# 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
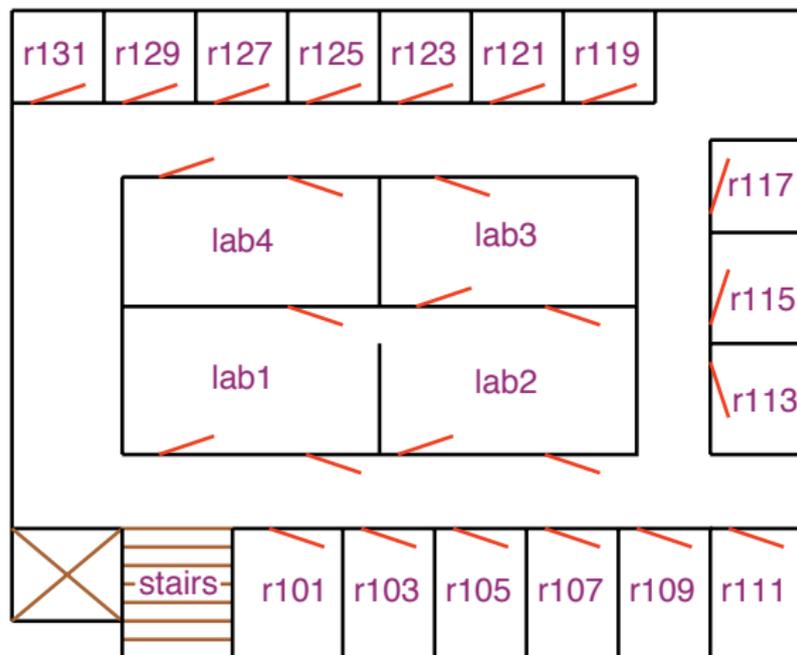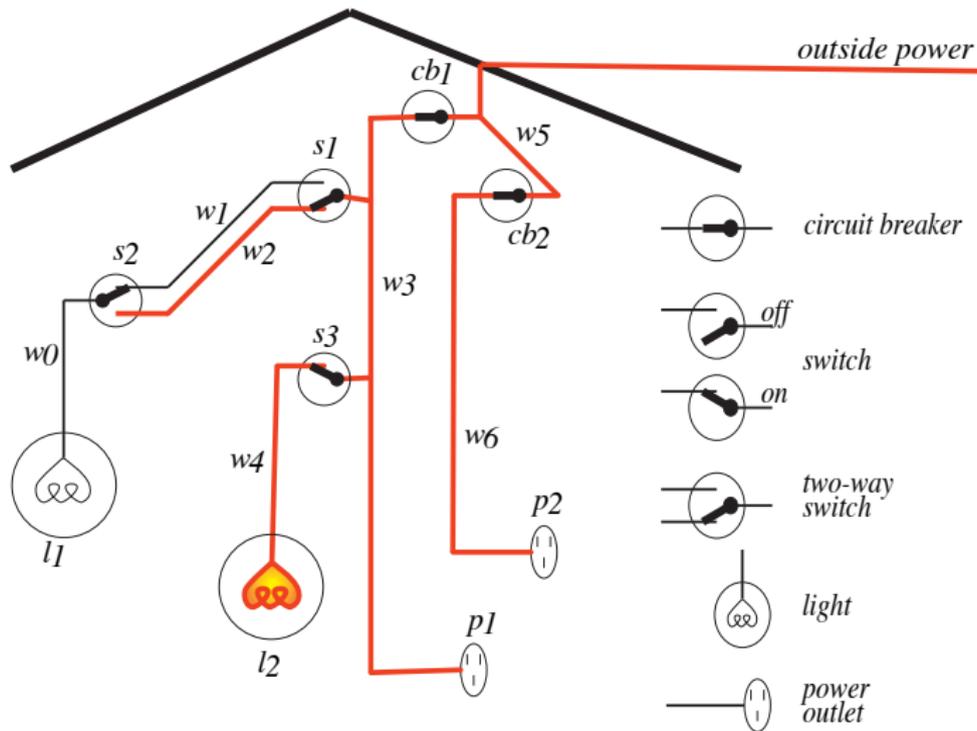
Autonomous Delivery Robot

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 in a Smart Home

outside power

cb1

w5

s1

w1

s2

w2

cb2

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.