human based on imitative learning, word computing. Imitative learning is made up of model observation and model reproduction. ANN is applied to extract spatial and temporal patterns of gestures and for utterances. A self-organizing map was used to group the gestures. The experimental results showed that a robot could learn action patterns by incorporating some segments of the movements of the human hand and regulating the pattern-symbol relationship of the cognitive environment through communication with the human being.

The concept of IoT refers to things that may not be smart and do not include AI. However, IoRT is a smart concept that provides associated things, the ability to negotiate, reason and delegation. The integration of IoT and robots is growing in the ecosystem, while IoT devices, robots and humans communicate in a fundamental cooperative way. The target applications and technological implications of IoT-assisted robotics were discussed

IV. CONCLUSION

This article reviewed intelligence techniques that are currently used to improve robotic communication and make robot performance adaptive. Therefore, artificial intelligence is a key technology to help humans both on Earth and in space, making exploration feasible. AI includes many approaches such as ANN, ANFIS, PSO, fuzzy logic, machine learning, and big data. The main advantage of using AI in robot communication is coordinating the tasks of individual robots, protecting the collision and improving team performance, speeding up the process and making work easier. Intelligence added to robot communication makes robots smarter and perform tasks more effectively and efficiently. In addition, the use of AI as a communication technique between robots and humans over the Internet leads to a new phase called IoRT. IoRT is a promising technology that makes smart things communicate with each other and with humans.

REFERENCES

1. Allam, Z. and Dhunny, Z.A. (2019), "On big data, artificial intelligence and smart cities", *Cities*, Vol. 89, pp. 80-91, doi: 10.1016/j.cities.2019.01.032.
2. Amoretti, M. and Reggiani, M. (2010), "Architectural paradigms for robotics applications", *Advanced Engineering Informatics*, Vol. 24 No. 1, pp. 4-13, doi: 10.1016/j.aei.2009.08.004.
3. Andreas, V., Gunawan, A.A.S. and Budiharto, W. (2019), "Anita: intelligent humanoid robot with SelfLearning capability using indonesian language", In *2019 4th Asia-Pacific Conference on Intelligent Robot Systems (ACIRS)*, IEEE, pp. 144-147, doi: 10.1109/ACIRS.2019.8935964.
4. Barredo Arrieta, A., Di'az-Rodríguez, N., Del Ser, J., Bennetot, A., Tabik, S., Barbado, A., ... Herrera, F. (2020), "Explainable artificial intelligence (XAI): concepts, taxonomies, opportunities and challenges toward responsible AI", *Information Fusion*, Vol. 58, pp. 82-115, doi: 10.1016/j.inffus.2019.12.012
5. M. Beetz and D. McDermott. Improving Robot Plans During Their Execution. In *Proc. AIPS*, 1994.
6. Alsamhi, S.H., Ma, O. and Ansari, M.S. (2019), "Survey on artificial intelligence based techniques for emerging robotic communication", *Telecommunication Systems*, Vol. 72 No. 3, pp. 483-503, doi: 10.1007/s11235-019-00561-z.
7. Chen, M., Saad, W., & Yin, C. (2017). Echo state learning for wireless virtual reality resource allocation in UAV-enabled LTEU networks. *arXiv preprint arXiv:1708.00921*.
8. S. Bernardini and D. Smith. Finding mutual exclusion invariants in temporal planning domains. In *Seventh International Workshop on Planning and Scheduling for Space (IWSPSS)*, 2011.



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9. J. Bohren, R. Rusu, E. Jones, E. Marder-Eppstein, C. Pantofaru, M. Wise, L. Mosenlechner, W. Meeussen, and S. Holzer. Towards autonomous robotic butlers: Lessons learned with the PR2. In Proc. ICRA, pages 5568–5575, 2011.
10. R. Bonasso, R. Firby, E. Gat, D. Kortenkamp, D. Miller, and M. Slack. Experiences with Architecture for Intelligent, Reactive Agents. *Journal of Experimental and Theoretical Artificial Intelligence*, 9(2/3):237–256, April 1997.
11. Umar Bashir Mir, Swapnil Sharma, Arpan Kumar Kar and Manmohan Prasad Gup, “Critical success factors for integrating artificial intelligence and robotics,” ISSN 2398-5038.
12. Bouguerra, L. Karlsson, and A. Saffiotti. Semantic Knowledge-Based Execution Monitoring for Mobile Robots. In Proc. ICRA, pages 3693–3698, 2007.
13. Boutilier, T. Dean, and S. Hanks. DecisionTheoretic Planning: Structural Assumptions and Computational Leverage. *Journal of AI Research*, 11:1–94, May 1999.
14. R. Brooks. A robust layered control system for a mobile robot. *IEEE Journal of Robotics and Automation*, 2:14–23, 1986.
15. L. Busoniu, R. Munos, B. De Schutter, and R. Babuska. Optimistic planning for sparsely stochastic systems. *IEEE Symposium on Adaptive Dynamic Programming and Reinforcement Learning*, pages 48– 55, 2011.
16. S. Cambon, R. Alami, and F. Gravot. A hybrid approach to intricate motion, manipulation and task planning. *International Journal of Robotics Research*, 28(1):104–126, 2009.
17. F. Chaumette and S. Hutchinson. Visual servo control, part ii: Advanced approaches. *IEEE Robotics and Automation Magazine*, 14(1):109–118, 2007.
18. Kanoun, J-P. Laumond and E. Yoshida. Planning foot placements for a humanoid robot: A problem of inverse kinematics. *International Journal of Robotics Research*, 30(4):476–485, 2011.
19. F’elix Ingrand, Malik Ghallab “Robotics and Artificial Intelligence: a Perspective on Deliberation Functions” *AI Communications* ISSN 0921-7126, IOS Press.
20. B. Argall, S. Chernova, M. Veloso, and B. Browning. A survey of robot learning from demonstration. *Robotics and Autonomous Systems*, 57(5):469–483, 2009.
21. T. Bailey and H. Durrant-Whyte. Simultaneous localization and mapping (SLAM): part II. *IEEE Robotics and Automation Magazine*, 13(3):108 –117, 2006.