Robot Form and Function Lab

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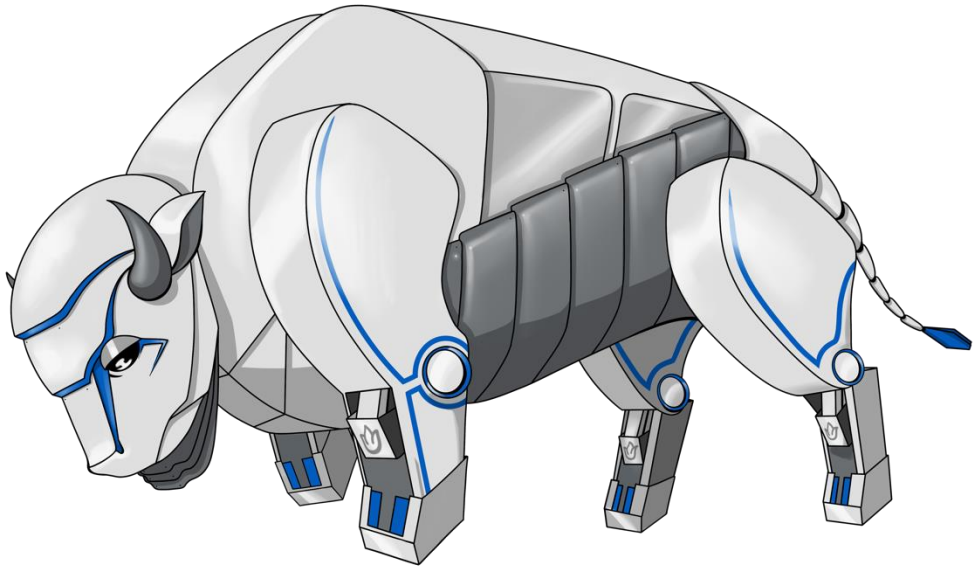


robotformandfunction.github.io

Youtube - Desert ant (Cataglyphis noda)

Why do we want autonomous ant-scale robots?

Youtube – National Geographic

Engineering
- Collaborative building
- Planetary exploration

Ecological
- Seed dispersal
- Pollination

Small-scale robots with on-board robot autonomy can be agile and secure, reducing the possibilities of hacking and various security threat, as well as make the robots more robust.

