Going Mobile: The Future of the Rosie Project

Soar Workshop 6/5/15

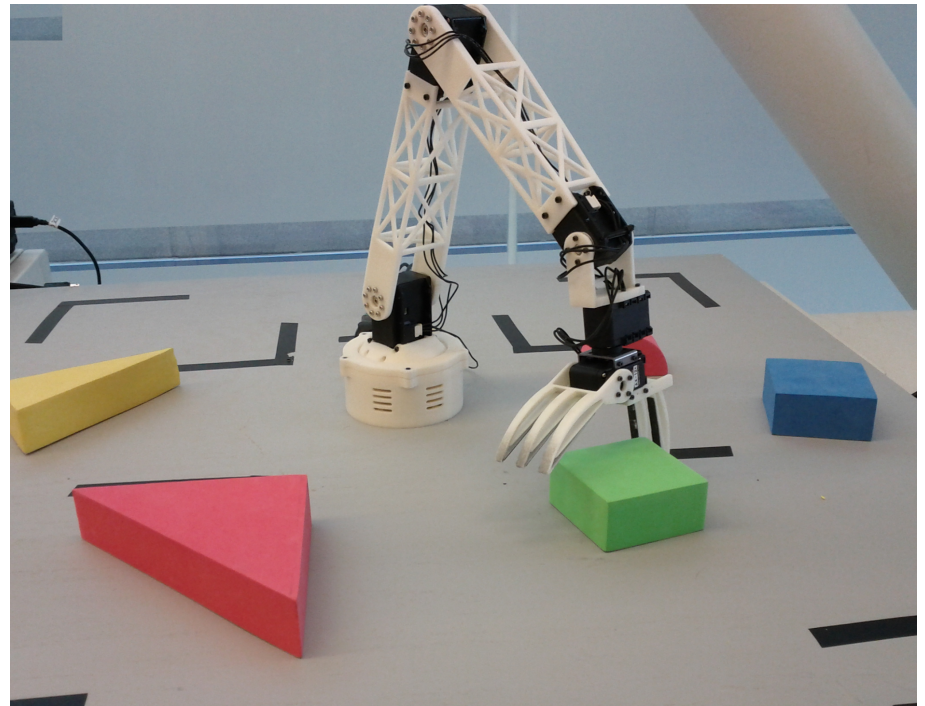## Aaron Mininger
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Current Rosie Platform

