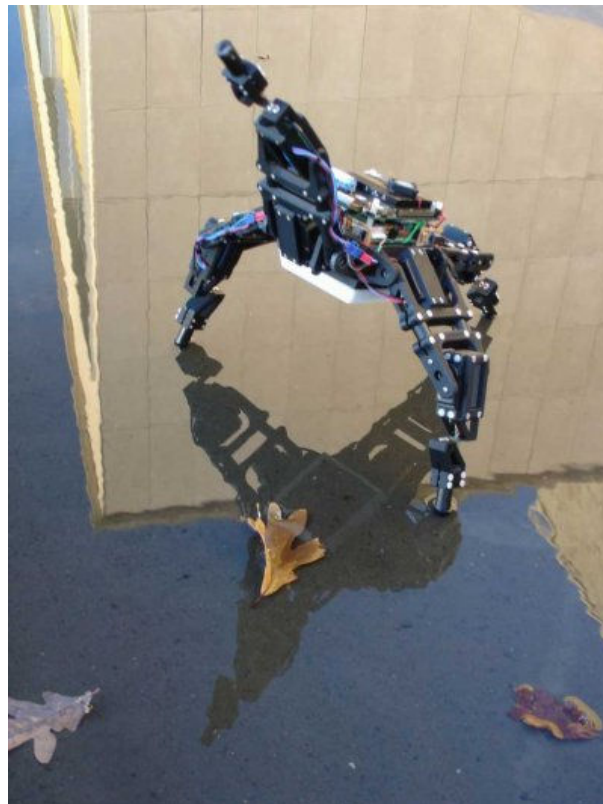

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The Self Modeling Robot



Researchers Josh Bongard, Victor Zykov, and Hod Lipson from the [Computational Synthesis Lab](#) at Cornell University have developed a **self-modeling robot** that can generate successful motor patterns for locomotion by creating an "internal model" of itself and then adapt itself even if some of its parts become damaged. The self-modeling robot begins by performing random movements and records two tilt angles. It then forms a set of competing self-models to account for the sensation-actuation relationship. Simultaneously, new competing behaviors are contemplated; that behavior creating the most disagreement in prediction among models is carried out physically, and the cycle continues. The self-models are tried and the best among them is chosen by a process of natural selection (Gerald Edelman's Neural Darwinism concept). This process continues and creates ever more refined movement suitable for the robot's physical condition and surroundings.

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The goal of the Cornell team is to create algorithms that will allow robots to be more robust and adaptive to new tasks, conditions, and environments, and to gain some quantitative (algorithmic) understanding as to how self-models might arise in nature.

The technology developed by the Cornell team has various future applications. It can help create robots that must function independently from humans (e.g., for space missions or hazardous environments). If such a robot encounters unforeseen damage to itself or an unforeseen situation, it may be able to diagnose the problem and create a compensatory or new controller - and do so without many physical trials that might be costly, too slow, or risky. Beyond robotics, many machines could benefit from continual diagnosis and repair. The Cornell team previously showed that the same algorithm can perform damage diagnosis for bridges or infer a hidden decision network from observations.

More information, pictures, and videos of this remarkable technology can be found on the Cornell Computational Synthesis Lab Self Modeling [webpage](#).

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