4.1 Capabilities of autonomous systems

The four sliders of an autonomous system are the planning slider, the action slider, the model slider and the knowledge slider.

The first one, the planning slider, slides from executed to generated plans and represents how the system decides what its goals are. When designing an autonomous system, the level of preplanned or on-the-fly plans used must be chosen as the preplanned ones must be hardcoded into the system and the generator for on-the-fly planning must be trained.

The second slider, the action slider, represents a choice between deterministic actions and non-deterministic actions. By this it means the level of specific actions taken given a set of input. This influences the complexity of the actions chosen, but also the ways the system can be tested. It could also influence the redundancy of the system’s functions if the system has more ways than one of acting.

The third slider is the model slider, and it deals with the mapping of the environment of the system. On one side, you can have an open world solution where nothing is known of the environment beforehand. Then the largest problem would be to map the closest part of the environment to react to this and to find the general direction to move in. If a closed world is used, then the overall map is known, and the problem is to figure out the parts of the map which can move.

Finally, the knowledge slider deals with how knowledge or goals are given to the system. Either the system can receive info concretely, by being told where to go and what to do, or it can be given something which should be done and figure the rest out itself.

For the Autonomous Extraction and Refueling Station, the sliders would look something like this:

Signal

Symbol

Knowledge Slider

Open World

Closed World

Model Slider

Deterministic

Non-deterministic

Action Slider

Executed

Generated

Planning Slider