

Decentralized approach to evolve the structure of metamorphic robots

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Abstract :

Metamorphic robots are robots that can change their shape by reorganizing the connectivity of their modules to adapt to new environments, perform new tasks, or recover from damages. In this paper we present a decentralized method for structural evolving of a class of lattice-based simulated metamorphic robots in a static environment. These robots are considered as a set of crystalline (compressible) modules that are able to connect or disconnect one from each another or even exchange information and energy with the neighbor modules in order to form various structures/patterns dynamically. Our approach is spited in two layers: in the first layer a genetic algorithm is used to generate a number of well suited target configurations based on current information perceived from environment, while in the second layer a PacMan-like algorithm is used to make a plan for modules movement to transform the robot from its current pattern to the target pattern emerged in first layer.

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