16.413 Class Project

In this project, you will build an autonomous system that can handle both activity planning and path planning. As a benchmark problem, you will test system on a lunar logistics problem in which the lunar surface has to be explored, certain material has to be collected from the lunar surface, and science experiments will be conducted.

The class project is composed of three parts. In the first two parts you will read research papers and implement the algorithms similar to those described in the papers you have read. The first part involves implementing an activity planner and the second part is on implementing a path planner. In the third part of the project, you will combine your activity planner and path planner in to an integrated planning system. Each part of the project is explained in detail below followed by the schedule.

1. In the first part of the project, you will implement an activity planner based on a SAT solver. The activity planner you will build should be able to take a PDDL specification of the problem and find a solution by reducing the problem to a SAT problem and solving the SAT problem using the miniSAT solver. You will be provided with the PDDL parser and the miniSAT solver. However, you will need to construct your own reduction to the SAT problem and implement the reduction. You will test your activity planner on an simple lunar logistics planning scenario.

2. In the second part of the project, you will implement a path planner using the incremental sampling-based motion planning methods you will learn in the class. Given the initial state of your vehicle, the obstacle region, and the goal region, your motion planner should be able to generate a trajectory that drives the vehicle from its initial state to the goal region.

3. In the final part of the project, you will integrate your motion planner with your activity planner to produce a planning system to accomplish a lunar mission. This lunar mission will include a single vehicle searching for certain resources, collecting them in the base, and doing certain science experiments. Your algorithm will be benchmarked on an example mission and compared with the algorithms designed and implemented by other students.

After completing each part of the project, you will turn in your code together with a small report explaining your approach.

The schedule for the project is as follows:

First part of the project will be handed

Second part of the project will be handed

Third part of the project will be handed

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