Extending Rosie to the Mobile Domain

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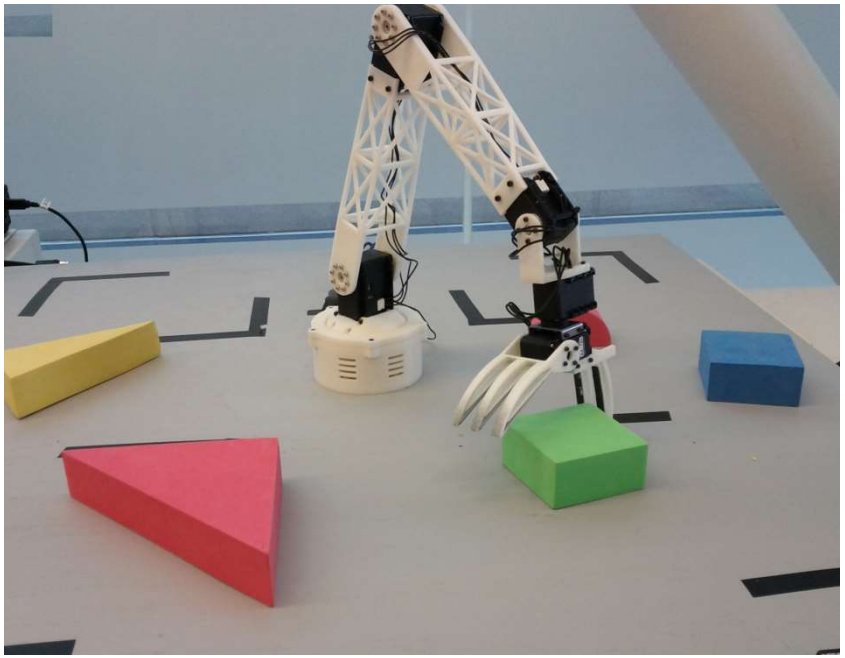
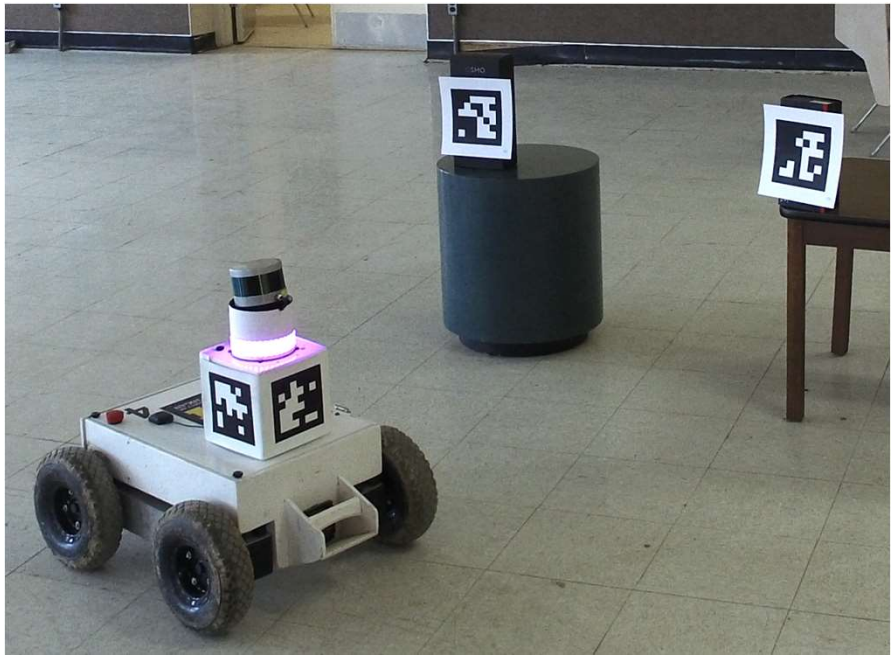
2016 Soar Workshop

Mobile ITL agent

- We want the same ITL agent to work in different environments with minimal changes





Mobile ITL agent

- We want the same ITL agent to work in different environments with minimal changes
  - Different set of starting actions
  - Different ways of handling perception
  - Same world representations

