AIAD - First Assignment

Theme

- **Control** and **management** of **elevators** in a building.

Description

The **Lift System** in a big skyscraper is a difficult task to handle. There are too many requests being made in a little amount of time. As such, optimizing elevator allocation for each call is essential to ensure everyone gets to their destination in a reasonable amount of time.

The **objective** of this project is to develop a **Multi-Agent System** for the management of a set of elevators in a building.

Modelling this system as a Multi-Agent System allows us to define **4** distinct agents:

- **Lift Agent** - Building's lifts.
- **Building Agent** - Skyscraper. Used to initiate environment.
- **Floor Panel Agent** - Floor's lift request button.
- **Systems Analyst Agent** - Lift's trips statistical analyzer.

The group opted for this theme since it is a very recurrent situation in our **daily lives** and we feel it would be something **useful** and **interesting** to develop and at the same time **challenging** in the scope of the course.

Interactions, Strategies and Protocols

From the moment a request is issued by a person through the **Floor Panel Agent**, all **Lift Agents** are messaged and each of them individually estimates the time they would require to pick up the person on the referenced floor. Each lift must take into account its internal state, that is, its working queue. For this effect:

- If a lift has reached its maximum capacity it must complete at least one of the tasks on the queue before attending to a new request
- If the call on floor **X** indicates the person would like to go to a floor **greater than X** then all tasks on the queue for floors **lower than X** should be completed before attending the new request.
- If there are no active requests, attending the number of lifts and floors in the building, they must be distributed evenly through the building to answer future calls quickly.

After these calculations, a lift would message all other lifts with the estimated time. Upon receiving a lower estimation from another lift the request is dropped, leaving only the best fit for the job. For this, we will use a distributed consensus algorithm. Once a decision is made, the elected lift should attend the request.

When receiving someone, the elevator saves the desired floor to its priority queue and continues its job.

After completing a task, the **Lift Agent** sends its trip information to the **Systems Analyst Agent**.

The interaction protocol that will be used during communication between agents should be the **FIPA Contract Network Protocol**.

Independent variables

- Lift characteristics
  - Maximum weight
  - Speed
- Number of floors
- Number of lifts

Dependent variables

- Waiting time
- Travelling time
- Occupation

Members

4MIEIC01 ***Group 13***

- António Dantas up201703878@fe.up.pt
- João Macedo up201704464@fe.up.pt
- Vítor Gonçalves up201703917@fe.up.pt