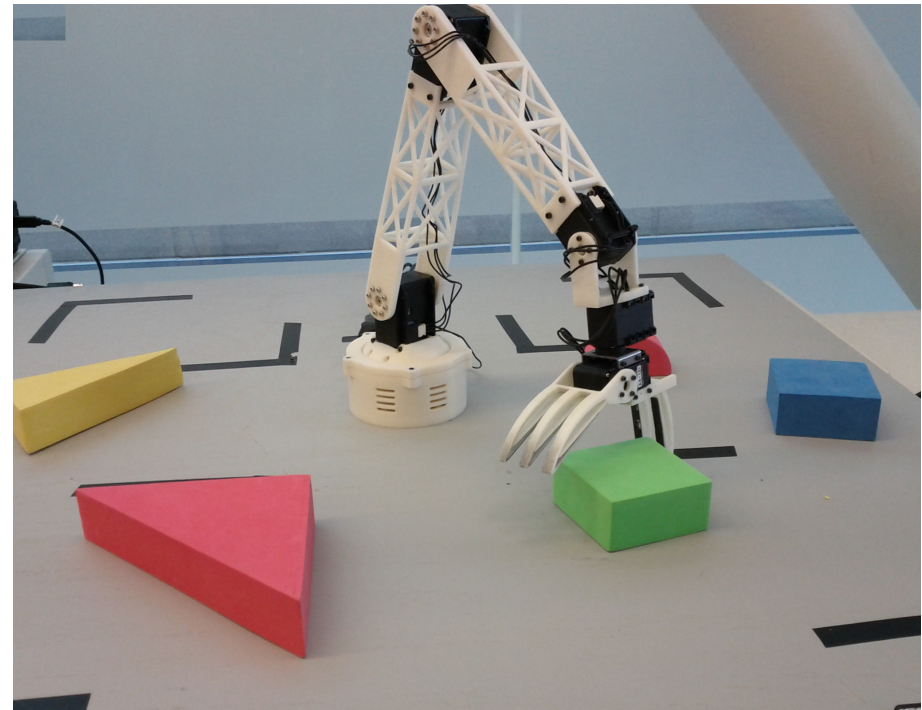Tabletop Blocks-World Domain

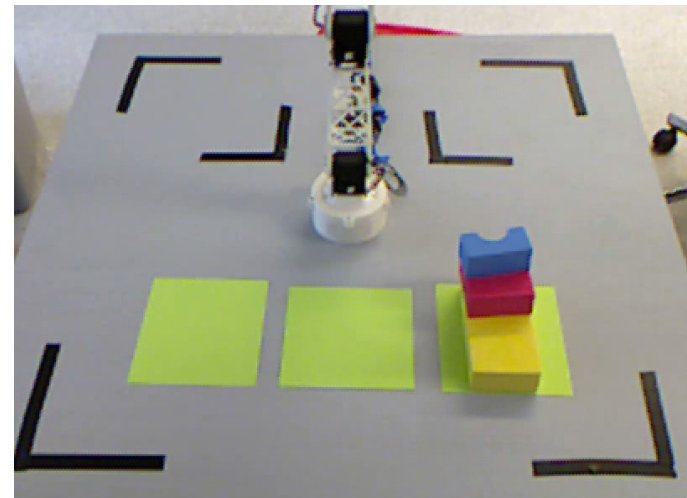Actuators
- 6 DOF Robotic Arm

Sensors
- Kinect RGBD Camera

Learned Concepts

- Visual Properties
  - Colors, Shapes, Sizes

- Spatial Relations
  - On, Right-Of, Near

- Actions
  - Move, Stack

Interactive Task Learning

- Games and Puzzles
  - Objects, Valid Actions, Win/Lose Conditions
  - Tic-Tac-Toe, Tower of Hanoi,

- Actions
  - Verb Syntax, Goals, Policy, Default Arguments
  - Cook, Store

Capabilities that Support ITL

- Reference Resolution
- Spatial Information Extraction
- Stable World Representation
  - Occlusions
  - Segmentation Errors
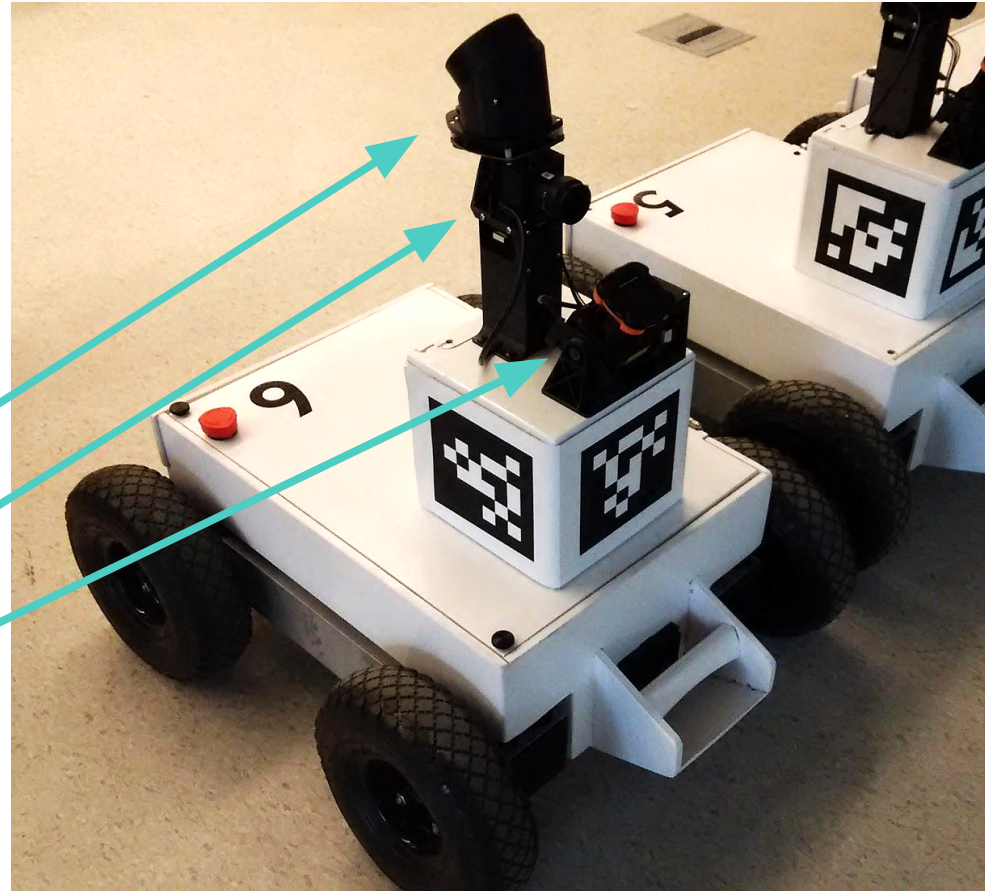 - Tracking Failures
  - Sensor Noise

