

Development of a task-oriented, auction-based task allocation framework for a heterogeneous multirobot system

Tan Eijyne¹, Rishwaraj G.², S. G. Ponnambalam³

¹Core Consulting PLT, 50100, Kuala Lumpur, Malaysia

²Imagine Sdn. Bhd., Jalan SS6/2, Level 3, Kelana Parkview Tower 1, 47301, Petaling Jaya, Selangor, Malaysia

³Faculty of Manufacturing and Mechatronics Engineering, Universiti Malaysia Pahang, 26600, Pekan, Pahang, Malaysia

ABSTRACT

A multirobot system has cooperative team of robots designed to enhance efficiency of its operations. One of the critically investigated problems of multirobot system is the multirobot task allocation (MRTA) issue. The main objective of MRTA is to assign tasks to the most suitable robot based on its functions and capability as well as availability. In this paper, a task-oriented, auction-based task allocation framework is presented and tested through simulations and real-world experiments. The developed framework consists of a novel heuristic-based task allocation algorithm and communication module. It is implemented in a multirobot system, allowing tasks to be dynamically assigned to the robots as they achieve given tasks. The implemented framework shows robustness in its flexibility to the task and environment requirements such as resource and energy requirements and size of the environment. The framework involved a task allocation algorithm, which consists of bid generation and bid selection process, and a TCP/IP-based client-server communication module. The results from both simulations and real-world experiments matched, producing optimum results in task allocation.

KEYWORDS

Auction-based system; Multi-robot systems; Task allocation

ACKNOWLEDGEMENT

This research is funded by University Malaysia Pahang research grant (Project ID: RDU1803139)