Evolutionary Design of Both Topologies and Parameters of a Hybrid Dynamical System - DTU Orbit (22/12/2018)

Evolutionary Design of Both Topologies and Parameters of a Hybrid Dynamical System

This paper investigates the issue of evolutionary design of open-ended plants for hybrid dynamical systems--i.e. both their topologies and parameters. Hybrid bond graphs are used to represent dynamical systems involving both continuous and discrete system dynamics. Genetic programming, with some special mechanisms incorporated, is used as a search tool to explore the open-ended design space of hybrid bond graphs. Combination of these two tools--i.e., hybrid bond graphs (HGBs) and genetic programming (GP)--leads to an approach called HBGGP that can automatically generate viable design candidates of hybrid dynamical systems that fulfill predefined design specifications. A comprehensive investigation of a case study of DC-DC converter design demonstrates the feasibility and effectiveness of the HBGGP approach. Important characteristics of the approach are also discussed, with some future research directions pointed out.

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