

ID2209 – Distributed Artificial Intelligence and Intelligent Agents

Final Project

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1 Introduction

Assignment Description

This project is about having interaction between five different types of agents in GAMA [1]. Each type of agent has a certain guideline to follow while interacting with the fellow agents and the guidelines are also affected by their traits. The agent interaction also depends on the location they meet in the festival such as food or drink or stage shows. For short-distance communication, *ask* communication is used whereas for long-distance communication *FIPA net-protocol* is used.

How to run?

Run GAMA Platform - v1.8.0 (<http://gama-platform.org>) and import project Assignment3. Press main to run the simulation. Note that the number of agents (FestivalGuest, EvilGuest and Journalist), and the time step can be changed by changing the global parameters. There are two models in the projects which can be simulated. These are:

1. base.gaml
2. creativity.gaml

2 Method

The species are the fundamental part of GAMA whose behaviour is manipulated to achieve the desired goal.

2.1 Basic model

The basic model demands the interaction of 5 different types of agents in the festival governed by certain rules. Each type of agents has 3 personal traits and other preference attributes that affect their behaviour while interacting with fellow agents. Apart from the guests, there are other agents which act as meeting locations and festival attractions.

2.1.1 FestivalGuest

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. They also visit stage shows of their choice to enjoy the festival.

There are two types of FestivalGuest - 1) One who likes to party hard 2) Other one likes to remain chill. They both have the following personal traits which affect their behaviour and interaction in the festival.

1. Generosity
2. Friendliness
3. Boredom
4. Want to be interviewed



Figure 1: Festival guest icon

2.1.2 EvilGuest

There are some guests at the festival that are trying to sell drugs or loot people. When their behaviour gets extreme they are reported by FestivalGuest and are thrown out of the festival by the security guard. They also have some wallet money which they can use to bribe the security guard or fool the guard in certain cases when the guard is not strict. The agent EvilGuest has the following personal traits:

1. Badness
2. Generosity
3. Boredom



Figure 2: Evil guest icon

2.1.3 Journalist

The Journalist is a type of agent who works for certain newspaper and magazines and is assigned to interview the guests present at the festival. The journalist has the following personal traits:

1. Curiosity
2. Asking Controversial questions
3. Party or chill



Figure 3: Journalist icon

2.1.4 SecurityGuard

This agents plays the role of a security guard in the festival i.e removing bad agents from the festival. The security guard is commanded by the information centre and removes the reported bad agents one by one. All communication done by the security guard is through FIPA. The security guard has the following personal traits:

1. Corruptness
2. Strictness
3. Violent



Figure 4: Security guard icon

2.1.5 InformationCentre

The agents 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 before all festival guests.



Figure 5: Information centre icon

2.1.6 FoodShop

The agents 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. But after visiting once, the festival guests remember the location of food shops as well as the drinks shops.



Figure 6: Food shop icon

2.1.7 DrinksShop

The agents 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.



Figure 7: Drink shop icon

2.1.8 Stage

These are the agents that conduct regular shows or events in the festival to make the festival more lively. The type of shows includes dancing, singing and band play as shown in figure 8. Each stage show has some attributes and is communicated to all guest during the start of the show through FIPA. Then each guest decides which stage to join based on their maximum utility and inform the respective stage. The stage only plays when there is at least 1 audience to attend the show.



(a) Dancing act



(b) Band play act



(c) Singing act

Figure 8: Stage acts [2]

2.1.9 ExitGate

This agent plays the role of the gate from where agents take exit from the festival. The gate is represented as shown in figure 9.

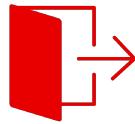


Figure 9: Exit gate icon

2.2 Festival setting

Initially, the festival begins with more than 50 guests including all different types of guest agents. There is 1 information centre, 2 food shops, 2 drinks shops and 3 stages set in the festival along with the exit gate. The party and chill type of festival guest wander about the festival. They visit food and drink shops whenever hungry. When they feel generous they offer drinks to a fellow guest who is willing to accept the drink offer. Their interaction with other guest is governed by personality traits and the agent type. The party and chill agent may get bored after some time and may seek companions, drinks to reduce boredom. Once, the boredom reaches a peak value, the guest leaves the festival through the exit gate.

