Artificial Intelligence

Project 1
Phase 1

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WorkLoad

Mohamed Ismail:

1. Problem Formulation and Modeling

Eslam El Sharkawy:

1. Informed Search Algorithms
    a. A*
    b. GFS
    c. Hill Climbing
    d. Local Beam Search
    e. Simulated Annealing

Mohamed Hazem:

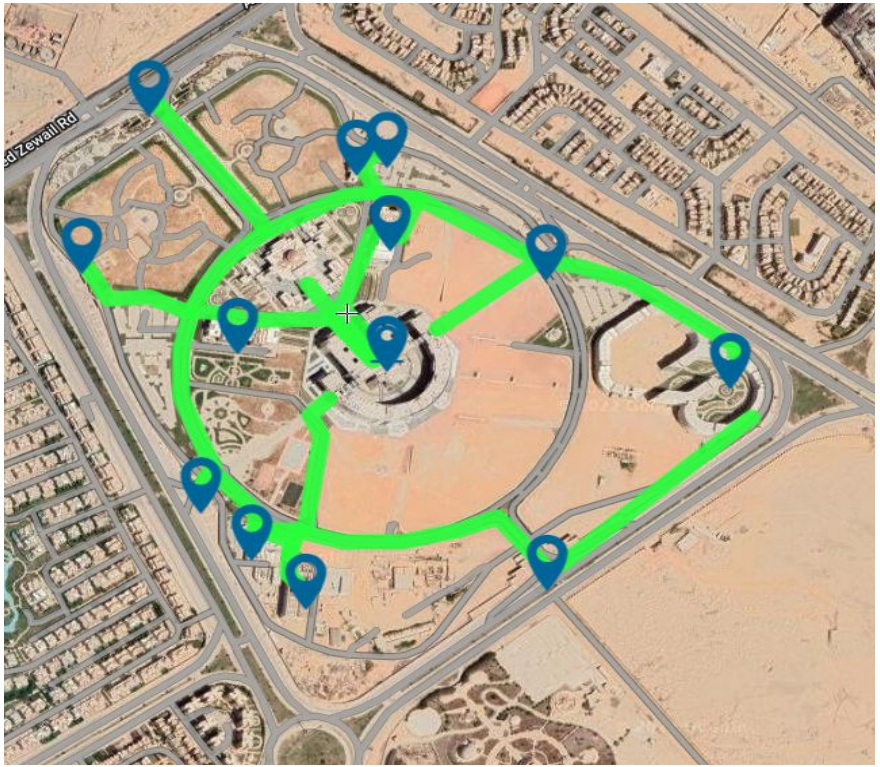
1. Uninformed Search Algorithms
    a. BFS
    b. DFS
    c. IDS
    d. UCS

Requirements

- Problem formulation
  - Initial State
  - Goal State
  - State Space (main buildings, labs, research centres, operation departments, etc)
  - Path Cost
- Modeling Assumptions (bumps to slow down cars, pedestrian crossings, waiting areas, sun shields)
- Set of Actions
- Inputs & Outputs
- Methods (Successor Function)
  - Uninformed Search
  - Informed Search (heuristics)

