Embodied Evolution with a New Genetic Programming Variation Algorithm

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ABSTRACT

Embodied Evolution is a research area in Evolutionary Robotics in which the evolutionary algorithm is entirely decentralized among a population of robots. Evaluation, selection and reproduction are carried out by and between the robots, without any need for human intervention. This paper describes a new Evolutionary Control System (ECS) able to control a population of mobile robots. The ECS is based on a Genetic Programming algorithm and has two main modules. The first one, called EMSS (Execution, Management and Supervision System), is the system responsible for managing all the evolutionary process in each robot. The second module, called DGP (Distributed Genetic Programming), is an extension of classical Genetic Programming algorithm to support the robot control system evolution. To test the DGP's performance a simulation experiment, with the collision-free navigation task, was accomplished and its results are presented.

INDEX TERMS

Primary Classification:
I. Computing Methodologies
I.2 ARTIFICIAL INTELLIGENCE
I.2.8 Problem Solving, Control Methods, and Search
Subjects: Heuristic methods

Additional Classification:
I. Computing Methodologies
I.2 ARTIFICIAL INTELLIGENCE
I.2.8 Problem Solving, Control Methods, and Search
Subjects: Control theory
I.2.9 Robotics

J. Computer Applications
↳ **J.7** COMPUTERS IN OTHER SYSTEMS
↳ **Subjects:** Command and control

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