

ID2209 – Distributed Artificial Intelligence and Intelligent Agents

Assignment 1: GAMA and agents

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1 Introduction

Assignment Description

This assignment is about the interaction of agents in GAMA [1] based on Festival theme. There are certain guests in the festival who enjoys dancing, and exploring food or drinks shops when hungry or thirsty. There is an information centre to guide festival guests to various food and drink shops.

How to run?

Run GAMA Platform - v1.8.0 (<http://gama-platform.org>) and import project Assignment1. Press main to run the simulation. Note that the number of festival guests and shops, and the time step can be changed by changing the global parameters. There are four models in the projects which can be simulated. These are:

1. Basic model
2. Challenge 1
3. Challenge 2
4. Creativity

2 Species

2.1 Festival Guest

These are the agents as a guest in the festival and their quantity is determined by the user (default is 10). They have two main attributes: hunger and thirst. Their main function is to dance hard in the festival and when they get either hungry or thirsty, they replenish themselves by going to other agents being the food and drink shops and go back to dancing.

2.2 Information Centre

The agent of this species has information about the location of food and drinks shops in the festival. It is responsible for sharing the information about food and drinks shops with a festival guest when asked. Note that the location of this agent is known prior to all festival guests.

2.3 Food Shops

The agent of this species are responsible for replenishing the hunger of festival agents. The location of these agents are only known to Information Centre and not to festival guests.

2.4 Drinks Shops

The agent of this species is responsible for replenishing the hunger of festival agents. The location of these agents is only known to the information centre and not to festival guests.

3 Implementation

Firstly, four different kinds of agents as stated earlier were created making sure each agent looks different and more close to real life. The locations of food and drinks shop agents were made available to the Information Centre agent and the location of the Information Centre was made available to festival guests. The next logical step was to set the behaviour of the festival guest which was defined as to dance/wander

until hungry or thirsty. If they are hungry or thirsty, they move to the information centre to know the locations of food or drinks shops to replenish their hunger or thirst. When their stomach is full again, they go back to dancing at some random place on the map. All the interaction between agents is carried using the ask action in GAMA and reflex actions are used to monitor the hunger and thirst of festival guests.

4 Results

As it can be observed from figure 1, all four kinds of agents are in play and behaving as expected. Few guests are busy dancing while those hungry (orange) and thirsty (green) are rushing to the information centre to know if there are any food and drinks shops in the festival. After getting the location of respective shops, they refill themselves and head back to dancing!

Note that, they do not remember the locations of shops they visited and ask Information Centre each time they are hungry or thirsty.

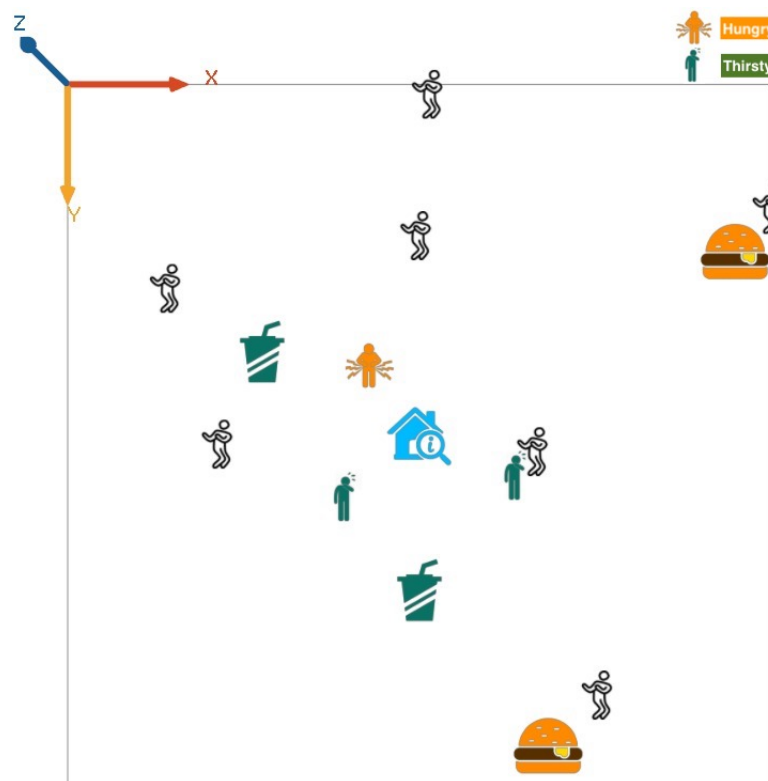


Figure 1: Basic model festival outlook [2]. The festival mode is on, guest dancing, wandering, and filling their bellies!