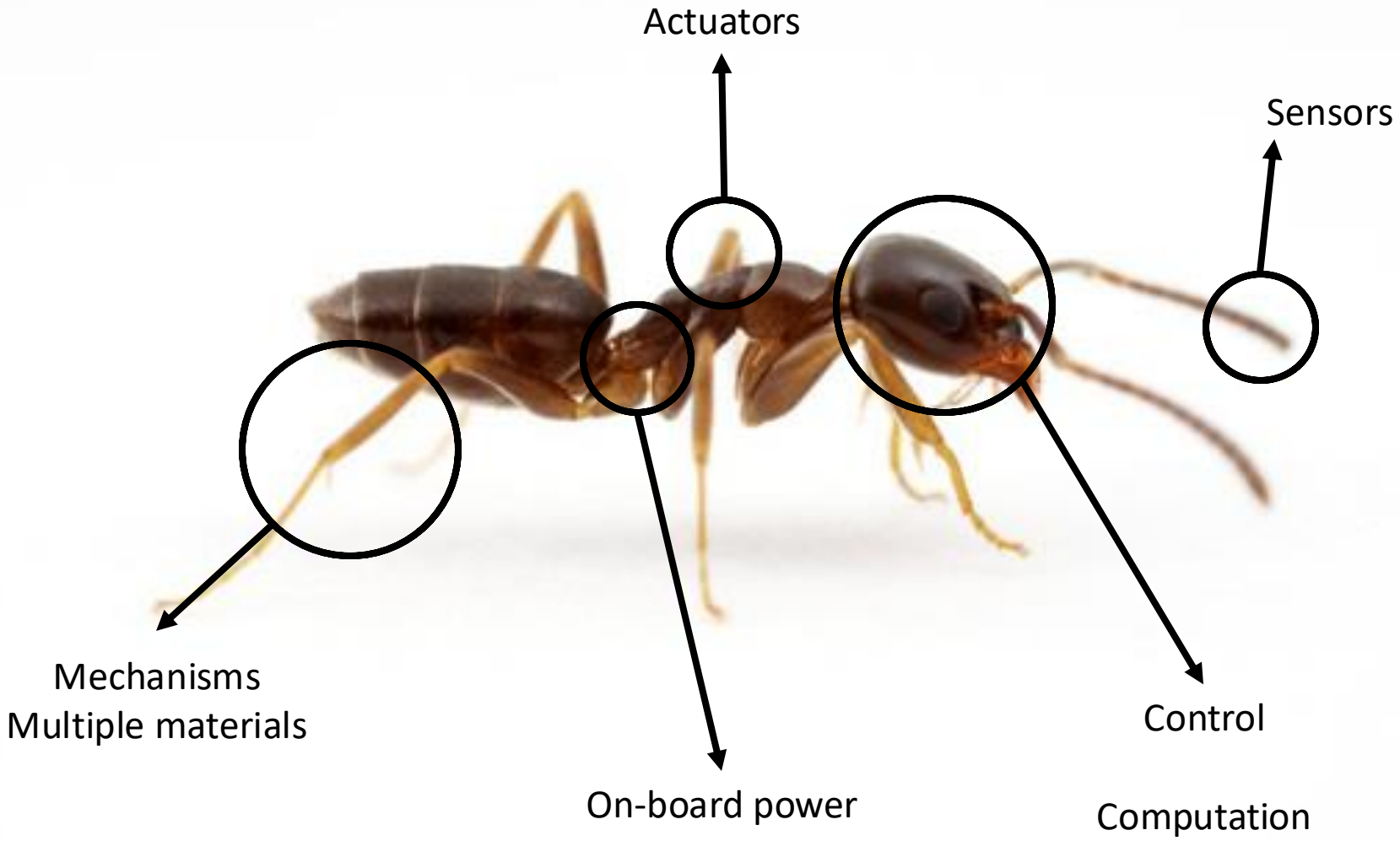
What do we care about for autonomous operation?

Control
The ability to navigate from point A to point B

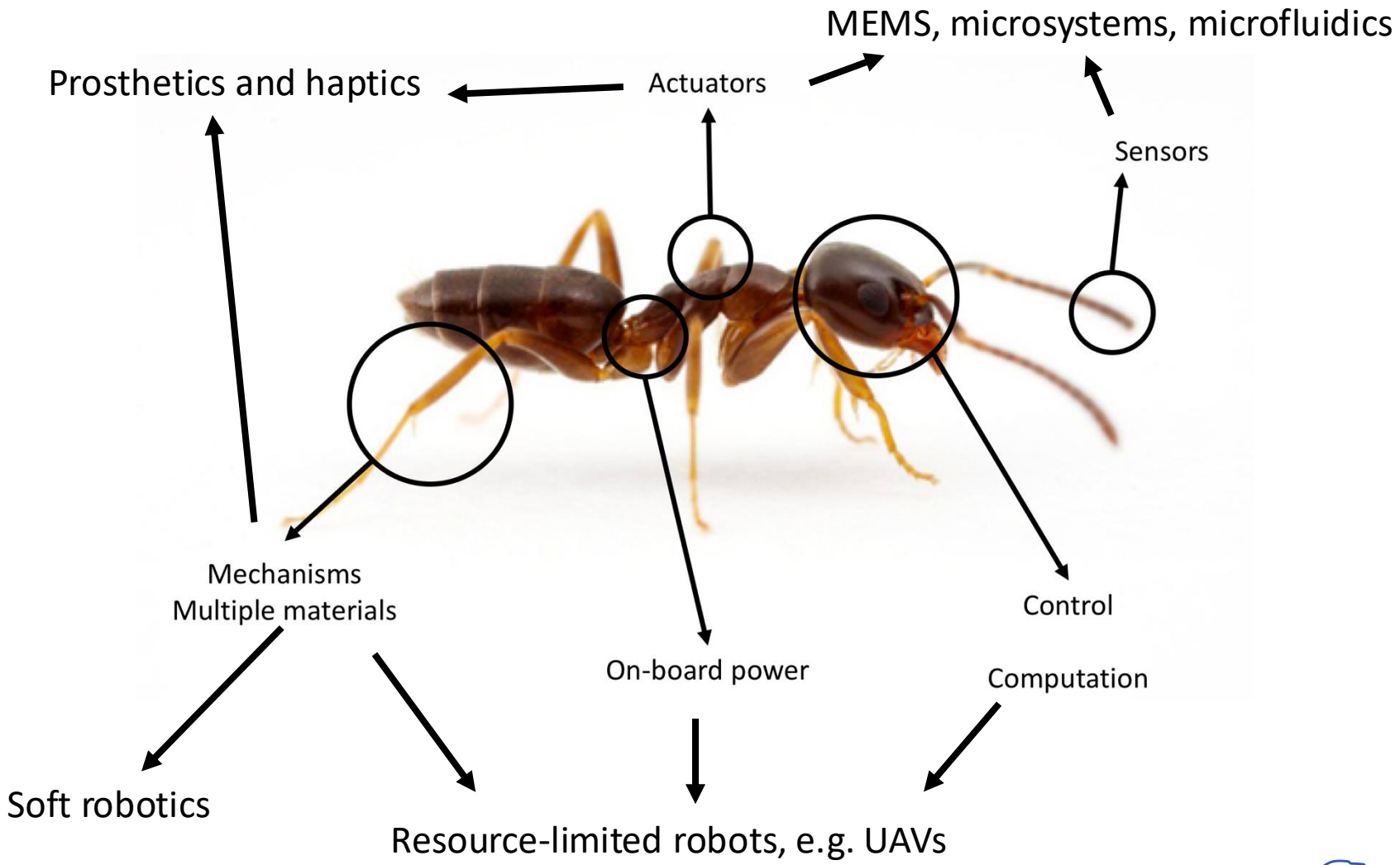
Mobility
The ability and probability to traverse terrain