The evil guest wanders just like the festival guest. When they become extremely bad they are reported by the festival guest to the information centre which in turn report the security guard to remove these agents. Now the security guard approaches to remove the evil agents. The security guard could be corrupt, strict or violent. If the guard is strict, the evil guy will try to bribe the security guard. The security guard accepts the bribe if it is corrupt else escorts the guard outside. The guard may beat the evil guy while escorting if the guard is violent. If the guard was not strict, then the evil agents could fool the guard by saying they will go leave the festival themselves and instead changes their location in the festival.

The journalist, on the other hand, goes on interviewing people as long as he is curious. It may also throw controversial questions on the guests which they may not like and ruin the interview. The journalist also gets going with the guest having the same personality traits of party or chill to the journalist and it prolongs the interview by some extent.

The stage shows show acts at regular intervals and send an invitation to all guest when the act is about to start through FIPA. All guests attend the show of their choice and get along with other guests. Each stage shows animated visuals until the end of the show, afterwards each guest goes exploring the festival again. The less friendly festival guest try to wander away from crowds while roaming and while attending shows they tend to separate them selves away from the crowd and party guests. Finally, certain personality traits of agents are monitored to see interesting graphs and draw some conclusions regarding the behaviour of agents.

2.3 Creativity model

For the creativity part, the entire basic model is simulated in a 3D environment. The guests, journalists, security guard, food and drink shops, information centre, and stages have 3D aspects as shown in figure 10. Interestingly, the festival ground is also vegetated with grass. All the 3D models of the agents are built-in SolidWorks [3]. They all show animated behaviour i.e the aspect shows a sequence of 3D shapes to mimic the real-life scenario.