Actions

Soar sends discrete commands which are executed by a motor controller

- `turn(radians)`
- `orient(heading)`
- `drive-to(x, y)`
- `drive-forward(distance)`
- `stop`

The controller sends back the status

(executing, complete, failure)

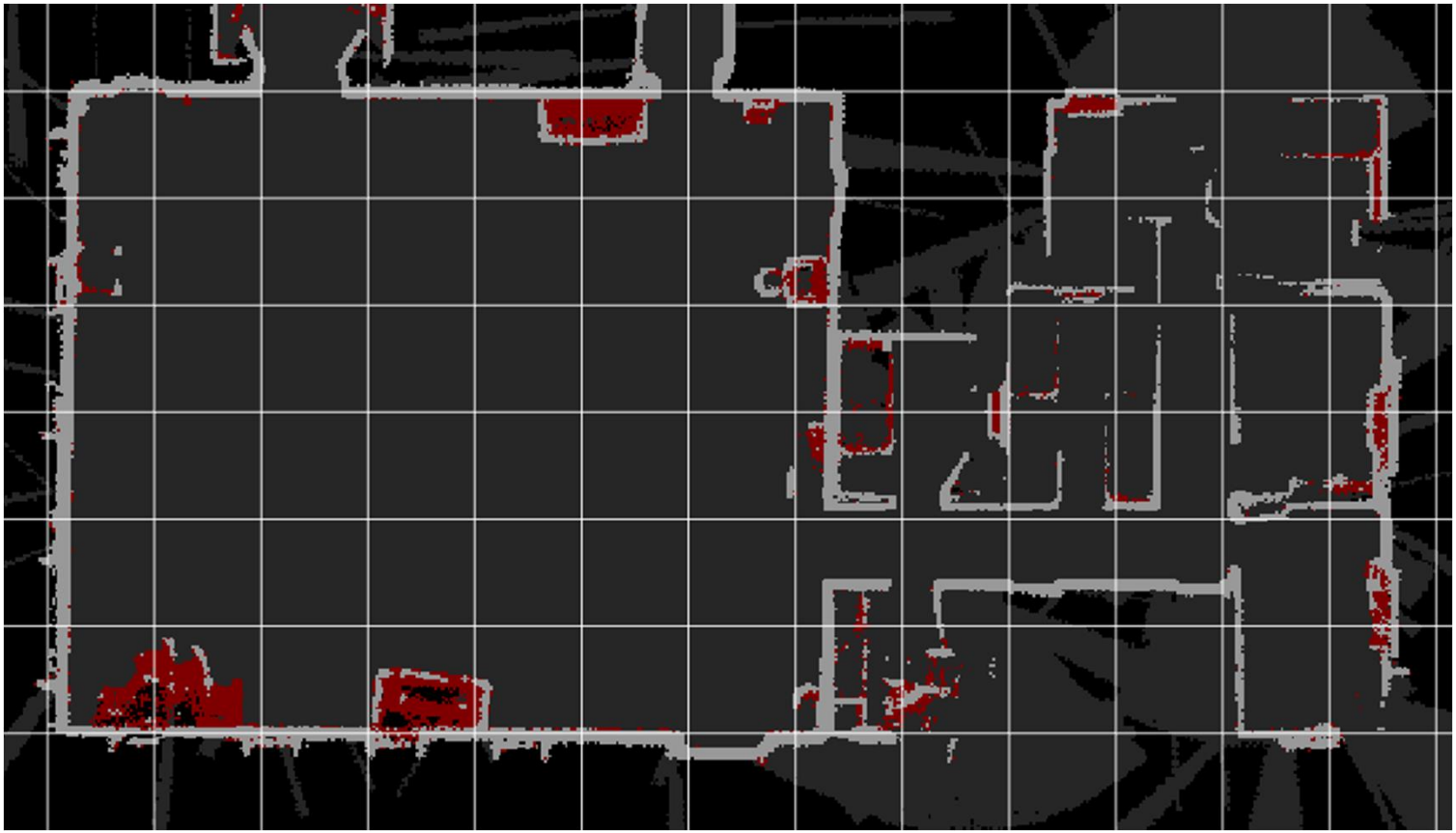
Actions

Some actions are done through language

- `say(message)`
- `pick-up(object)`
- `put-down(object)`
- `give(object, person)`

