Research Overview

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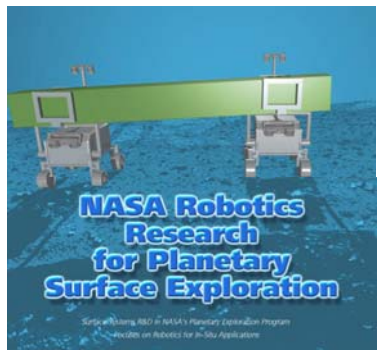
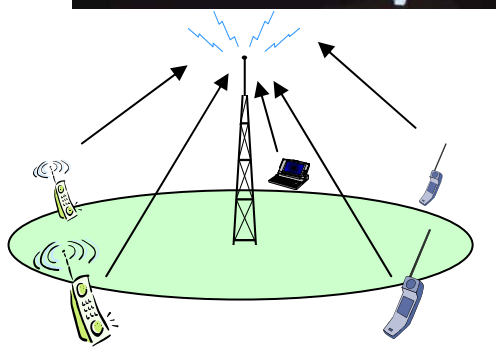
Control Laboratory for Mechanical Structures (CLaMS)

Distributed Control Systems

- Social insects, e.g., ants
- Team robots
- Internet
- Cellular network
- Power systems
- Networked control system



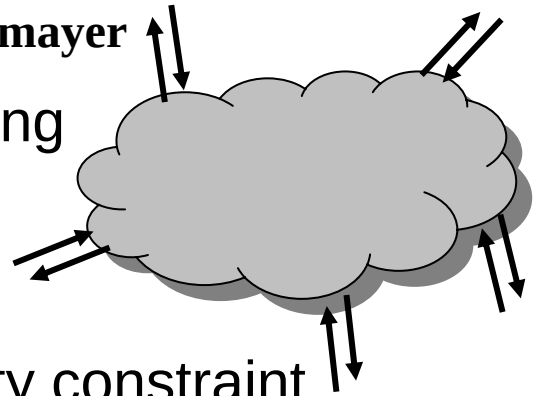


Distributed information and action is characteristic of complex dynamic systems

My Research in Distributed Control

Decentralized action toward centralized goal through indirect communication (stigmergy: Grasse 1959 for social insects)

- **Collaborative load handling:** **Gustavo Montemayer**
  - Goal: carrying load to target without dropping
  - Communication: reaction force



- **Network flow regulation (e.g., Internet):**
  - Goal: maximize overall utility under capacity constraint
  - Communication: packet loss, delay

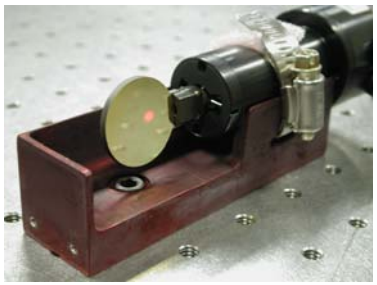
w. Murat Arcak and Xingzhe Fan

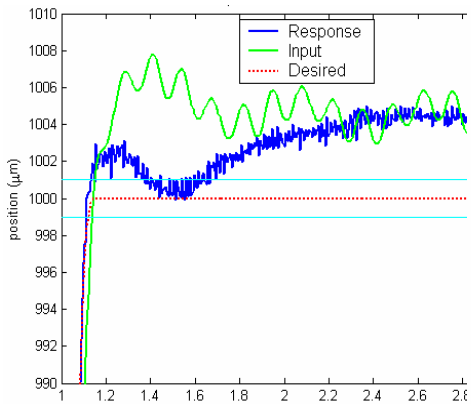
- **Cellular network (CDMA):**
  - Goal: maximum throughput subject to interference
  - Communication: interference, signal quality

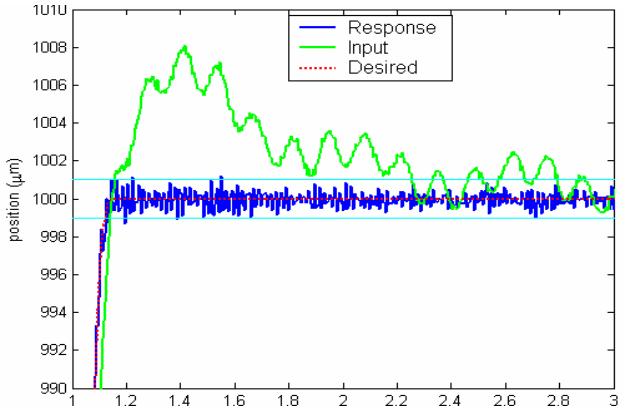
How to achieve these goals without explicit communication?

