Four Example Application Domains

- **Autonomous delivery robot** roams around an office environment and delivers coffee, parcels,...

- **Diagnostic assistant** helps a human troubleshoot problems and suggests repairs or treatments. E.g., electrical problems, medical diagnosis.

- **Intelligent tutoring system** teaches students in some subject area.

- **Trading agent** buys goods and services on your behalf.

Domain for Delivery Robot
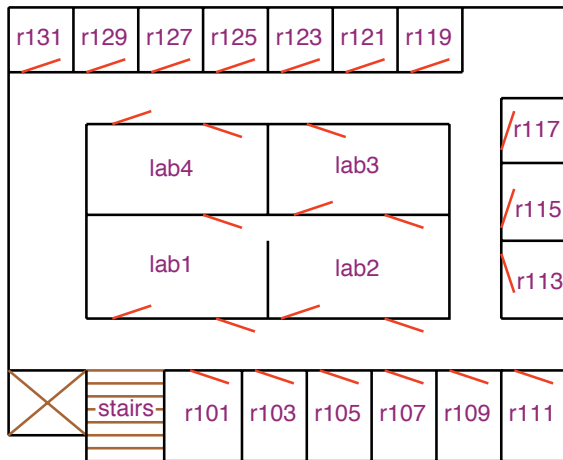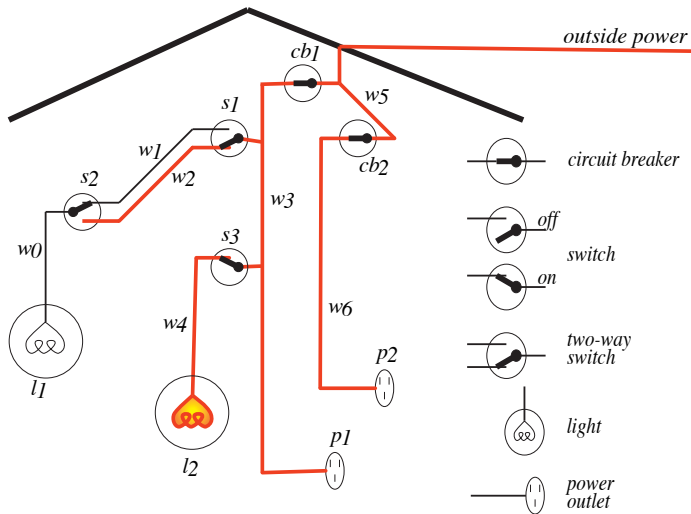
Autonomous Delivery Robot

Example inputs:

- **Abilities:** movement, speech, pickup and place objects.
- **Prior knowledge:** its capabilities, objects it may encounter, maps.
- **Past experience:** which actions are useful and when, what objects are there, how its actions affect its position.
- **Goals:** what it needs to deliver and when, tradeoffs between acting quickly and acting safely.
- **Observations:** about its environment from cameras, sonar, sound, laser range finders, or keyboards.

What does the Delivery Robot need to do?

- Determine where Craig's office is. Where coffee is. . .
- Find a path between locations.
- Plan how to carry out multiple tasks.
- Make default assumptions about where Craig is.
- Make tradeoffs under uncertainty: should it go near the stairs?
- Learn from experience.
- Sense the world, avoid obstacles, pickup and put down coffee.

Domain for Diagnostic Assistant

outside power

cb1

w5

s1

w1

w2

cb2

s2

w3

w0

s3

w4

w6

p2

l1

p1

l2

circuit breaker

off

switch

on

two-way
switch

light

power
outlet

Diagnostic Assistant

Example inputs:

- **Abilities:** recommends fixes, ask questions.
- **Prior knowledge:** how switches and lights work, how malfunctions manifest themselves, what information tests provide, the side effects of repairs.
- **Past experience:** the effects of repairs or treatments, the prevalence of faults or diseases.
- **Goals:** fixing the device and tradeoffs between fixing or replacing different components.
- **Observations:** symptoms of a device or patient.

Subtasks for the diagnostic assistant

- Derive the effects of faults and interventions.
- Search through the space of possible fault complexes.
- Explain its reasoning to the human who is using it.
- Derive possible causes for symptoms; rule out other causes.
- Plan courses of tests and treatments to address the problems.
- Reason about the uncertainties/ambiguities given symptoms.
- Trade off alternate courses of action.
- Learn what symptoms are associated with faults, the effects of treatments, and the accuracy of tests.

Trading Agent

Trading agent interacts with an information environment to purchase goods and services.

- It acquires a users needs, desires and preferences.
- It finds what is available.
- It purchases goods and services that fit together to fulfill your preferences.
- It is difficult because users preferences and what is available can change dynamically, and some items may be useless without other items.

Trading Agent Inputs

- **Abilities:** acquire information, make recommendations, purchase items.
- **Prior knowledge:** the ontology of what things are available, where to purchase items, how to decompose a complex item.
- **Past experience:** how long special last, how long items take to sell out, who has good deals, what your competitors do.
- **Goals:** what the person wants, their tradeoff.
- **Observations:** what items are available, prices, number in stock,

Intelligent Tutoring System

- **Abilities:** Present information, give tests
- **Prior knowledge:** subject material, primitive strategies
- **Past experience:** common errors, effects of teaching strategies
- **Goals:** the students should master subject material, gain social skills, study skills, inquisitiveness, interest
- **Observations:** test results, facial expressions, questions, what the student is concentrating on

Common Tasks of the Domains

- **Modeling the environment** Build models of the physical environment, patient, or information environment.

- **Evidential reasoning or perception** Given observations, determine what the world is like.

- **Action** Given a model of the world and a goal, determine what should be done.

- **Learning from past experiences** Learn about the specific case and the population of cases.