Navigation

- Start with a metric map used for localization

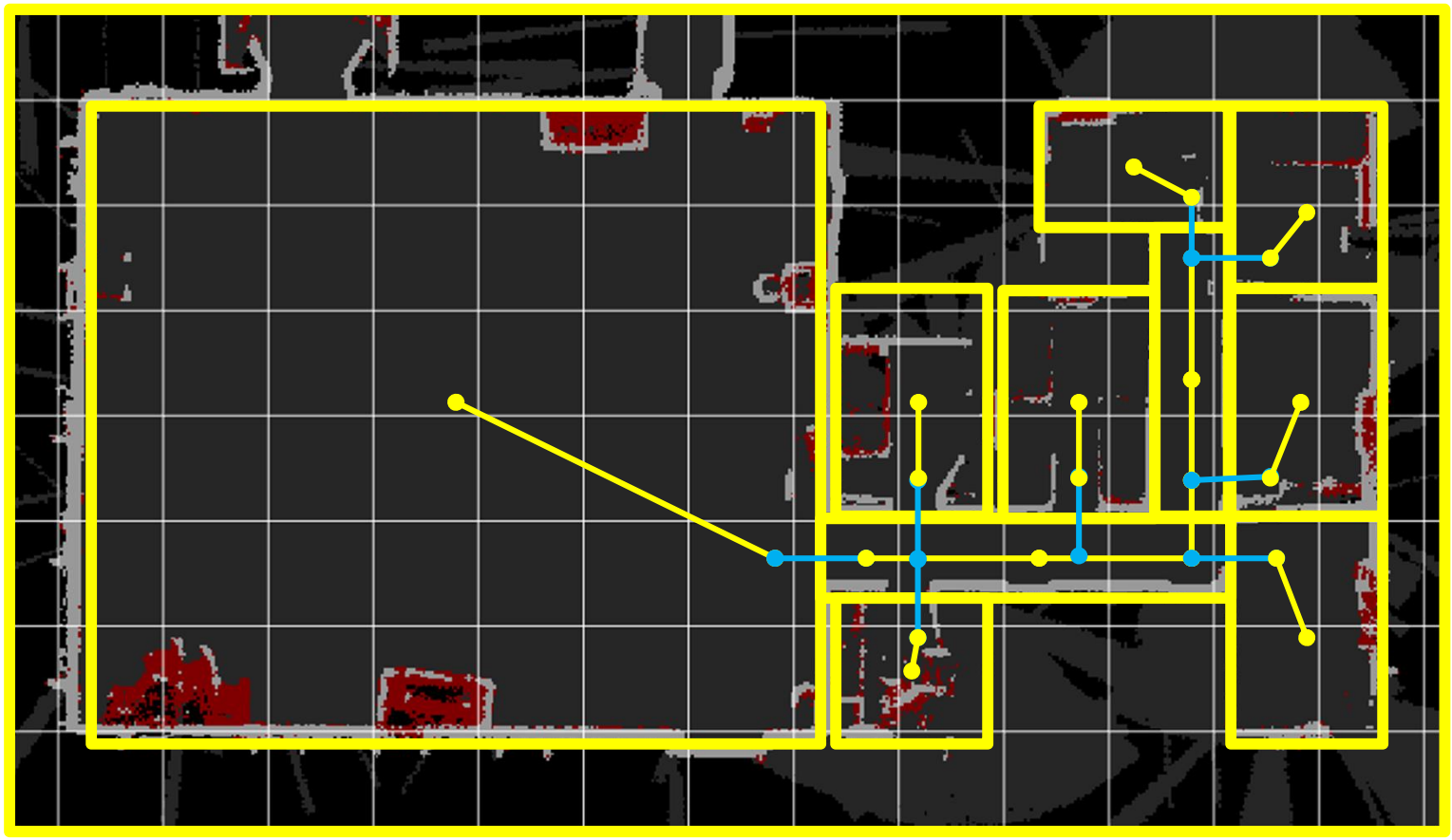


Navigation

- Add a set of regions

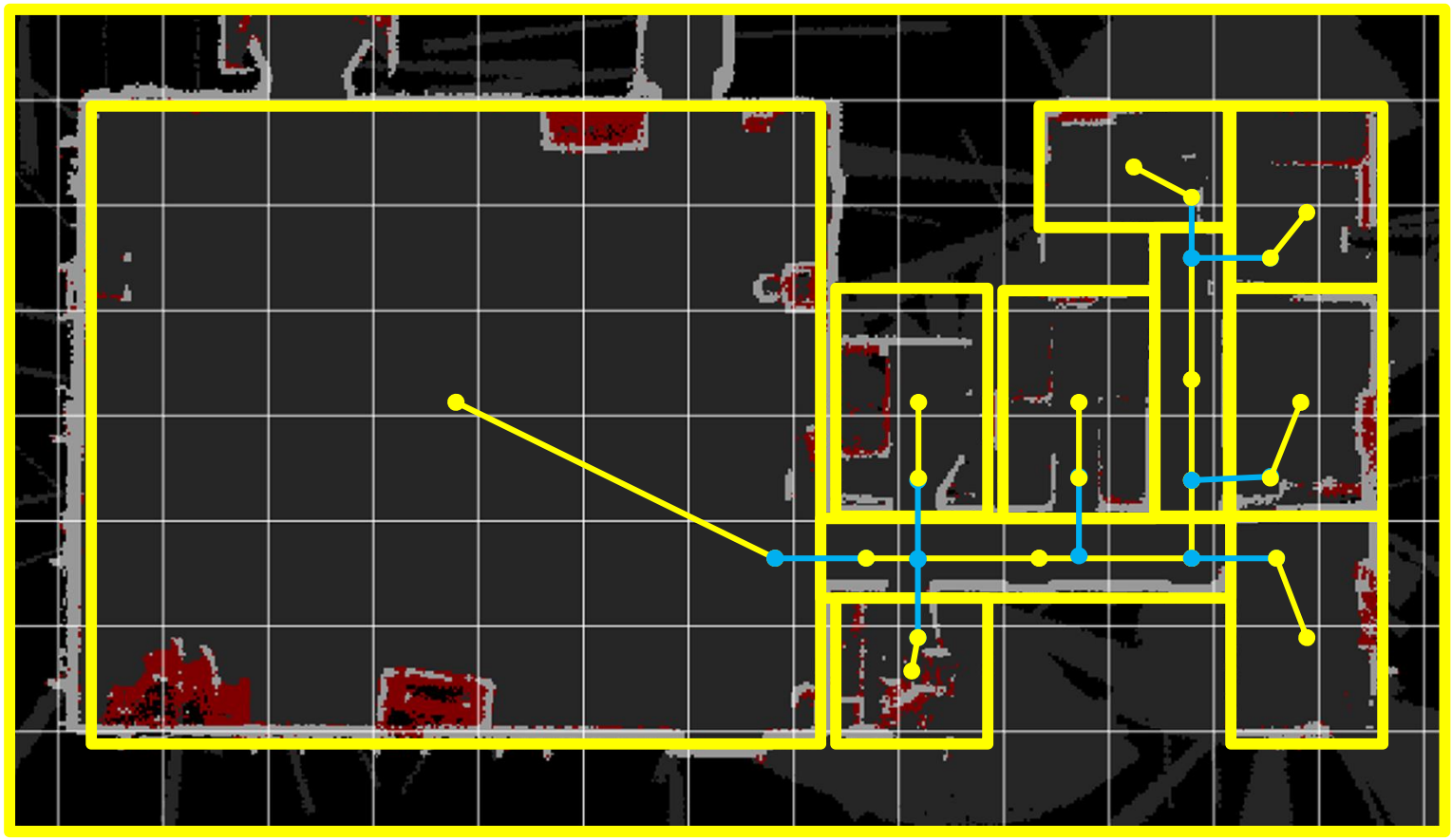
