Interactive Robot Simulation Environment

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Abstract

Traditional design of a robot and its control mechanism require both time and specialized knowledge. Evolutionary algorithms can reduce the human effort required for design, but typically lead to many design cycles because the computer lacks humans' innate pattern-recognition ability, and therefore evolution searches through many ineffective designs.

Our research seeks to prove that a combination of evolutionary algorithms and human guidance leads more quickly than either human-only or computer-only development to better robot performance, even with untrained users guiding the evolution.

In this early stage of the research, untrained users create a robot in a simulator using an interactive graphical interface, then let evolution find a controller that enables efficient locomotion. (Locomotion stands as a proxy for cognition.) The user can change the morphology of the robot and test the new design iteratively, altering the design based on his assessment of the robot's performance after a period of evolution of the controller.

Preliminary results show a variety of unusual robot designs, but also shortcomings in the design system.