Collaborative Research: An Expedition in Computing for Compiling Printable Programmable Machines

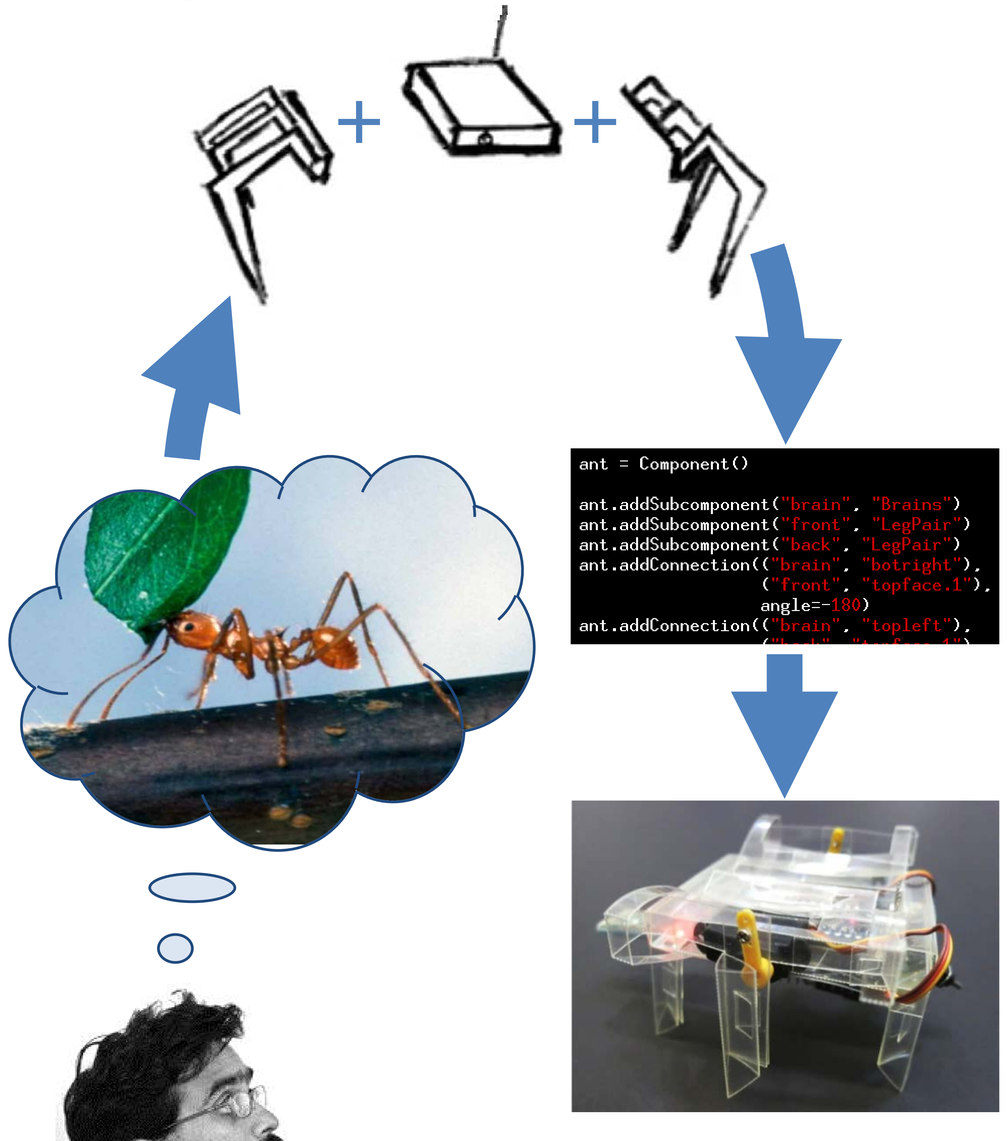
Daniela Rus (PI, MIT), Vijay Kumar (PI, UPenn), Andre DeHon (UPenn), Erik Demaine (MIT), Martin Demaine (MIT), Sanjeev Khanna (UPenn), Sangbae Kim (MIT), Insup Lee (UPenn), Wojciech Matusik (MIT), Martin Rinard (MIT), Cynthia Sung (UPenn), Rob Wood (Harvard), Mark Yim (UPenn)

Challenge:

A compilation system for programmable physical devices as an **end-to-end process** that provides automatic modeling, specification, design, fabrication, and programming for creating **functional 3D machines**.

Solution:

- Database driven ecosystem
- Composition algorithms for robot designs
- Simplified high-level programming languages
- Self-assembly through folding



CNS 1138967/1138847
4/2012-3/2017
Contact: Danela Rus (rus@csail.mit.edu)

Scientific Impact:

- Functional specification and automated co-design of multiple aspects of a device
- Planning and control algorithms for device assembly and function
- Device-specific and task-specific programming environments that provide safeguards
- Automated production of new, customized devices

Broader Impact:

- Mass customization of robotic technology
- Flexible manufacturing and fast reconfiguration of production lines
- Rapid creation of assistive devices for healthcare and education
- Enable students to experiment with physics in a hands-on way
- Workshops and capstone symposia