




Life Engineering Symposium

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Biologically Inspired Robots

Automatic Design and Assembly of Machines

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Abstract:

Biological machinery seems to be of such high complexity that many people believe in an Intelligent Designer. The same people have not yet experienced the "mythical man-month" of software engineering projects, or the reliability of the most complex human-built systems like the space shuttle.

Intelligent, engineered design - which requires a mind or enterprise capable of understanding all the interactions among millions of unique moving parts - bumps into a complexity limit far shy of what evolution achieves.

Thus, using evolutionary computation, neural networks, physical simulation, and constraints from manufacture, we have been developing co-evolutionary design systems. We have built several generations of tools that generate blueprints and controllers for robotic machines automatically - without human intelligence in the loop. These machines can then be fabricated from reusable sensors, effectors, and chips, held together with modular parts (like Lego) or by rapid prototyping (robotically manufactured).

The work illustrates how irreducible complexity can emerge without a designer through the interaction of search and physics, and lays the groundwork for a non-engineering approach to artificial life-forms which may be useful as nano-technology and protein based design tools become practical.