Navigation

- Add waypoints for navigation



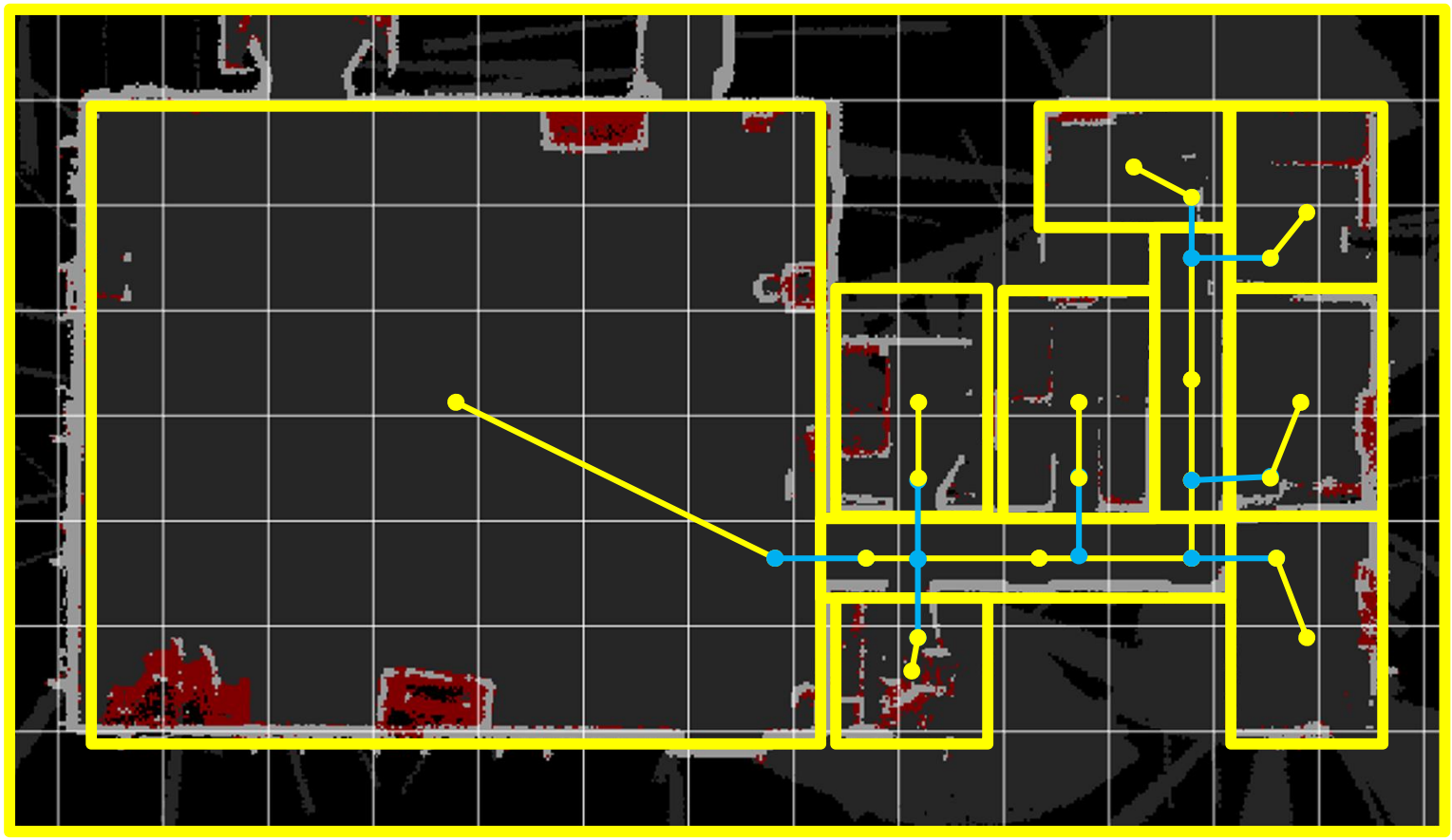
Navigation

- Robot reports current region and position



Navigation