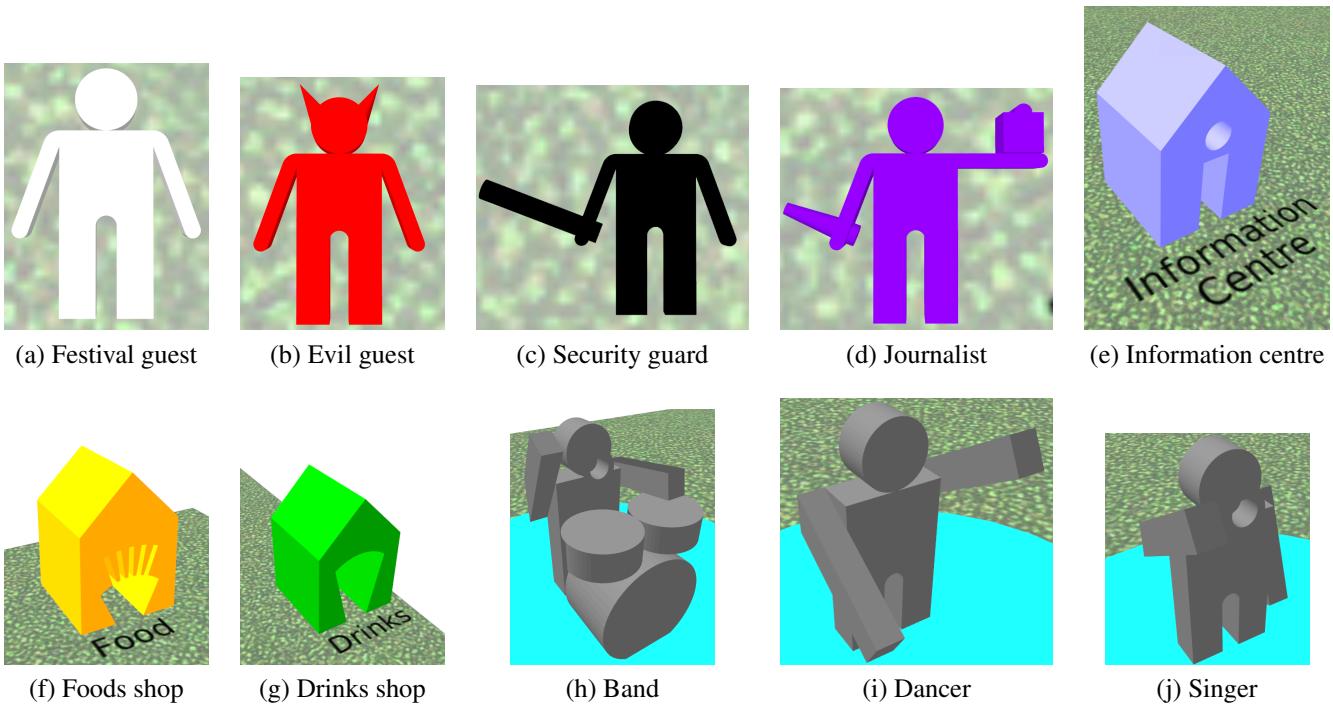


Figure 10: 3D CAD models created in SolidWorks (a 3D CAD modelling software).

3 Results

3.1 Basic model

The basic model simulation is done for 50+ guests in a 2D environment. Few scenarios encountered while simulation is shown in figure 11 where agents are dancing and enjoying stage acts. Figure 12 shows the graphs monitoring the changes in traits of agents while simulation.

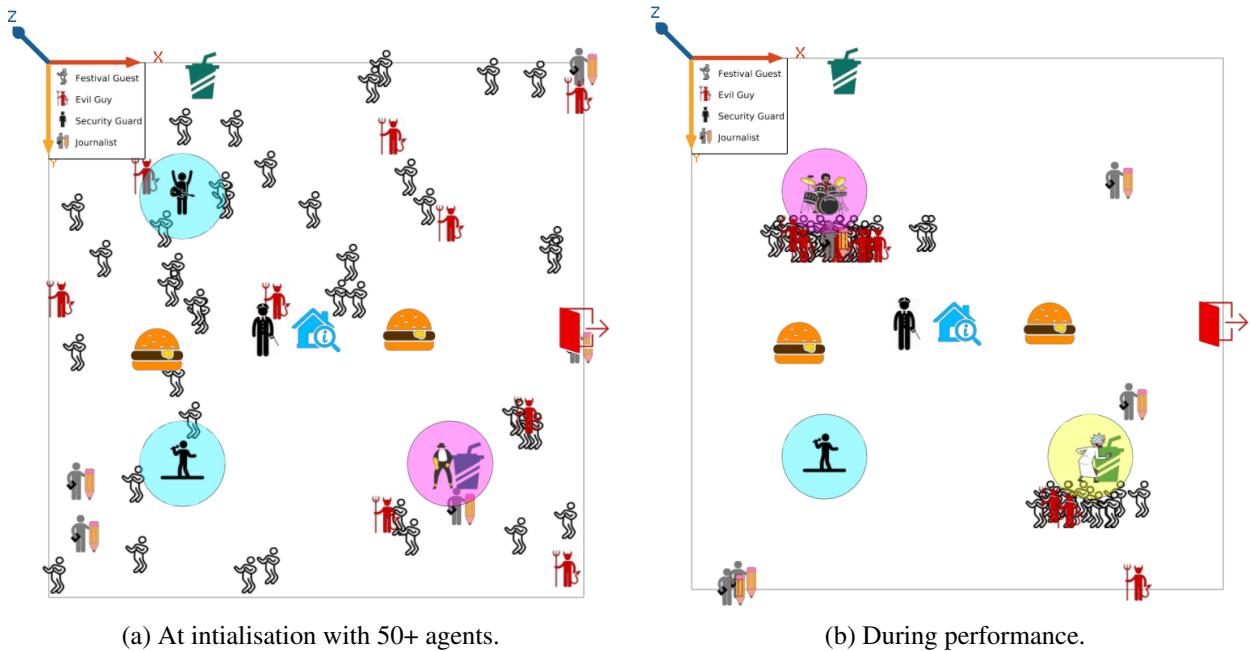


Figure 11: Simulation displays.

