MAE 598: Multi-Robot Systems

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Instructor: **Spring Berman**

spring.berman@asu.edu

Assistant Professor, Mechanical and Aerospace Engineering

Autonomous Collective Systems Laboratory

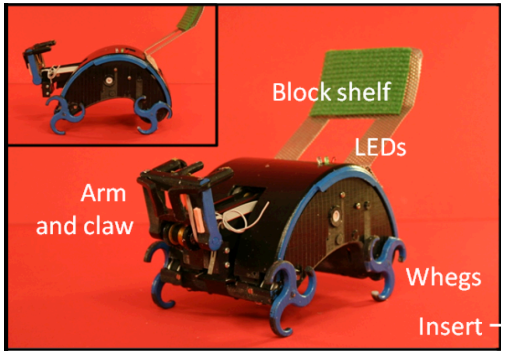
http://faculty.engineering.asu.edu/acs/

Lecture 28: Collective Construction

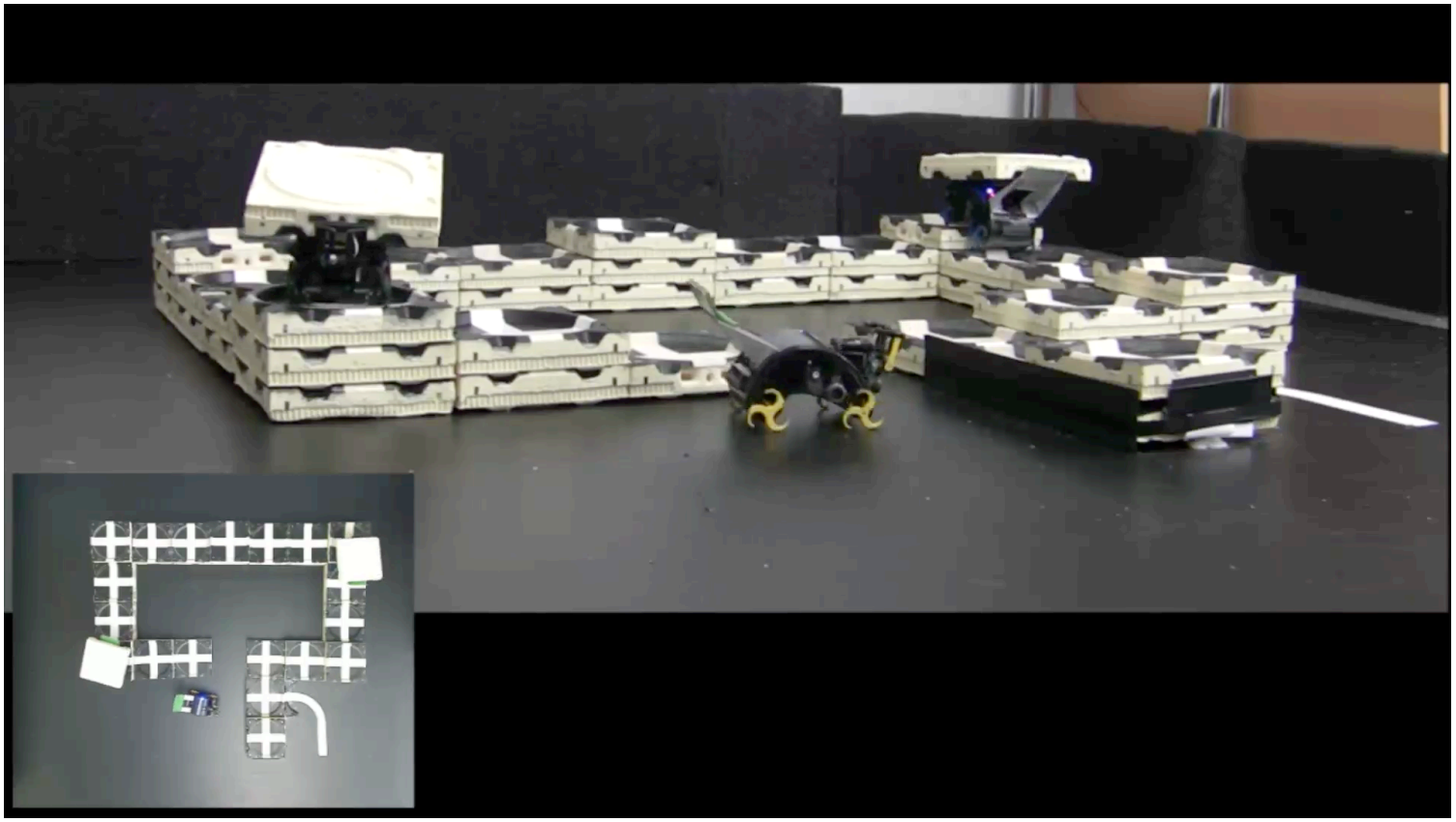
Construction by Ground Robots

TERMES robot

Petersen et al., *RSS* 2011; Werfel et al., *Science*, vol. 343, 2014



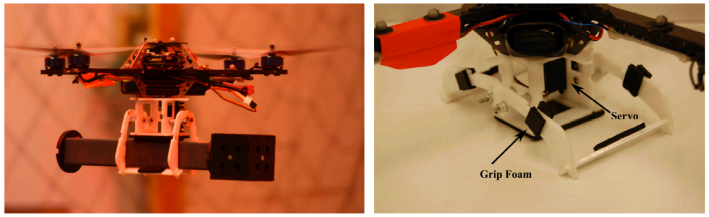
- Robots can locally sense bricks and other robots
- User-specified structure → offline compilation into a "structpath" representation that provides movement guidelines for robots at each location



Construction by Aerial Robots

Lindsey et al., *Robotics: Science and Systems (RSS)*, 2011