Power
The ability to move with an untethered energy source

What do we need for ant-scale robots?



What are the impacts of engineering ants?



Lab mission

Our research focuses on design of mechanisms for locomotion and actuation, integration of computing for control and autonomy, and applying engineering tools to understand insect biomechanics. **We leverage our new understanding and knowledge toward bringing microrobots to the same levels of autonomy as their insect counterparts.**

Research interests

- Autonomy in small-scale robots
- Robot hardware (mechanical, electrical, computer) and software co-design
- Computing in resource-constrained devices
- Collective computing

Robot Form and Function Lab – current projects

- Jumping microrobots

Research questions:

1. How can we distribute jumping robots as sensor nodes with sufficient coverage?
2. How can we enable autonomy to move on different terrains?

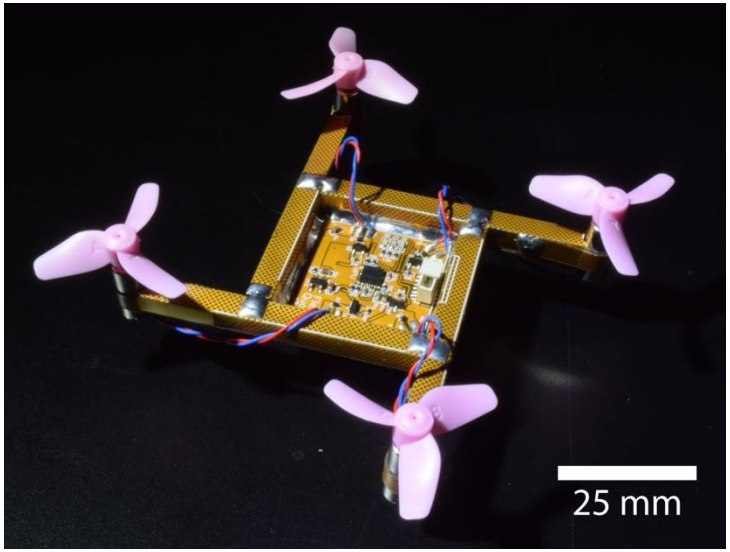
- Mobile millirobots

Research questions:

