

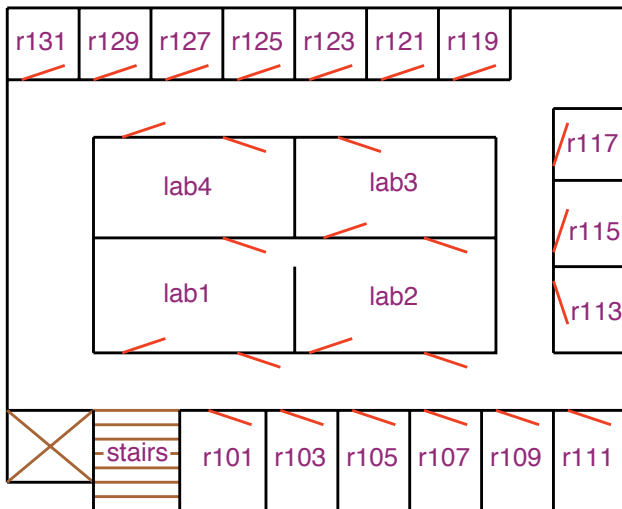
Four Example Application Domains: 1,2

- **Autonomous delivery robot** roams around a building delivering packages and coffee to people in the building. This delivery agent should be able to find paths, allocate resources, receive requests from people, make decisions about priorities, and deliver packages without injuring people or itself.
- **Diagnostic assistant** helps a human troubleshoot problems and suggests repairs or treatments to rectify the problems. One example is an electrician's assistant that suggests what may be wrong in a house, such as a fuse blown, a light switch broken, or a light burned out, given some symptoms of electrical problems. Another example is medical diagnosis.

Four Example Application Domains: 3,4

- **Intelligent tutoring system** interacts with a student, presenting information about some domain and giving tests of the student's knowledge or performance. The system tailors the information presented to each student based on his or her knowledge, learning preferences, and misunderstandings. The system must understand both the subject matter and how students learn.
- **Trading agent** knows what a person wants and can buy goods and services on her behalf. It should know her requirements and preferences and how to trade off competing objectives. E.g., in hotel booking, if the most suitable hotel cannot accommodate the family for all of the days, it should determine whether they would prefer to stay in the better hotel for part of the stay or if they prefer not to move hotels. It may even be able to shop around for specials or to wait until good deals come up.

Domain for Delivery Robot



Autonomous Delivery Robot

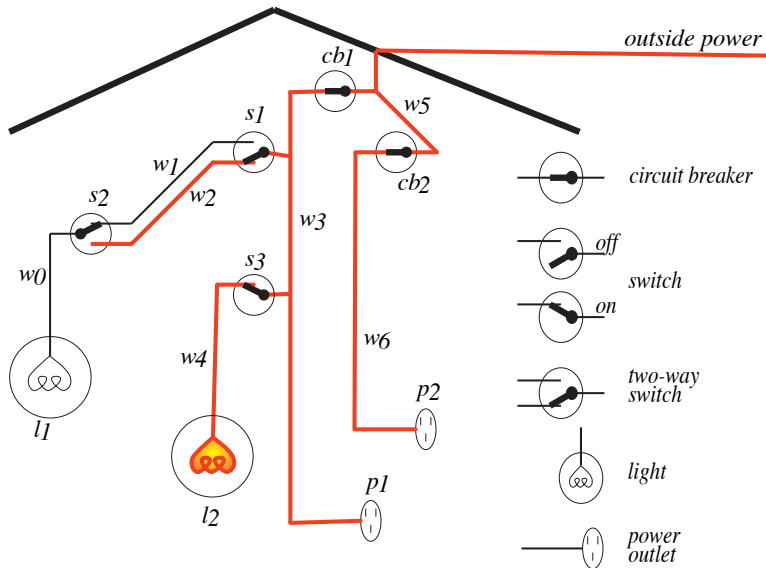
Example inputs:

- **Abilities:** movement, speech, pickup and place objects.
- **Prior knowledge:** its capabilities, objects it may encounter, maps, what requests mean.
- **Past experience:** which actions are useful and when, what objects are there, how its actions affect its position.
- **Goals:** in terms of what it should deliver and when, as well as preferences that specify trade-offs, such as when it must forgo one goal to pursue another, or the trade-off 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



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.