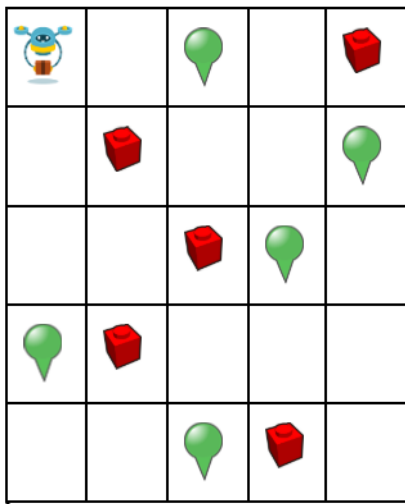


## Assignment 2

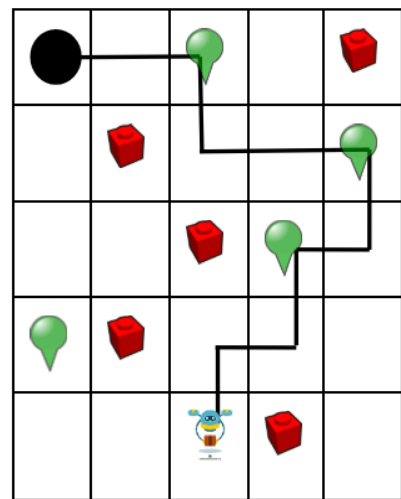
### Problem 1 - Delivery Drone Routing with Uninformed Search: (3.5 Marks)

A drone has to deliver packages in a city grid ( $M \times N$ ). The drone (**represented by D**) **starts at the top-left corner** and must visit various delivery points (**represented by P**) to drop off packages. There are obstacles (**represented by O**), and the drone must avoid them. **The goal is to visit as many delivery points as possible while avoiding obstacles.**

You are required to **write a Prolog program** that finds the path for the drone to visit the **most delivery points** and avoid obstacles **using formal uninformed search (DFS or BFS)**.



Initial State



Final State

**Bonus: (0.5 Marks)**

Draw the initial grid, the solution steps, and the final state when run the program.

```
?- solve().
```

Drone Route:

```
D - P - O
- O - - P
- - O P -
P O - - -
- - P O -
```

Steps:

```
* D P - O
- O - - P
- - O P -
P O - - -
- - P O -
```

```
* * D - O
- O - - P
- - O P -
P O - - -
- - P O -
```

```
* * * - O
- O D - P
- - O P -
P O - - -
- - P O -
```

```
* * * - O
- O * D P
- - O P -
P O - - -
- - P O -
```

```
* * * - O
- O * * D
- - O P -
P O - - -
- - P O -
```

```
* * * - O
- O * * *
- - O P D
P O - - -
- - P O -
```

```
* * * - O
- O * * *
- - O D *
P O - - -
- - P O -
```

```
* * * - O
- O * * *
- - O * *
P O - D -
- - P O -
```

```
* * * - O
- O * * *
- - O * *
P O D * -
- - P O -
```

Final:

```
* * * - O
- O * * *
- - O * *
P O * * -
- - D O -
```

## Problem 2 - Delivery Drone Routing with Informed Search: (3.5 Marks)

A drone Still needs to deliver packages in a city grid. The drone **starts at the top-left corner** and must visit **all delivery points while minimizing the total cost**. The goal is **to complete all deliveries in the shortest possible path using an informed search algorithm (A\*)**.

### Bonus : (1 Mark)

The drone can only fly a limited distance before its battery runs out. It starts with **X energy units (e.g. 6)**, and each move costs 1 unit. The value of X should be taken as input from the user. If the drone runs out of energy, it can't move. Add **one recharge station (represented by R)** to the grid, where the drone can refill its battery to full.

You should **modify your A\* algorithm to include energy constraints and recharging behavior**.

### Important Notes:

#### Please read these notes carefully to avoid losing grades:

The number of students in a team is 3-4 students from the same lab group or with the same TA.

- Please make sure that the load is almost equally distributed between team members.
- Please submit one .pl file containing your solution. The file name must follow this Structure:
  - For General Students Gen\_TA\_ID1\_ID2\_ID3\_ID4 \_GROUP.pl
  - For Special Students SP\_TA\_ID1\_ID2\_ID3\_ID4 \_GROUP.pl
  - Note that: any violation in the assignment submission will cost you 0.5 mark of the assignment grade (like submitting more than one file, not following the naming convention, using different file extension)
- **Cheaters will be given a NEGATIVE grade and no excuses will be accepted.**

### Grading Criteria:

Problem 1 (Uninformed search)	
1	Design of Inputs and State Representation
1	Player Engine (search)
1	Moves
0.5	Output
0.5	<b>Bonus Task</b>

Problem 2 (Informed search)	
0.5	State Representation and Moves
1	Player Engine (search)
1	Heuristic Function
1	Output
1	<b>Bonus Task</b>