5 Challenges

5.1 Challenge 1

The task for challenge 1 was to give memory to festival agents to help them remember the locations of shops taken from the information centre and the capability to interact with nearby fellow agents to know the locations of shops if they already know. The implementation was pretty simple as a list of points variable was used to store the locations inside the festival agents. For interaction with fellow agents, if the agents within certain radius knew the location already, they acted as the source of information instead of going all the way to the information centre.

As one might guess the average distance travelled by a festival guest agent is least in agents with memory and ability to interact with fellow agents.

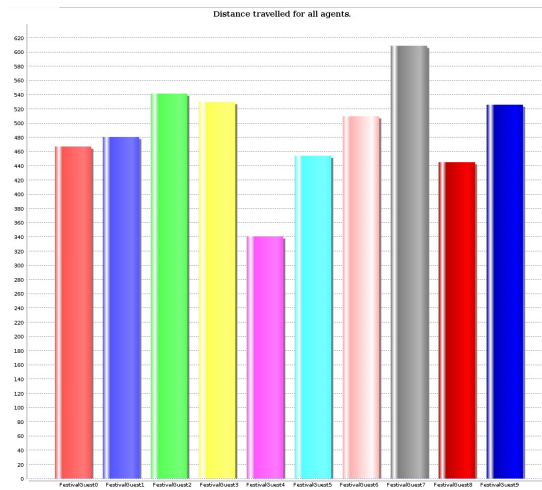


Figure 2: The chart shows the distance covered by each festival guest agent for 300000 cycles (step = 1 sec) during the festival. The guests didn't have any memory and asked Information Centre each time they planned to visit food or drinks shops. The total sum of distance travelled by all agents amounts to 4945.98 units.

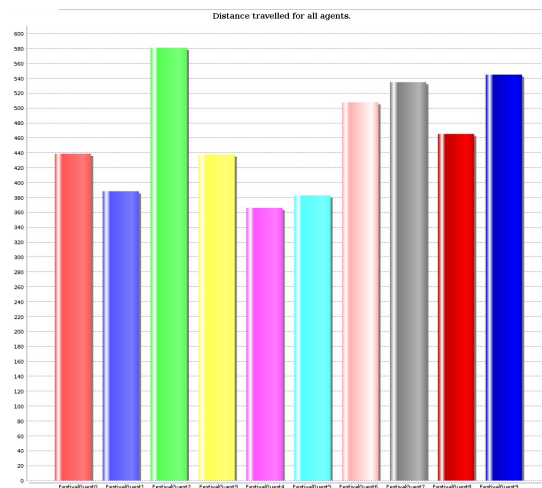


Figure 3: This chart shows the distance covered by each festival guest equipped with a small memory during the festival. The simulation was run for a total of 300000 cycles (step = 1 sec). The total sum of distance travelled by all agents amounts to 4661.21 units.

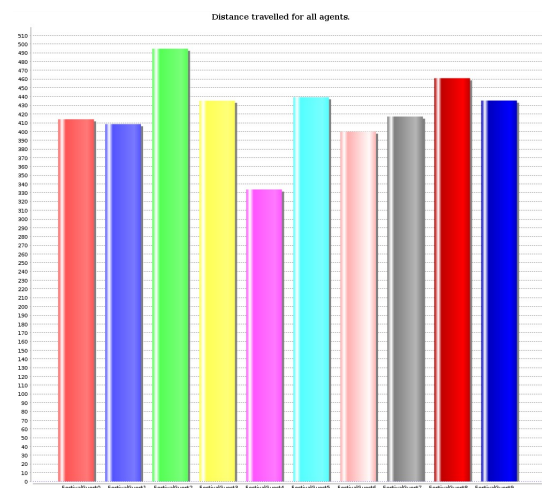
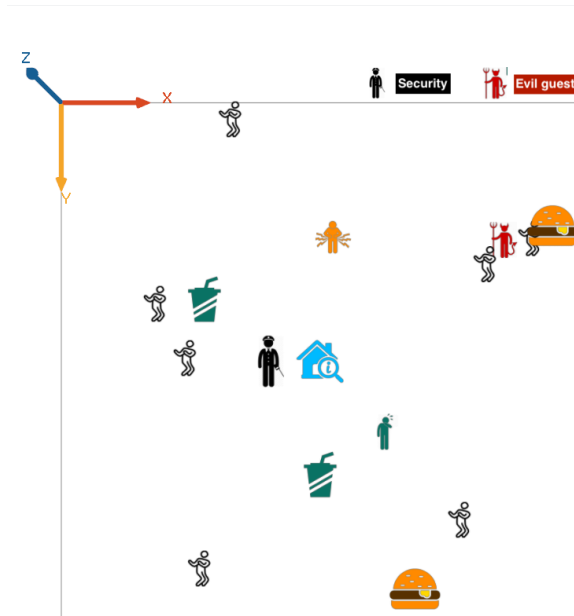