Zewail City Map

State Space Representation



Zewail city has 6 gates and 8 buildings

One Stop Shop *Nano building*

Helmy building *service building*

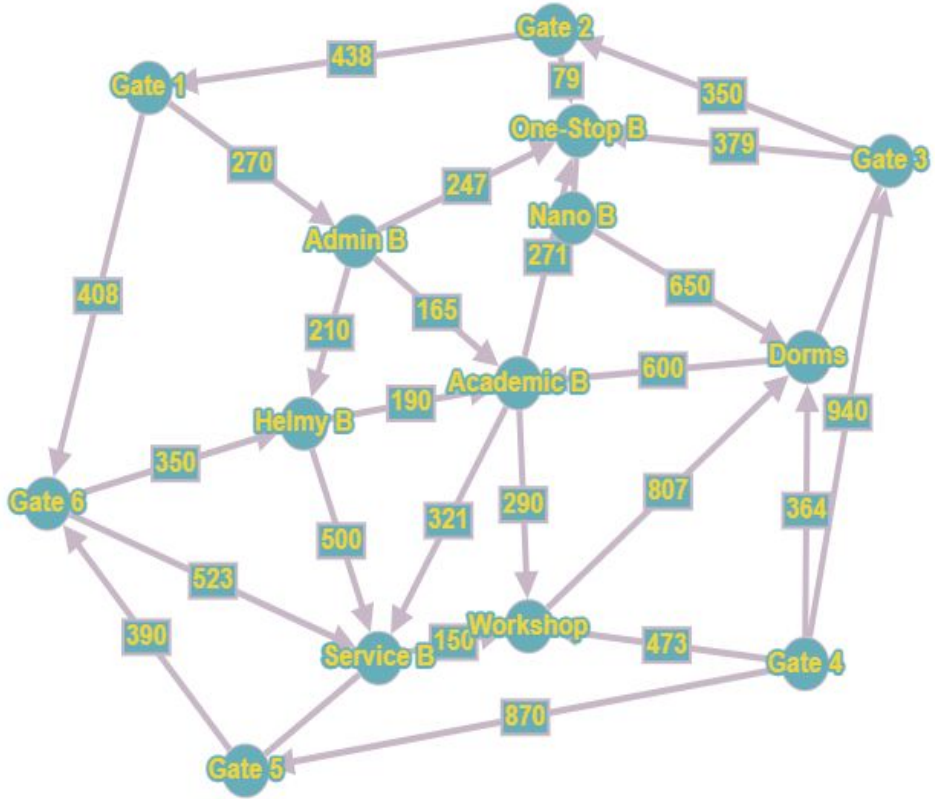
Workshops *Dorms*

Administrative building

The academic building (with different gates)

The aim is to start at any place in the city and reach another place, so the initial and goal states will be inputs from the user

Actions and Successors



On each place we have some available places to reach and that represents the actions and successors.

We can reach any place by different paths with different path costs. E.g,

The main gate → the administrative building= 270 m

The main gate → One Stop Shop = 470 m

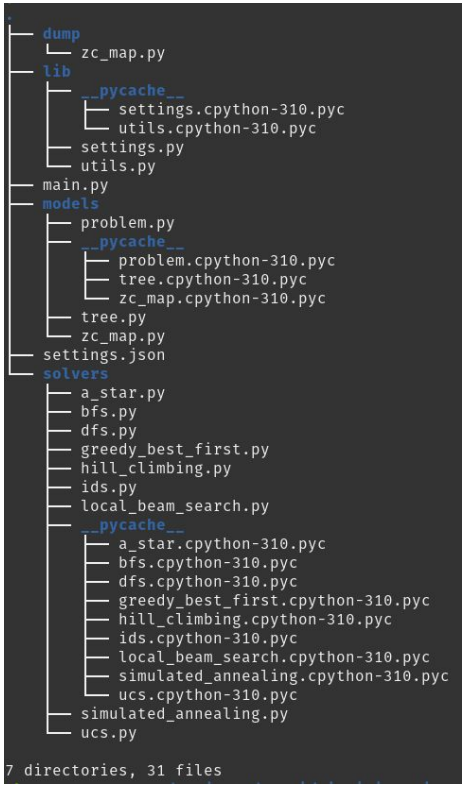
The to administrative building → Helmy = 210 m

Problem Formulation

```
_ZC_ROAD_MAP = '''
##############################
############A#################
###====$$==========$$======###
###=########==########===#####
###==########==########=#######
###=########$$########=#######
#F==########==#####-----H---B##
##==########==#####I---------##
##==########==#####----------##
##==###-====xx======---#####==##
'''
```

```
step_cost_map = {
            '=': 1,  # cars road
            '-': 2,  # passengers road
            'x': 3,  # crossing
            '$': 4,  # car slow down
        }
```