- Agent navigates through a sequence of go-to(x,y) commands

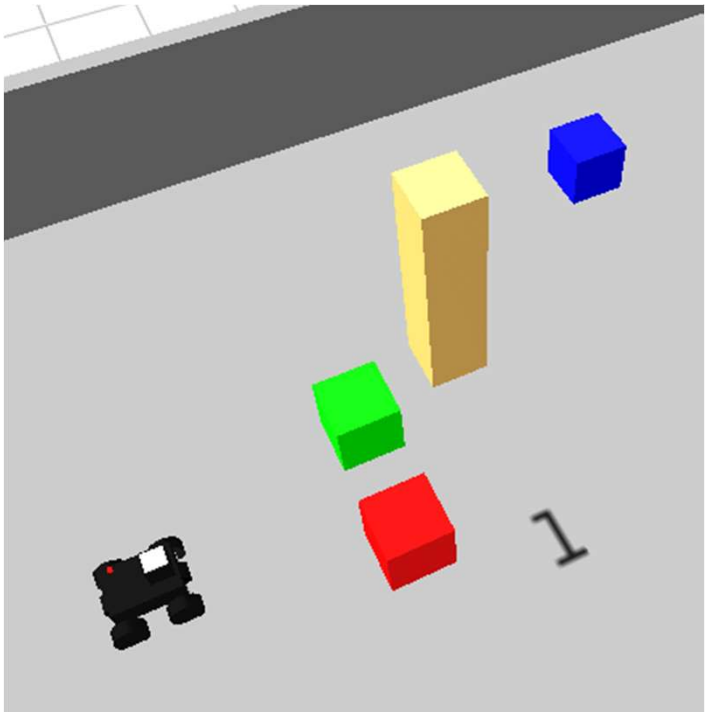


Perception

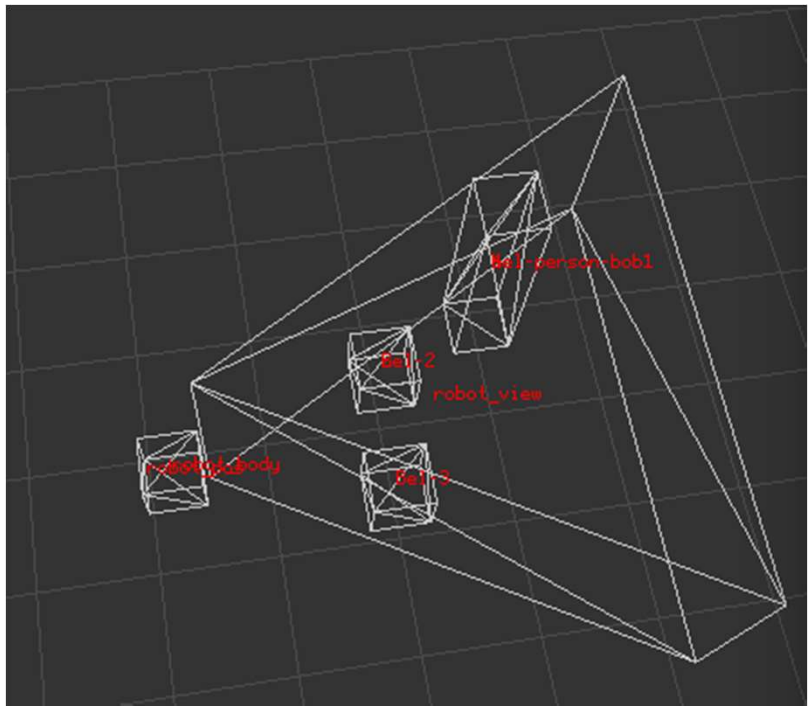
- Object detection and recognition through fiducials
- Perceptual ids are tracked while in view
- The soar agent receives both
  - Metric info (pos/bbox) in SVS
  - Predicates (color/shape) in WM