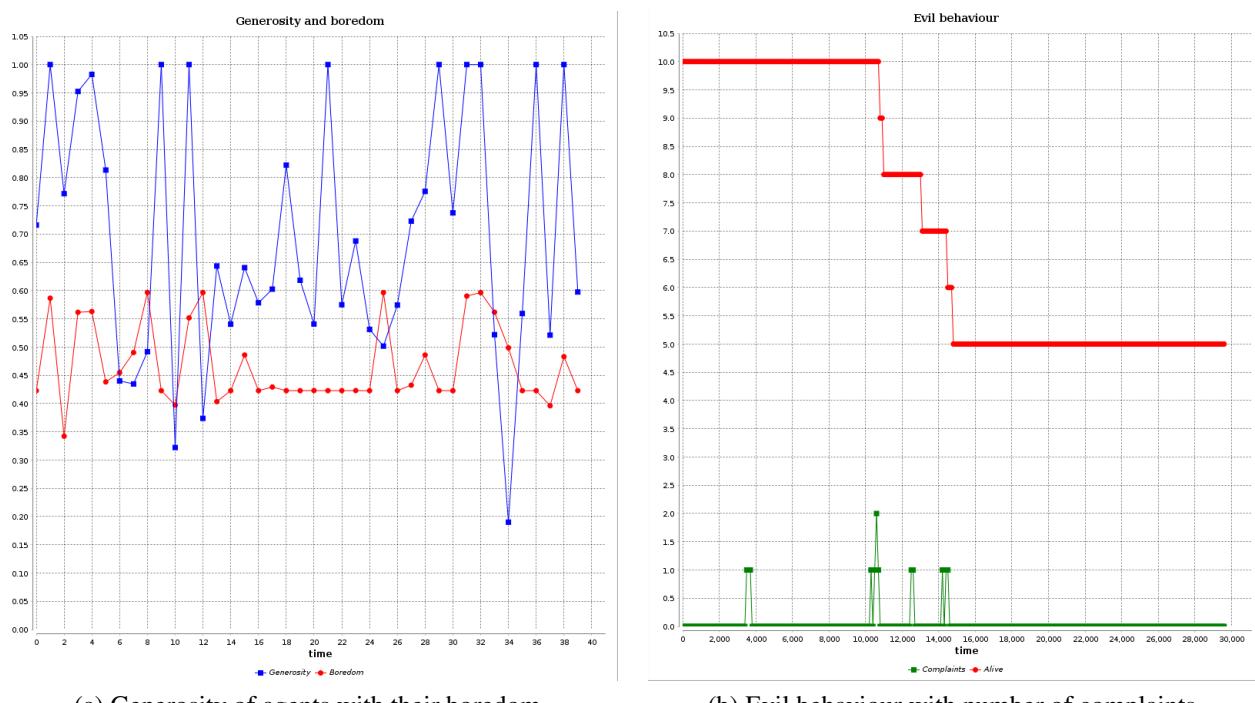
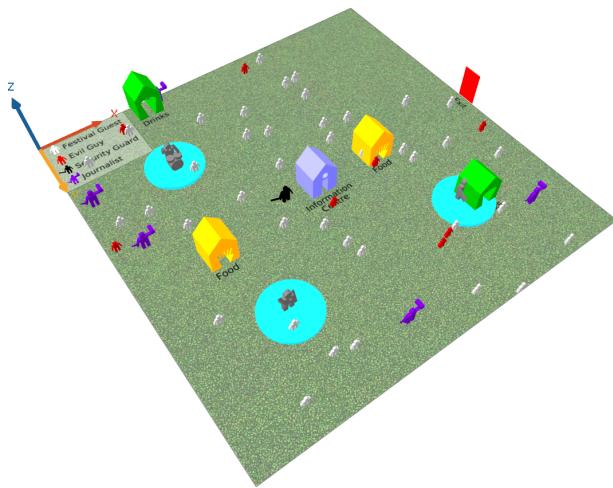


Figure 12: Plots of important interaction behaviour defining attributes.

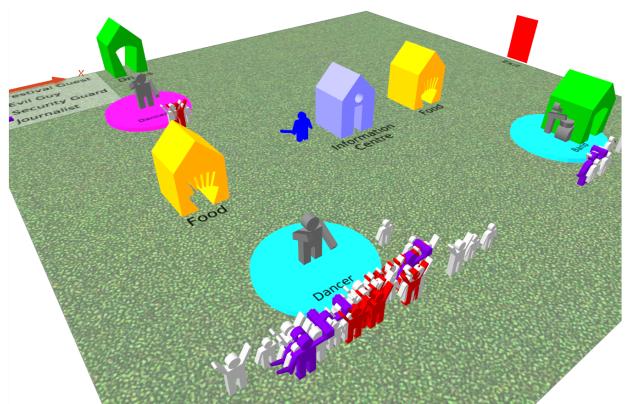
3.2 Creativity model

The creative model is implemented in using 3D agents as can be seen in figure 13, with a more close-up view shown in figure 14. The below table answers some of the qualitative and quantitative questions based on creativity model as per the need of the survey.