Project Structure



Showcasing Results

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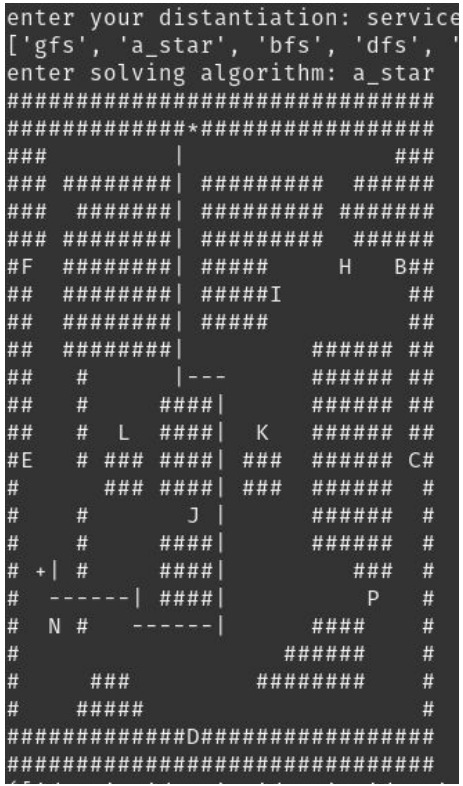
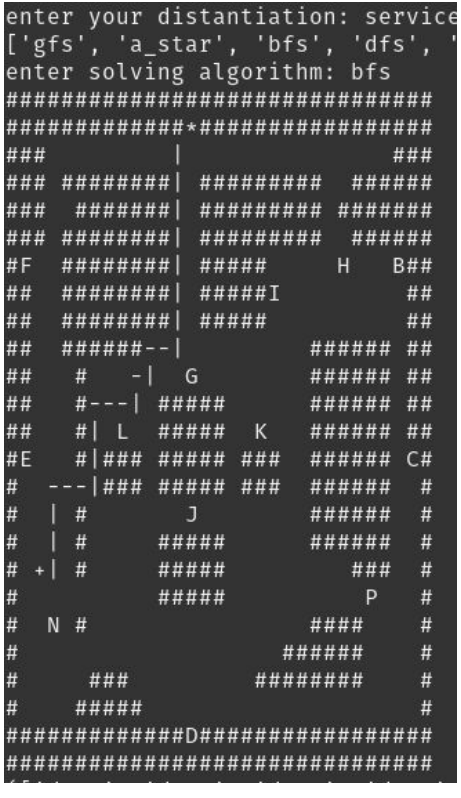
```
enter your current location: gate_1
enter your distantiation: service_building
['gfs', 'a_star', 'bfs', 'dfs', 'ids', 'ucs', 'sim', 'hill', 'local']
enter solving algorithm:
```

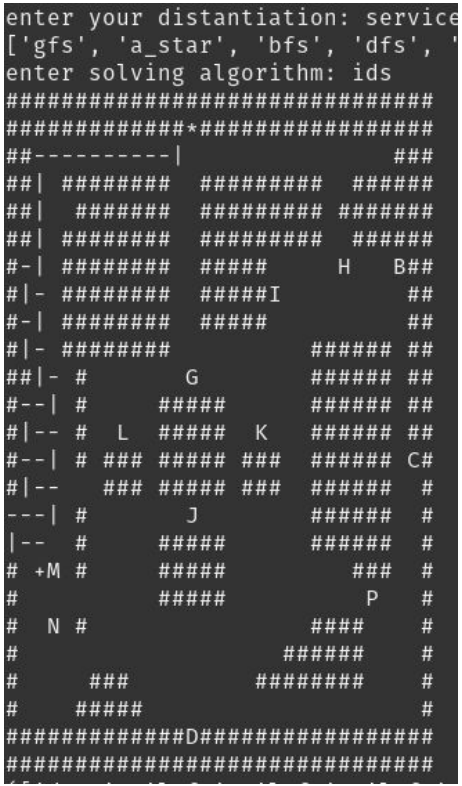
Showcasing Results



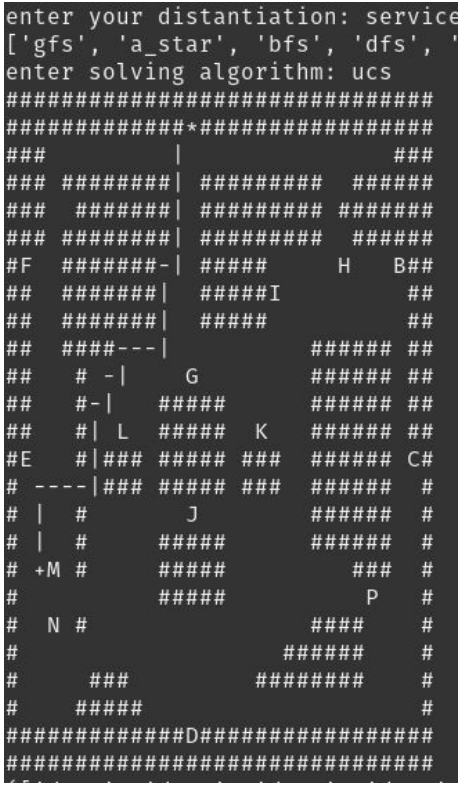
Uninformed Algorithms Showcase (BFS)