- A blueprint for a truss-like structure is automatically translated into a deterministic plan for assembly of simple cubic structures
- The algorithm for building a 2D layer can be implemented using 4 building primitives



(a) Quadrotor with Part (b) Gripper

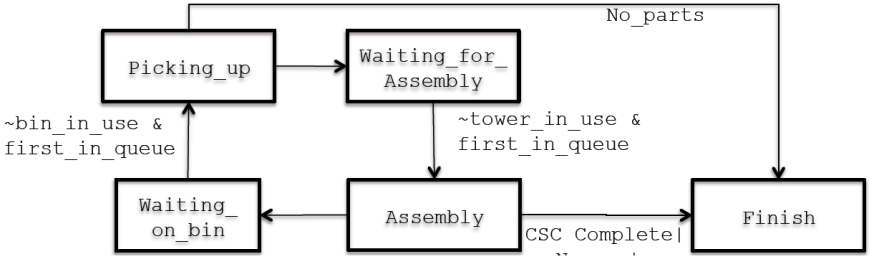
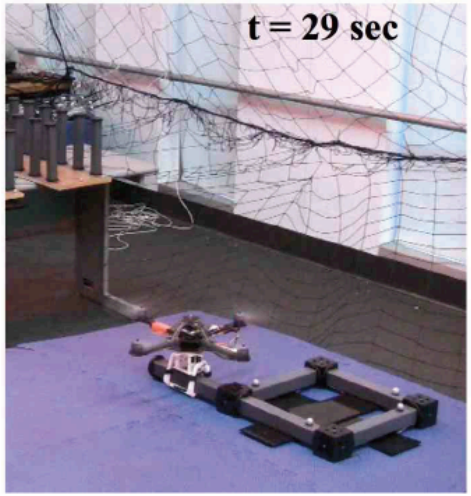
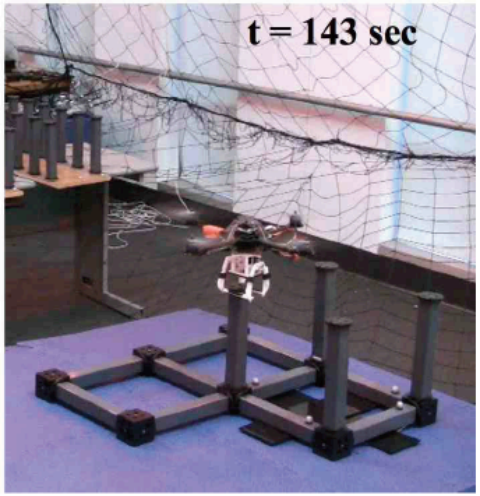
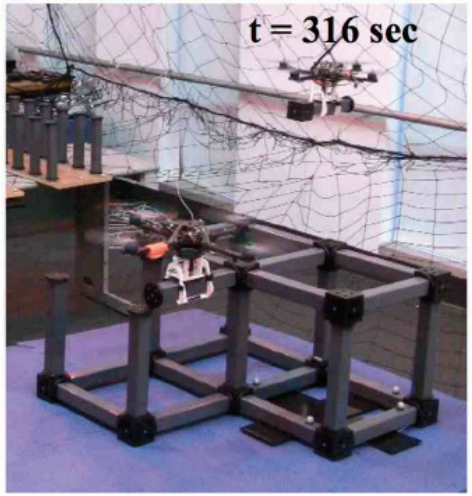


Fig. 8. The finite state automaton for picking up and assembling parts using multiple quadrotors.

Video: https://www.youtube.com/watch?v=W18Z3UnnS_0







Construction by Aerial Robots

Augugliaro et al., *IEEE Control Systems Magazine,* Aug. 2014

"The Flight Assembled Architecture Installation": 6-m-tall tower made of 1500 foam blocks was assembled by 4 quadcopters in 18 hours

Video: https://www.youtube.com/watch?v=xvN9Ri1GmuY&t=44s