

# Mobile Manipulation Robots

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## Objectives

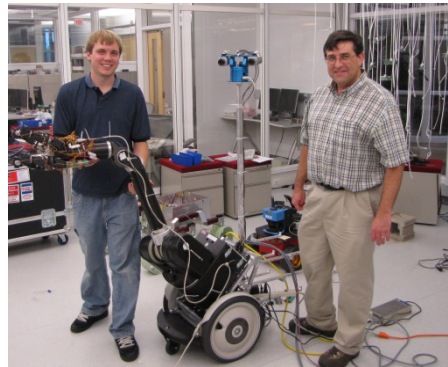
- Mobile robots that can perform many different tasks in human environments
- Skillful and robust grasping and manipulation of everyday objects
- Learning grasping and manipulation skills from human teachers and by “playing” with the world
- Learning task-oriented representations that generalize across tasks
- Social interaction for collaboration in tasks and for learning

## Background

- Aging populations in Japan, Singapore, Germany and (soon) the US -> reduced labor force and scaled back economy
- Must care for these populations and maintain the labor force
- A part of the solution: robots that can work in our homes, offices and communities
- Require robotic systems that are:
  - Flexible in the types of tasks that they can perform
  - Can safely work along side and in collaboration with their human counterparts
  - Can learn to perform new tasks *in situ*

## Current State

- New platform is largely in place:
  - Arm (Barrett) and hand (our own)
  - Mobile base: Segway
  - Steerable binocular vision: TracLabs
- 3D vision system: localize objects to be manipulated
- Automatic mapping of environment



- Planning and navigation
- Affordances for connecting vision to grasp actions

## Relevant Publications

- Platt, R., Fagg, A. H., and Gruben, R. A. (2010) Null Space Grasp Control: Theory and Experiments, IEEE Transactions on Robotics
- Bodenhamer, M., Bleckley, S., Fennelly, D., Fagg, A. H., and McGovern, A. (2009) Spatio-Temporal Multi-Dimensional Relational Framework Trees,, In the Proceedings of the International Workshop on Spatial and Spatiotemporal Data Mining, IEEE Conference on Data Mining, Miami, FL, Electronically Published
- Palmer, T. J. and Fagg, A. H. (2009) Learning Grasp Affordances with Variable Centroid Offsets,, Proceedings of the International Conference on Intelligent Robots and Systems, M011T7.1, St. Louis, MO
- de Granville, C., Southerland, J., Fagg, A. H. (2006), Learning Grasp Affordances Through Human Demonstration, Proceedings of the International Conference on Development and Learning (ICDL'06), Electronically Published
- Brock, O., Fagg, A. H., Gruben, R. A., Karuppiiah, D., Platt, R., Rosenstein, M., (2005), A Framework For Humanoid Control and Intelligence, International Journal of Humanoid Robotics, 2(3):301-336