

# Robot Team Establishment using E-CARGO/RBC

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## **ABSTRACT**

Intelligent systems refer to computer-based systems that can perform tasks that typically require human intelligence. Multi-Robot teams are such systems, which have been investigated in a wide range of applications, including surveillance, inspection, rescue, automation, and logistics. To establish a robot team, the collaboration between agents in the robot team can quickly become a challenging problem, particularly when there is a variety of hardware, software, battery life, size, and functionalities of the robots that are moving in a dynamic environment.

Robot team establishment introduces new requirements, new challenges, and new solutions to real-world problems when robots are made autonomous. When many heterogeneous and autonomous robots are organized as a team to accomplish a mission, evaluating each robot for each task and assigning proper tasks to each robot before acting is essential. Pertinent and dynamic task assignments can avoid failures and increase operating efficiency while the robots are executing their mission.

Role-Based Collaboration (RBC) is a computational methodology that uses role mechanisms to facilitate collaboration activities. RBC and its Environments - Classes, Agents, Roles, Groups, and Objects (E-CARGO) model have been developed into a powerful tool for investigating teamwork. Related research has brought and will bring exciting improvements to the development, evaluation, and management of systems, including collaboration, services, clouds, productions, and administration systems.

E-CARGO/RBC has been verified by formalizing and solving significant problems in collaboration and complex systems, e.g., Group Role Assignment (GRA). With the help of E-CARGO, the methodology of RBC can be applied to solve various real-world problems. E-CARGO itself can be extended to formalize abstract problems as innovative investigations in research.

In this speech, we examine the requirement of research on robot teams and collaboration, discuss RBC and its model E-CARGO; review the related research achievements on RBC and E-CARGO in the past years, including Group Role Assignment (GRA), GRA with Constraints (GRA+), and Adaptive Collaboration; analyze their connections with robot teams, and present initial simulations and experiments. The speaker welcomes queries, reviews, studies, applications, and criticisms.

**Keywords:** Robot Teams; RBC; E-CARGO; Agent Collaboration, Intelligent Systems.