Motion Control

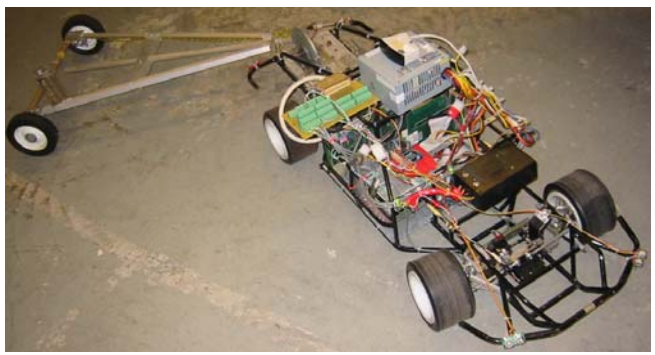
- Precision and high speed motion: Iterative learning + adaptive LMS **Ben Potsaid, Rafael Quintanilla**

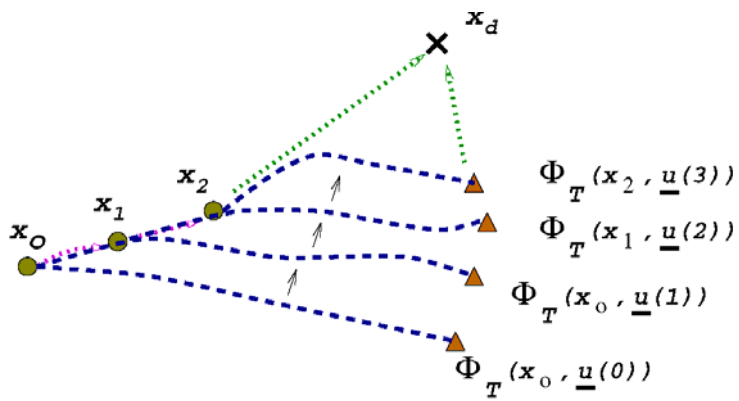






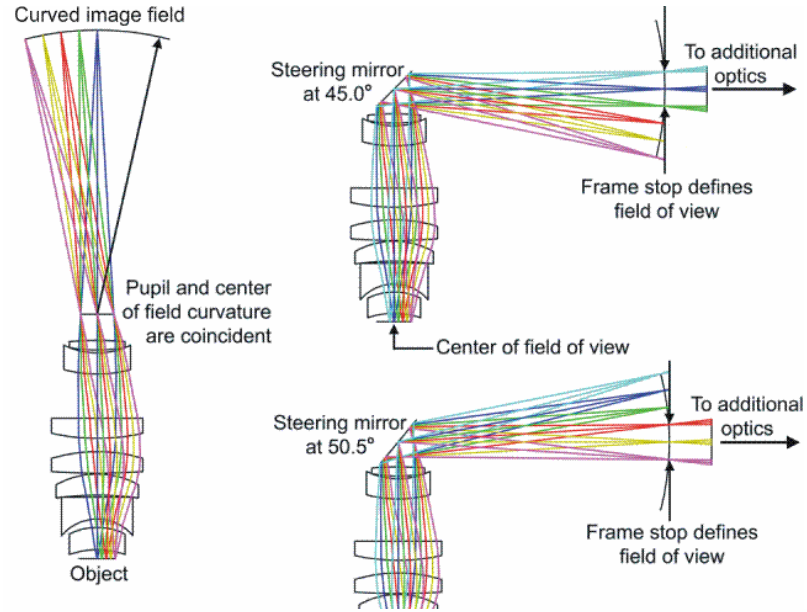
- Receding horizon control: combining iteration and time evolution