Qualitative/Quantitative questions	Answer
Time spent on finding and developing the creative part	≈24 hours
In what area is your idea mostly related to...	Realism, 3D
On the scale of 1-5, how much did the extra feature add to the assignment?	5
On the scale of 1-5, how much did you learn from implementing your feature?	5

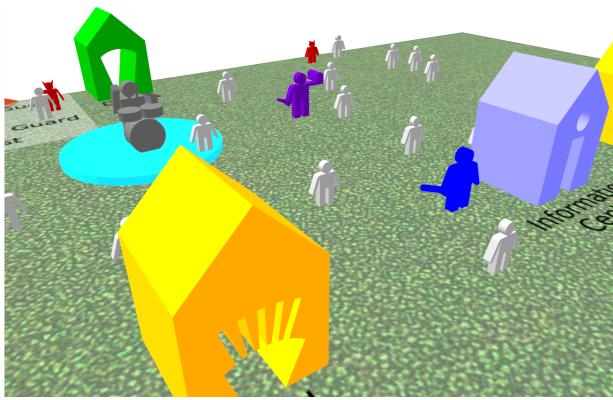


(a) At intialisation with 50+ agents.

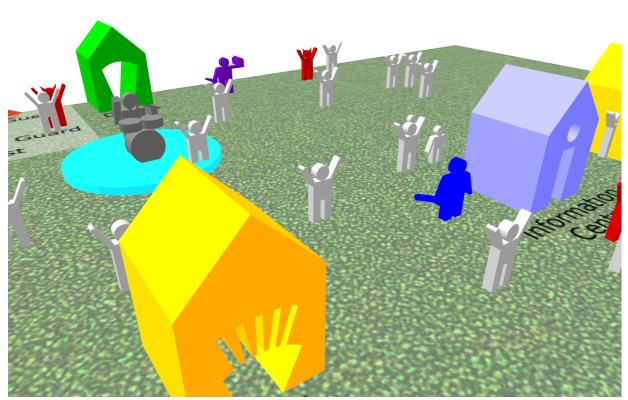


(b) During performance.

Figure 13: Simulation displays for 3D scenario.



(a) Frame 1.



(b) Frame 2.

Figure 14: Animation frames showing agents dancing when idle.

4 Discussion

The basic model is built upon the foundation of previous assignments. Creating more types of agents and modifying their behaviour based on agent type and personality traits was time-consuming. Few days were

spent in brainstorming on choosing the agent types and personal traits. The debugging part took most of the time. Additionally, adding FIPA for long-distance communication for multiple agents was a headache as on several occasions they interfered.

The basic model simulation in Figure 11(a) shows 50+ agents interacting in the festival. In Figure 11(b), we can observe that the chill people like to stand away from the party people in the crowd.

For the basic model in Figure 12(a), we observed that the generosity of the agents is somewhat correlated to how bored they are. If a guest feels bored, he becomes more and more generous in order to interact with other agents. But this happens differently for the party and chill people as their levels of friendliness are different.

For the behaviour of evil guests12(b), reporting does not necessarily mean removal of the trouble makers by the security guards. This is because the guard himself can be inherently corrupt or just too lenient that he lets the evil agent go off with a minor bribe or with a warning respectively.

The behaviour of the agents will be identical in the creative part as shown in Figure 13 with the added bonus of appealing graphics and a closer to reality visualisation. The agent models have been created to portray lifelike movements while dancing or interacting as shown in Figure 14.

References

- [1] GAMA. GAMA-Platform. (2019, Nov 13). [Online]. Available: <https://gama-platform.github.io>
- [2] The Noun Project. (2019, Nov 13). [Online]. Available: <https://thenounproject.com>
- [3] SolidWorks. (2019, Dec 24). [Online]. Available: <https://www.solidworks.com>