Perception

Simulated Robot



SVS View



Object Representation

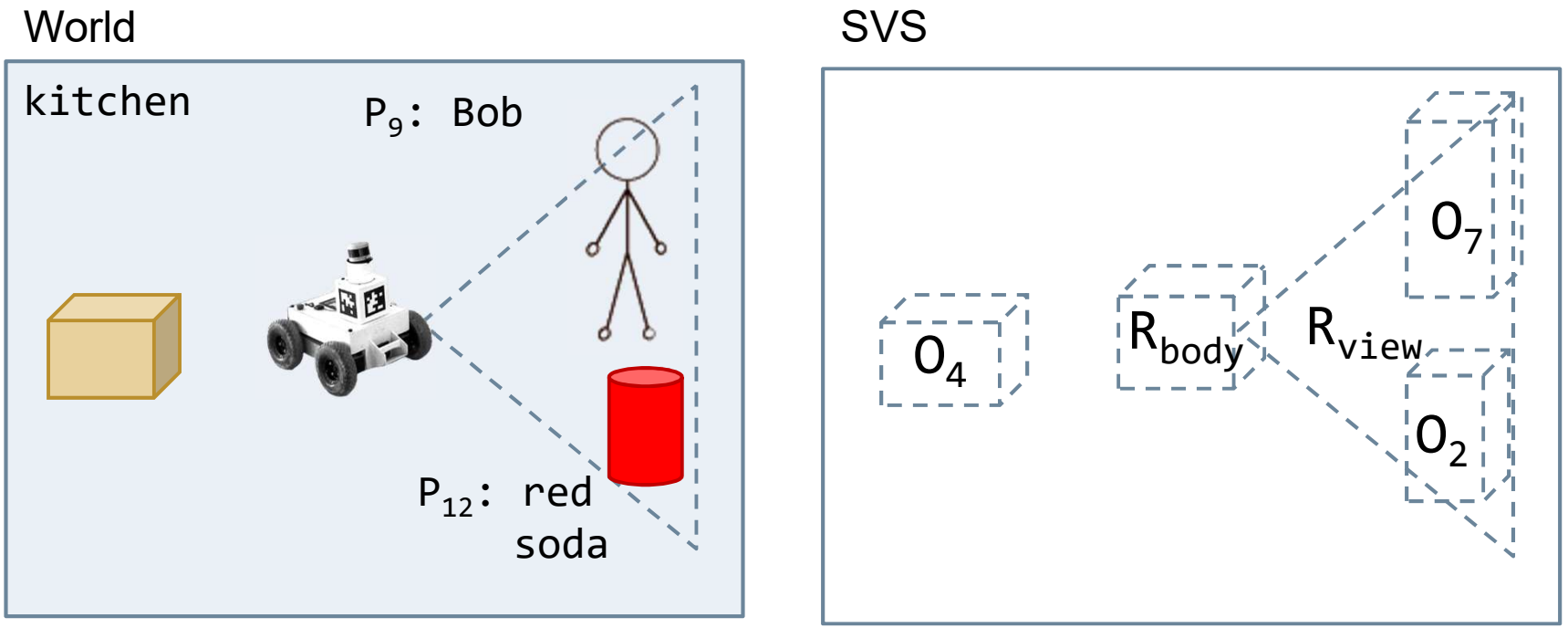
Objects are represented as a set of unary predicates

O_3: {red(O_3), ball(O_3), visible(O_3)}
O_7: {Bob(O_7), person(O_7), visible(O_7)}
O_9: {lab(O_9), location(O_9), current(O_9)}

Relations are represented as binary predicates:

in(O_3, O_9), holding(O_7, O_3)

Object Representation



O_1: {robot(O_1), stopped(O_1)}
O_2: {red(O_2), soda(O_2), visible(O_2)}
O_3: {kitchen(O_3), location(O_3), current(O_3)}
O_4: {brown(O_4), package(O_4), not-visible(O_4)}
O_7: {Bob(O_7), person(O_7), visible(O_7)}

in(O_1, O_3)
in(O_2, O_3)
in(O_4, O_3)
in(O_5, O_3)

Location Changing

- Locations help divide the environment
- Changing locations triggers a context change
  - All objects in the previous location are removed
  - Metric information is stored in episodic memory
  - Previous objects in the new location are retrieved

Nuggets + Coal

Nuggets

- Sufficient for our initial set of tasks
- Can navigate in a partially observable, multi-room environment
- Supports the same task learning agent

Coal

- Simple perception
- Not robust to perceptual noise/errors
- Coarse navigation primitives