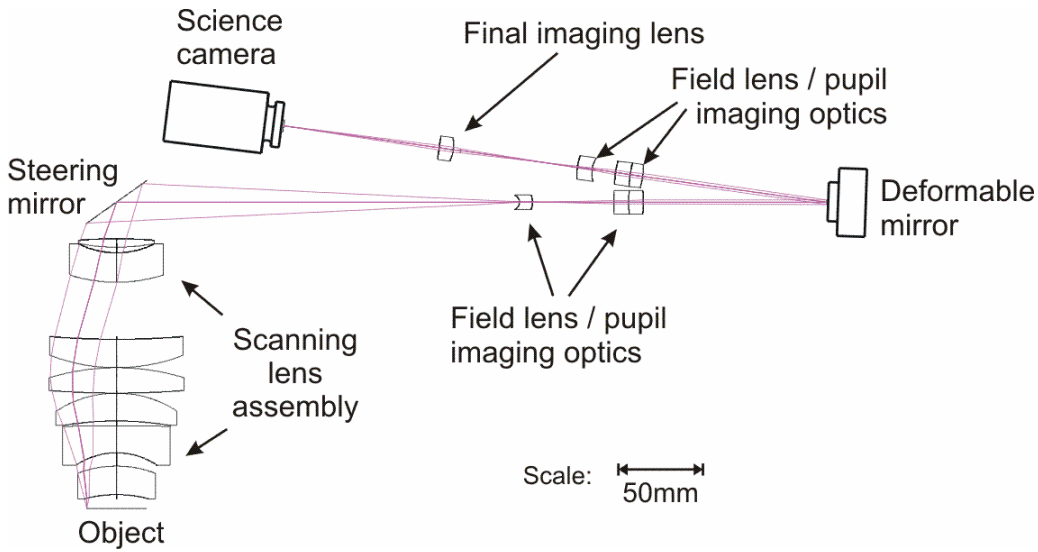


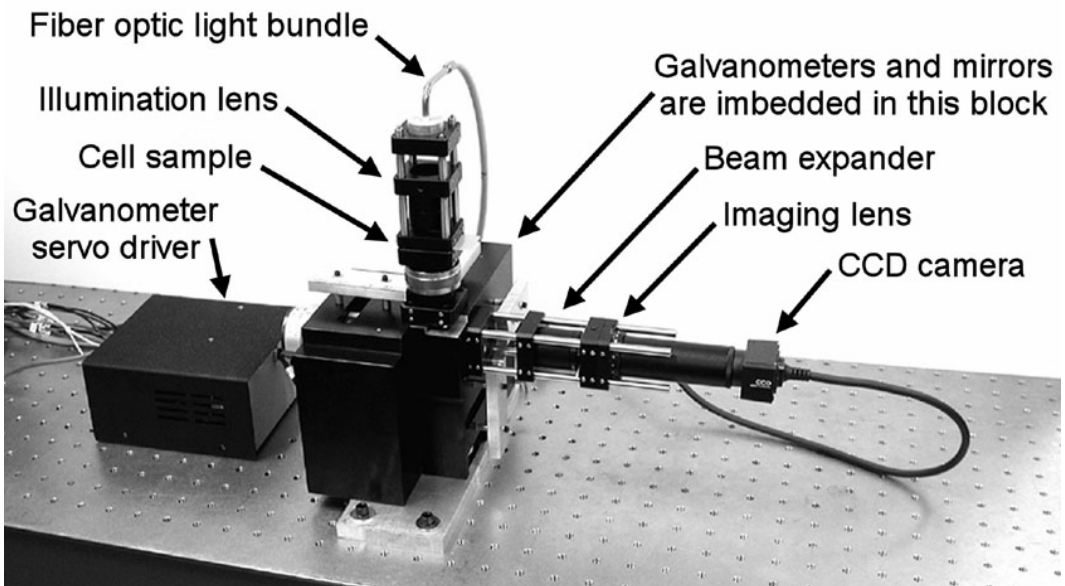


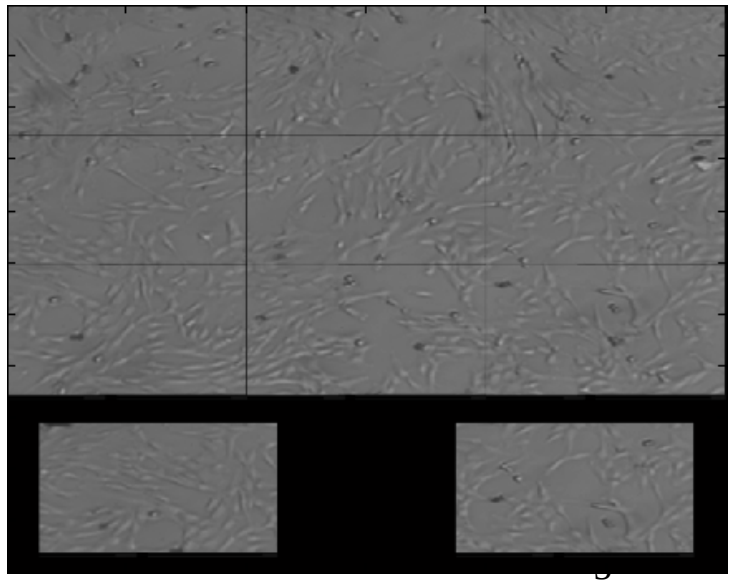
Scanning Optical Microscope

Ben Potsaid







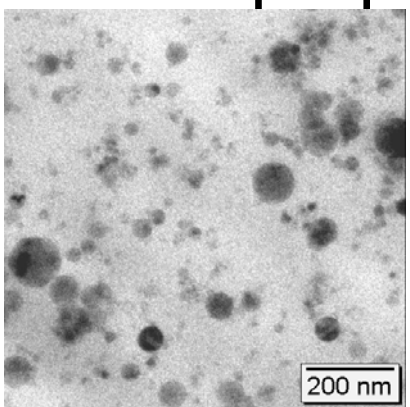


Multiscale Systems

Josh Hurst

Apply systems perspective to the computation of macroscopic properties based on microscopic model (molecular dynamics).

Application: Design of (nano)-particle size, volume fraction, geometry, surface chemistry, etc., in filled polymers to achieve desired properties.



TEM of the 16.7wt% nano alumina filled gelatin film