Report of PDDL course work
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Group 19
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Introduction

Our group built a set of PDDL domain and problem files to solve the routine and operation in a spaceship to explore another planet. According to the basic requirements, there are assumptions about the staffs ,places and equipment in the ship. We will use PDDL to automatically plan a sequence of steps to meet the goal our goal.

Rooms

We assume that our ship is called “spaceship”, in this ship we are having 3 decks and 8 different areas.
Deck 1 contains Bridge, Engineering Room and Transporter Room.
Deck 2 contains Restroom and Sports Centre.
Deck 3 contains Cargo Bay, Science Lab and Sick Bay.
Initially, all the doors are closed except the door of the bridge, only the captain can open the door while he is on the bridge.

Crews

In this ship, there is 8 crews who are working 8 positions and only one robot called “C3PO”
Ashwin is the captain of this spaceship, Leo is the navigator, Ray is transporting chief, Peter is engineer, Michal is the doctor, Wancy is sports centre crew, Kary is the rest room crew and Jackie is the security. All of the crew initially stay in the bridge located on Deck 1. Before starting the journey, they need to be healthy and return to their working place.

Besides the crew, there is a robot in the spaceship called “C3PO”. It can move around the ship and carry heavy equipment. After moving heavy equipment, it will have low battery and it will return to the science lab and recharge automatically.

Planet

There are five planets, Earth, Mars, Mercury, Jupiter and Saturn. Every planet, barring Earth, is has a special material. First, Earth is the initial and final destination. Second, Mars has special ice. Third, Mercury contains plasma ore. Fourth, metal can be found in Jupiter. Finally, Saturn has a special rock.

The spaceship will be damaged when the spaceship lands on planets which are surrounded by asteroids, i.e. Mars and Jupiter.

In addition, we assume each planet has different planet status. This will affect the relationship building and colony building missions. There is only one hostile planet which is mars. Mercury, Jupiter, Saturn are non-hostile planets. Mars and Jupiter have aliens on the planets. Mars, Saturn and Earth are hospitable but Jupiter and Mercury are not.

Equipment

The equipment and materials have three different classes which are light, heavy and huge. For light equipment, crew can use the small engine car named shuttlecraft to move them. For heavy equipment, only the robot can carry them. For the huge equipment, crew can use the transporting car which has a big engine to move them.

Route and Destination

The spaceship is initially located on Earth, the first destination is Mars. When the mission is completed on the target planet, captain can change the destination to another one. We assume the order of the route is Mars, Saturn, Mercury, Jupiter and finally return to Earth.

Crews injury

All of the crew should be healthy to work but during the operation, captain and navigator are susceptible to injuries. If the spaceship lands on an asteroid planet, the ship will be damaged and both of the captain and the navigator will get injured. Also, when trying to build a relationship with a hostile planet, security and the captain will get injured.

Building relationship

Building relationship with other planets is one of the mission goals. This mission's success is determined if the planet is hostile and if there are aliens on the planet. When the planet contains no aliens, no relationships will be built. If the aliens are hostile, there will be a bad relationship. Good relationships can be built only when the aliens in the planet are friendly (which means non-hostile). This mission's aim is to try build relationships with planets. Therefore, the result of the relationships with each planet can be good, bad or no relation.

Goal

The goal of the operation is to:

1. Put all the special equipment and material to the correct locations within spaceship and ensure all planets have sufficient medical supplies.
2. Try to build relationships with the planets.
3. Ensure people in the ship are working right locations and they are healthy.
4. After this, the ship can return to earth.

Extra Feature (Building colony)

There is an extra mission which is trying to build colony in the planet. The mission can be a failure or success, depending on the status of the planets: Colonies can be built on the planet which have no alien and is hospitable. This mission is quite similar to the building relationship mission, as they can be either a failure or success, it depends on the conditions on the planet.

Limitation

This planning system is working well and able to meet our goals, as well as the extra goal which we added. However, there are some scenarios which the planner cannot solves such as:

1. We set all of the crews are staying on the bridge located on the dock 1 initially , before they go to their location for working. However, if the lift is set as "fail" initially, there will be no solution to fix because there will be no way to send peter the engineer to the engineering room.

2. If the doctor is injured initially, the whole mission will fail. Since there is only one doctor in the ship and no one can heal him. Therefore, no doctor in the sickbay to heal other injured crew members over the course of the mission.

3. If goa 1(see the goal section above) fails, one the target planets. For example, the target equipment or materials is missing on the planet or there is a failure in transporting the equipment to the spaceship. Then the whole mission will be fail and no plan will be found because the spaceship will not return to earth without collecting all the required materials.