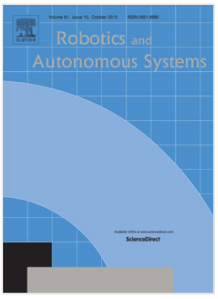
Accepted Manuscript



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PII: S0921-8890(14)00110-9
DOI: http://dx.doi.org/10.1016/j.robot.2014.05.015
Reference: ROBOT 2291

To appear in: *Robotics and Autonomous Systems*

Received date: 29 April 2013
Revised date: 2 May 2014
Accepted date: 16 May 2014

Please cite this article as: M.O.F. Sarker, T.S. Dahl, E. Arcaute, K. Christensen, Local interactions over global broadcasts for improved task allocation in self-organized multi-robot systems, *Robotics and Autonomous Systems* (2014), http://dx.doi.org/10.1016/j.robot.2014.05.015

Local interactions over global broadcasts for improved task allocation in self-organized multi-robot systems

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Abstract

We present a study of self-organized multi-robot task-allocation, examining performance under local and centralised communication strategies. The results extend our current understanding of the effects of communication by providing evidence that local strategies can improve system performance over centralised strategies, in terms of total task throughput as well as reduced communication overheads. The framework employed is the *attractive field model*, a generic model of self-organized division of labour derived from observations of ant, human and robot social systems. The framework provides sufficient abstraction to accommodate both communication strategies. Each of the studies used 16 e-puck robots in a simplified manufacturing environment where sensing and communication was realized using camera-based overhead tracking and centralized communication. In terms of task throughput, communication overhead and energy efficiency, the experimental results show that systems with restricted access to information perform better than systems with free flow of information. This suggests a potential paradigm shift where, for self-organizing systems, diminishing access to information renders a system more efficient.

Keywords: Multi-robot task allocation, self-organized systems, local communication, bio-inspired robotics

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