ID2209 – Distributed Artificial Intelligence and Intelligent Agents

Assignment 3 – Agents & stuff

Group 13

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Overview: Basic Festival with Stores

In the continuation of our simulation development in GAMA, we focused on Coordination and Utility.

The aim of the first task was about understanding how agents communicate and cooperate to achieve their goal using the N Queens Problem.

How to run

To run the simulation model developed in this assignment, please follow these steps:

- Open GAMA Platform version 1.7.
- Import the provided project files into GAMA by selecting File > Import, navigating to the 'General' folder, and choosing 'Existing Projects into Workspace'. Select the archive file and complete the import process.
- Locate the Project3.gaml model within the imported project.
- Select the main experiment, which serves as the entry point for running the simulation.
- Press the 'Play' button or 'Start' to initiate the simulation run.

Species

Agent Queen

The Queen agent, distinguished by its black circle representation, is the main figure in the first task's simulation. It moves in the grid with a certain logic that will be explained below.

Parameter Tweaking:

Adjusting this parameter will influence the simulation:

- n_queens: is the number of queens in the simulation, it will affect how crowded the grid cells are

Agent Stage

The agent Stage represents different stages at the festival, each offering unique attributes such as light show intensity, speaker quality, band performance, crowd size, language of songs, and music type. Each stage periodically updates its attributes, simulating different acts or performances.

It communicates these updates to the Guest agents through FIPA messages.

Agent Guest

Agent Guest represents festival attendees who choose which stage to visit based on their personal preferences for various attributes. The Guest calculates the utility for each stage based on its current attributes and the Guest's preferences. The utility function considers factors such as light show, speaker quality, band performance, etc. Each agent chooses the stage with the highest calculated utility and moves towards it.

It interacts with Stage agents through FIPA messages to receive information about current stage attributes.

Implementation

Task 1

- We started developing Agent *Queen* defining its aspect (colour and shape).
- Then we populated the grid with the available queens, depending on the n_queens

- The next logical step was to calculate the Occupancy Grid, storing the free cells in a list of points.
- Those points will be used by the queens to move in one of them. If they cannot move from one position to the other, they ask their predecessor to reposition her.
- The simulation will stop when all the queens are correctly positioned.

Task 2

- Stage Attributes Update is implemented through a reflex in the Stage agent that periodically changes the stage's attributes and informs Guest agents.
- Guests request updated stage attributes and receive this information through FIPA communication.
- A utility function is implemented to evaluate each stage based on the current attributes and Guest's preferences. The Guest agent selects the stage with the highest utility and updates its target location accordingly.
- Guest agents move towards their selected stage's location.

Results

Task 1

The results of our work can be seen by running the program on GAMA.

As you can see, messages have been printed to understand the different stages of the simulation.