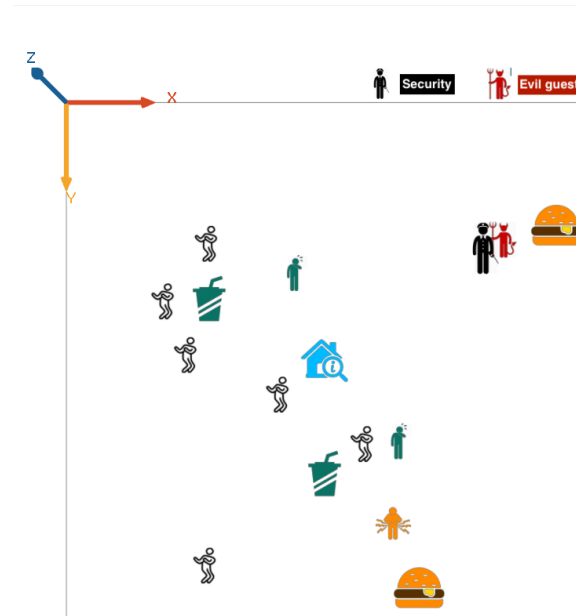
Figure 4: Finally, the guest has memory and can also interact with fellow guest to know the shop's location. The total sum of distance travelled by all agents amounts to 4290.44 units.

5.2 Challenge 2

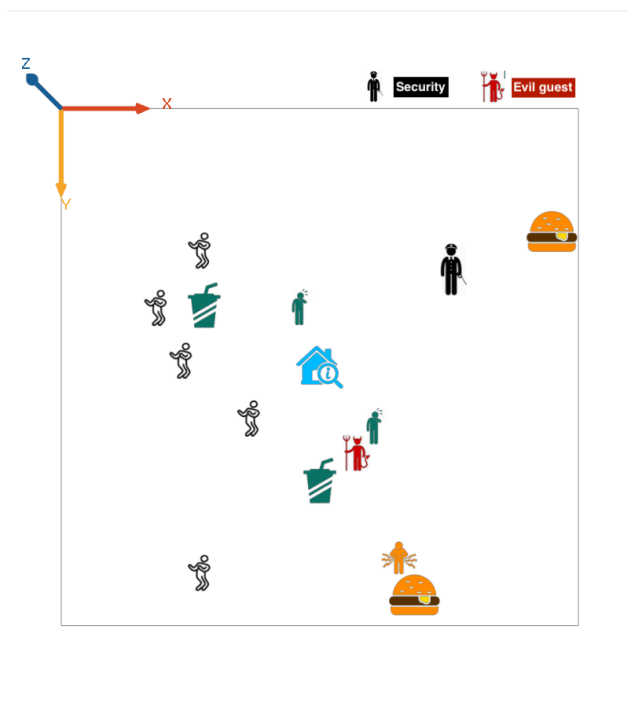
The task for challenge 2 was to make festival agents bad behave after a certain point of time and then get removed by the security guard (new agent) after a complaint filed by festival agents to the information centre. For the implementation of this task, a new agent species, a security guard was created. An extra attribute bad behaving probability was assigned to each festival guest. Whenever the probability of bad behaving was assessed true by nearby fellow guests (within a certain radius), they would report the bad agents to the information centre which would then ask the security guard to remove the bad agents from the festival or make them die.



(a) Bad agent reported by fellow guest.



(b) Bad agent approached by the security guard.



(c) Reported bad agent removed by the security guard while a new bad agent pops up at the bottom.

Figure 5: Process of reporting and removing of bad agents by the security guard from the festival.

6 Discussion/Conclusion

The basic assignment was easy to implement and the learning curve for GAMA platform was smooth. Tracking the total distance travelled of all festival guests for challenge 1 was tricky. Initially, summing the euclidean distances of points where the agents have been was thought to implement but it was giving wrong results. Therefore, another simple tricky approach of using speed and time was used to get the distance. Since the time step and speed of movement of agents were known, multiplying them gave the desired results. Also, creating the histogram chart the way we wanted in GAMA was a bit challenging but finally we learned and managed it.

We don't understand why a different set of language was needed and why python packages couldn't do it. Putting so many reflexes is sometimes a source of confusion, conflict and make the system slow. Overall, a good funny assignment and can't wait to show them to our friends and family!

References

- [1] GAMA. GAMA-Platform. (2019, Nov 13). [Online]. Available: <https://gama-platform.github.io>
- [2] For icons,. (2019, Nov 13). [Online]. Available: <https://thenounproject.com>