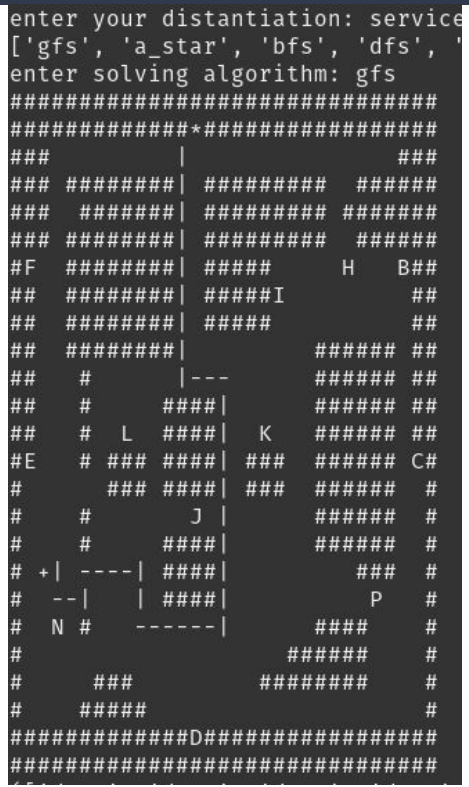
Uninformed Algorithms Showcase (IDS)



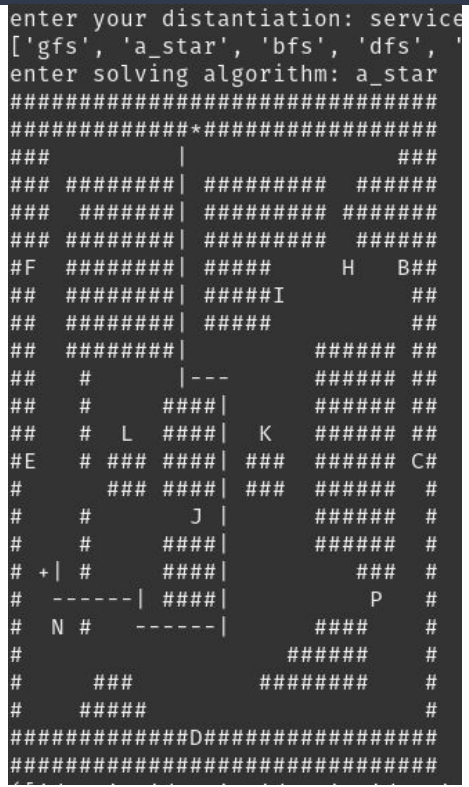
Uninformed Algorithms Showcase (UCS)



Informed Algorithms Showcase (GFS)

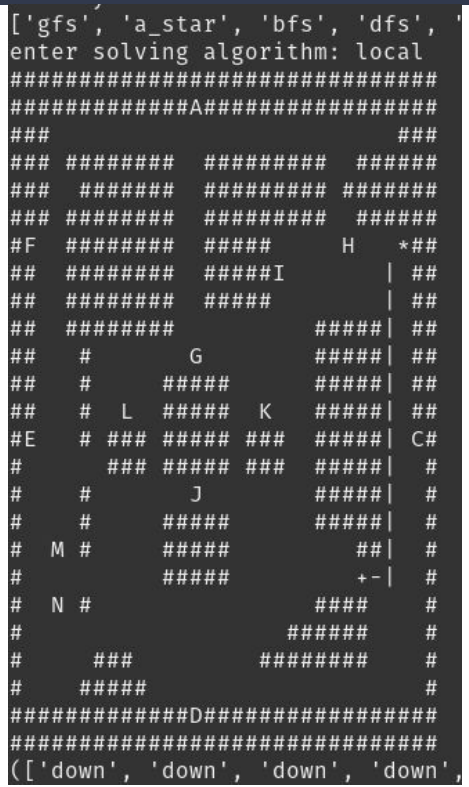


Informed Algorithms Showcase (A*)



Informed Algorithms Showcase (Hill Climbing)

Informed Algorithms Showcase (Local Beam)



Informed Algorithms Showcase (Simulated Annealing)