1. How can localize networks of multiple robots?
2. How do we develop missions for small robots?

Robot Form and Function Lab – current projects

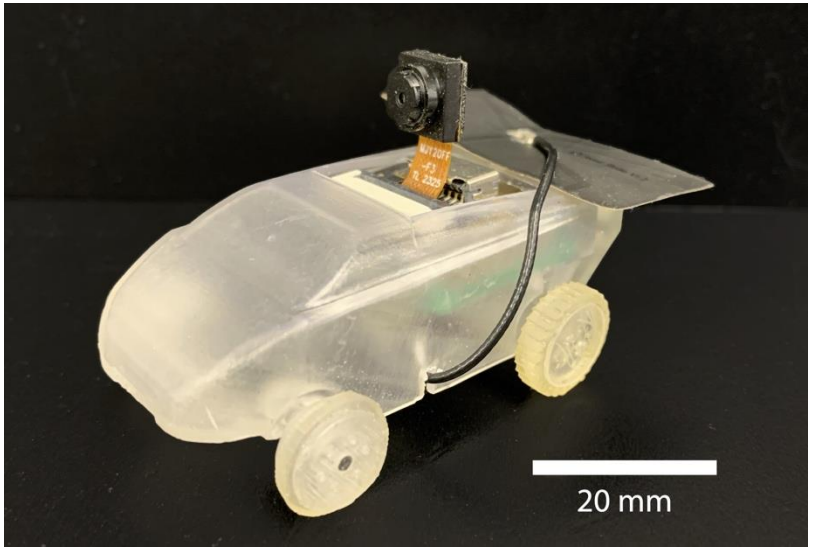
- Foldable PCB robots



Research questions:

1. How can we design integrated foldable robots?
2. Where can be apply on-demand foldable robots?

- Perception on small-scale robots

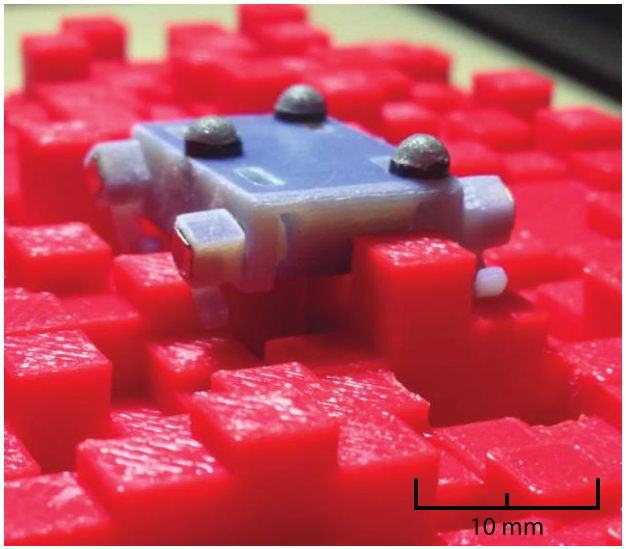


Research questions:

1. How can small, fast robots perceive visual fields?
2. How do we react to sparse visual data?

Robot Form and Function Lab – current projects

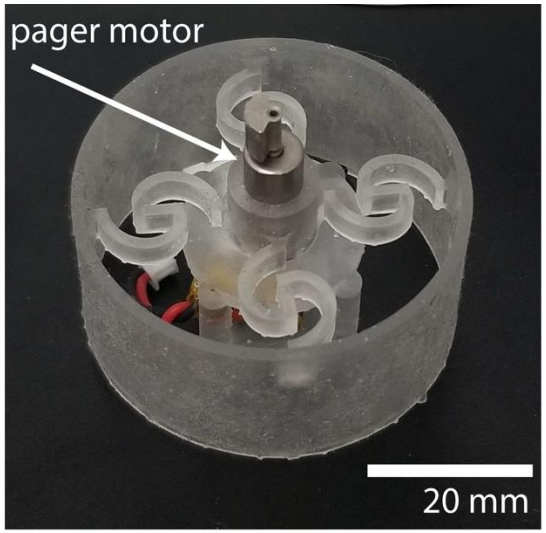
- Legged locomotion



Research questions:

1. How can we integrate neural networks on small, legged robots?
2. How do these compare to traditional controls?

- Collective computing



Research questions:

1. How can we utilize embodiments of small-scale robots for collective computing?
2. How do mechanical forces transmit information?

Getting involved

- Reach out to Dr. St. Pierre (ryans@buffalo.edu)
  - Tell me what you want to work on, why you want to work on it, and what you hope to get out of the experience
- Review the opportunities page on the lab website