New Rosie Platform

Actuators

- 4 Wheel Drivetrain
- Rear Mounted Arm

Sensors

- Hoop Skirt LIDAR
- Front and Rear Cameras
- Front-Facing LIDAR
- IMU and wheel encoders

Interactive Task Learning

Do ITL in a real-world office environment.

- Directed Tasks
  - Deliver, Find Object, Give Message, Check Room

- Ongoing Tasks
  - Pick up Trash, Restock

Supporting Interactive Task Learning

Two questions to motivate research direction:

- What capabilities do we need to support ITL?

- How can Soar provide top-down knowledge in those capabilities?

Navigation

How does Rosie get from one place to another?

- Nearby Locations – metrical planning
- Farther Locations – topological planning
- Unknown Locations – exploration or instruction

Object Detection and Recognition

Use top-down knowledge from Soar to aid in ambiguous situations

- Use semantic knowledge about objects
- Use episodic knowledge from previous experiences
- Get help from the instructor

Long-Term Spatial Information

What does Rosie remember about a room once it leaves? (objects, spatial arrangements)

- SVS has no long-term memory
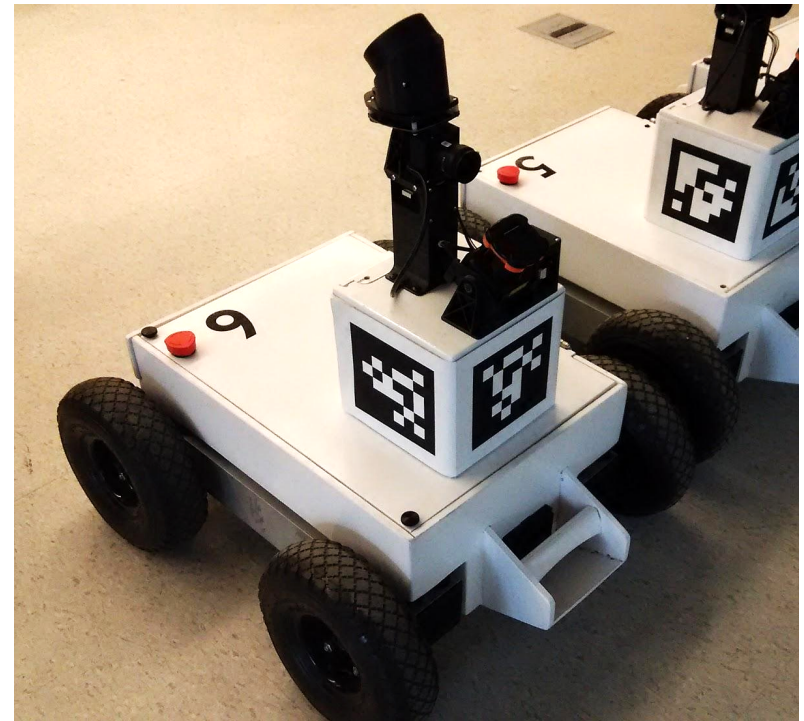- Episodic Memory is not designed for metric information

Attention

Direct perceptual processing based on the current task and goals

- Restrict focus to specific areas
- Only use costly vision algorithms when needed
- Change parameters or thresholds
- Ignore irrelevant errors or noise

Conclusion

New domain will present many challenges

Exciting opportunities to use task knowledge to aid in perception and control

Thanks!

Any questions?