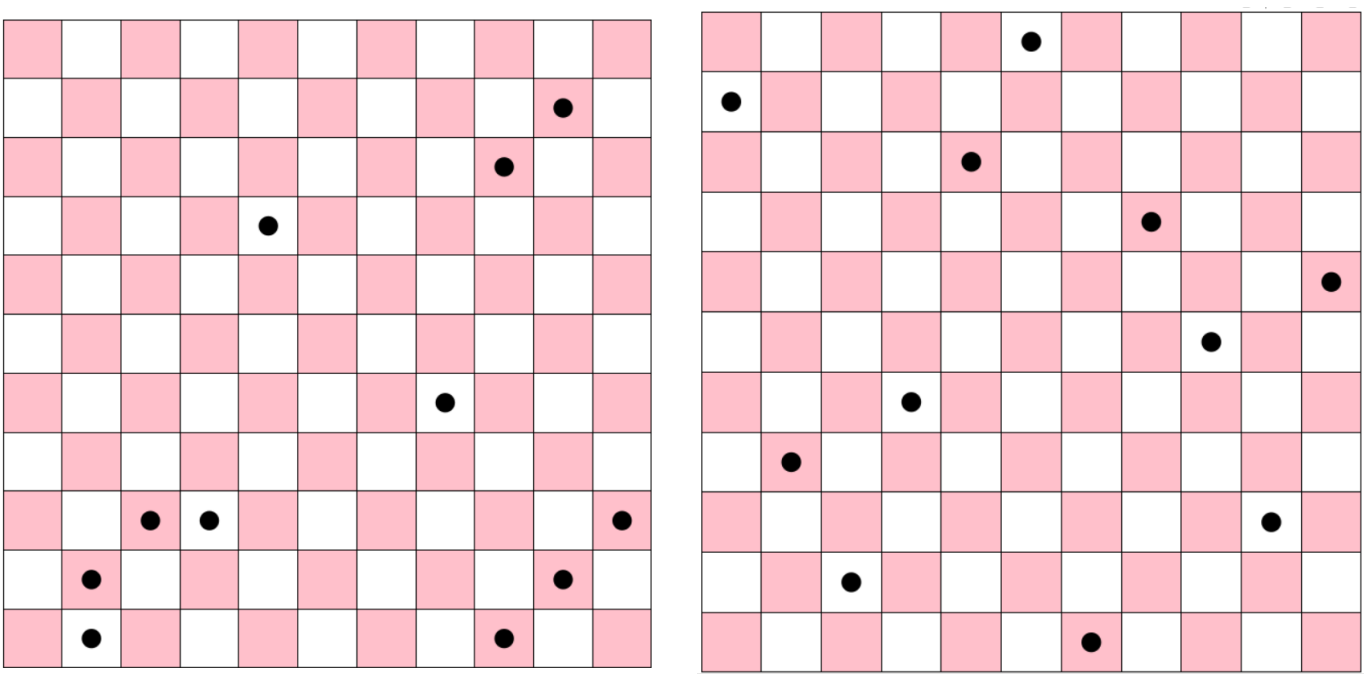

Figure 1: The image on the left was taken when the simulation was running, and when the queens were placed without following all the rules.

The image on the right was taken at the end of the simulation, when all the queens, communicating, have placed in a good position, following the rules.

```
Queen7
Free Points: [{8.0,4.0,0.0}]
New Position: 8, 4
The queen cannot move from the position: 8, 9
Currently I am at the position : 8, 9 But I am trying to move to the position: 5, 6
The new location is: 7, 8
```

Figure 2: The image shows the stages of the communication between queens

Task 2

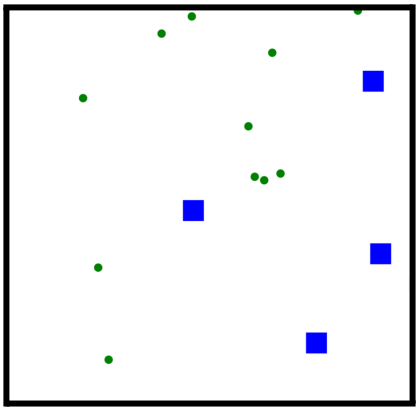

Figure 1: the blue squares are the stages, and Guests are green

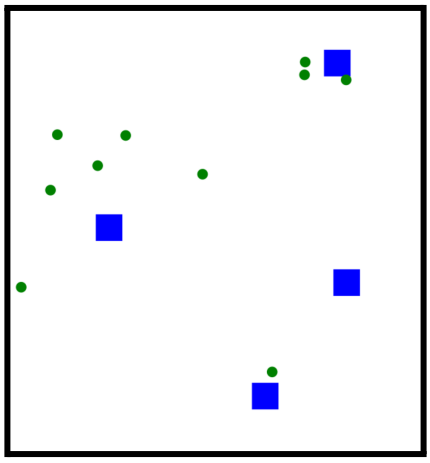

Figure 2: Some guests have chosen a stage and gathered nearby to see the act

Challenge

- Added a new attribute “CrowdMass” and set one Guest as leader in the init
- Add a preference attribute for crowd mass to the Guest species, and modified utility function
- Leader starts a conversation to collect preferences, and broadcasts the choices to every other guest to maximise global utility

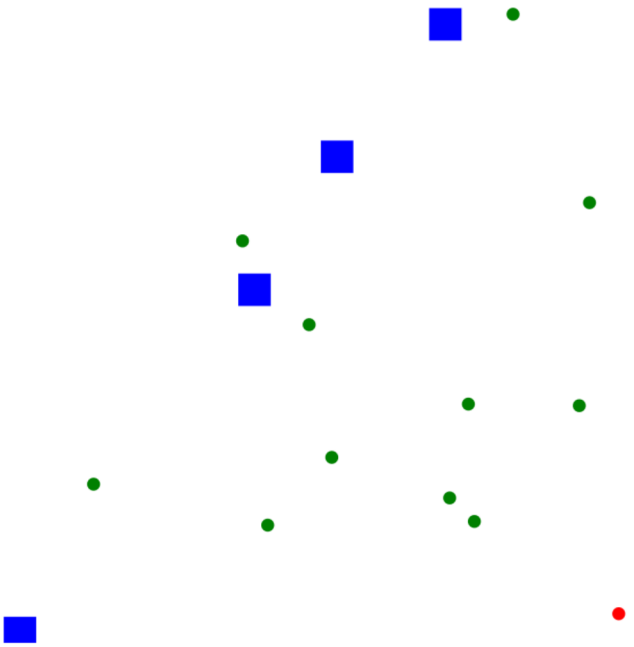

Figure: the leader is represented in red colour