Assignment 1: GAMA and Agents

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ID2209 – Distributed Artificial Intelligence and Intelligent Agents

Festival Peace&Love:

In this assignment, we were tasked with creating several agents in GAMA as shown in Species, and implement some tasks when a certain event happened. There are 3 main attributes of guest agents in this assignment are: thirst, hunger and WC.

Behaviour 1: When Guest agents are thirsty, they will try to move to Pub/Juice Parlour to grab a drink.

Behaviour 2: When Guest agents are hungry, they will try to move to Vegan Restaurant/NonVeg Restaurant to buy food.

Behaviour 3: When Guest agents want to use restroom, they will try to move to WC.

In order to make the festival more interesting, there are other behaviours added for some of the agents as well (e.g. Dancing behaviour for couples). Some other agents will simply roam around in the festival field. Some of the agents are implemented with memory and some with emotions. The agents leisure activities at festival like dancing or roaming around will reduce their energy levels and subsequently they will need to replenish their resources. Here, for example, random thresholds are assigned each time for each attributes thirst, hunger and WC.

The name of assignment "Peace& Love" was given because of our approach in *Challenge 2*. Instead of killing the bad guy in the festival, we made the security guard to chase and arrest the baddy to escort him out of the festival through the entrance. No violence! :-)

How to run:

Run GAMA 1.8 and import ID2209_DAIIA_Lab1 as a new project. Press main to run the simulation.

Species

Agent Entrance

<The entrance of the festival, pink box in the middle left>

Geometry: BOX

This non moving agent symbolises the entrance to the festival and is also the place through which the baddy will be escorted out by the security guard. For simplicity, we have not modelled all the moving agents as entering the festival through the entrance at the beginning.

Agent InformationCentre

<Orange pyramid in the middle, with which the agents communicate by default.>

Geometry: PYRAMID

This agent symbolises the information centre with which every moving agents will communicate and get guidance from. Guest agents will move to Information Centre if any of the thirst/hunger/WC attributes needs replenishment is and there by get the target position to Pub, Juice Parlour, NonVeg Restaurant, Vegan Restaurant or WC. With the target position updated, guest agents will move there and replenish themselves(either by drinking, eating or peeing).

Agent Disco

<Violet sphere in the top middle where dancing of couples is hosted.>

Geometry: SPHERE

This agent symbolises the disco bar where the dancing party is hosted. The guest **Couples** agent is mainly dancing around this area. The disco flashes between RED and VIOLET colours to symbolise the disco effect.

Agent RandomShop/RandomStore

<Set of blue pyramids and yellow boxes in the festival field.>

Geometry: PYRAMID/BOX

This agent symbolises the **RandomShop** and **RandomStore** agents. They are added to fill up the field space and are positioned randomly. They don't interact with other agents.

Agent Pub/JuiceParlor

<Blue box in the top left/yellow box in the top right, beverages and drinks are served according to guests' preference: non-alcoholic or alcoholic>

Geometry: BOX

This agent symbolises the **Pub** and **JuiceParlor** agents. Other guest agents will try to get here for drinking if attribute *thirst* needs replenishment.

Agent VeganRestaurant/NonVegRestaurant

<Cyan box in the bottom left/ red box in the bottom right, foods are served according to guests preference: vegan or non-veg>

Geometry: BOX

This agent symbolises the **VeganRestaurant** and **NonVegRestaurant** agents. Other guest agents will try to get here for eating if attribute *hunger* needs replenishment.

Agent WC

<Grey box in the bottom middle >

Geometry: BOX

This agent symbolises the **WC** agent. Other guest agents will try to get here for peeing if their attribute WC needs replenishment.

Agent Guest_Couple

<2 red cylinders randomly set in the festival. A romantic experience.>
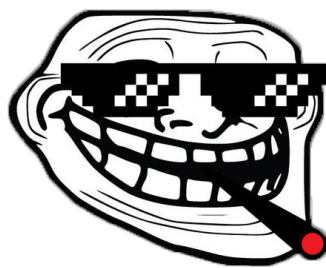
Geometry: CYLINDER

This agent symbolises a couple on a date in the festival (**Guest_Couple** agent). They roam around initially looking for each other and once met they starts dancing together and also have the *thirst/hunger/WC* attributes, but always together in their behaviours.

Agent Guest_Baddy

< The 2D image icon with randomly set position in the festival.>

Geometry:

This agent symbolises the baddy in the festival (**Guest_Baddy** agent). The baddy will roam around the festival field and also have the *thirst/hunger/WC* attributes. The special behaviour here is when the baddy reaches the **InformationCentre**. The **InformationCentre** will alert the **SecurityGuard** immediately as the **Guest_Baddy** enters triggering a security alert. As the **SecurityGuard** finds the **Guest_Baddy**, he is escorted out of the festival.

Agent Guest_Single_WoM

*<5 white cylinders with **emotions** but no memory and randomly set positions in the festival.>*

Geometry: CYLINDER

This agent symbolises the independent single guys or girls in the festival with *thirst*/*hunger*/*WC* attributes. Their main behaviour is roaming around the festival spending their energies and replenish their attributes as and when needed. These agents are randomly positioned and randomly replenished. This agents are designed with emotions and desires. Their behaviour depends on the fulfilment of their desire which is *enjoyment* in the festival. When they feel they are enjoying, they get an emotion *joy*. They also have an emotional threshold defined which decrements constantly towards zero after which they becomes *sad*. These agents choice of vegan restaurant or non veg restaurant or pub or juice parlour depends on their emotions. Here we have tried to implement a simple emotional structure.

Agent Guest_Single_WM

<2 yellow cylinders with memory and randomly set positions in the festival.>

Geometry: CYLINDER

This agent symbolises the independent single guys or girls in the festival with *thirst*/*hunger*/*WC* attributes. Their main behaviour is roaming around the festival spending their energies and replenish their attributes as and when needed. These agents are randomly positioned and randomly replenished. The main peculiarity of these agents are that they have memory and can memorise the places they have visited. As a consequence these agents will go only once to the information centre to know the locations of the restaurants, pub, juice parlour etc and then onwards they can move themselves directly to the locations based on their attributes without having to communicate with the **InformationCentre**.

Agent SecurityGuard

<Set next to the Entrance.>

Geometry:

This agent symbolises the **Security_Guard** agent. His main behaviour is to act up on a security alert from the **InformationCentre** agent flagging the **Guest_Baddy** agent by chasing the **Guest_Baddy** agent and escorting him out of the festival entrance gates (**Entrance** agent).

Implementation

We started designing the whole structure of the festival with 5 buildings, 10 guests and 1 security guard inside. Besides we added a background as shown, like the festival is held on outdoor grass. We tried to implement different clusterings thus, we divided the 10 guests in to a couple of 2, a single group of 5 and 2, 1 baddy and a security guard. Each of the cluster has different behaviours, emotional structures and memory capabilities. E.g. **SecurityGuard** agent can move faster than all other agents.

The detailed behavioural patterns are given against each individual agents above.

Results

Here we list the steps for the **Guest_Couple** agent behaviour as an example to depict the console output.

Step 1: Couple meets after hanging around the festival for a while.

```
Guest_Couple1says: Hello! Nice to meet you!
Guest_Couple0says: Hello! Nice to meet you too!
```

Step 2: They get thirsty after dancing for a while.

```
Guest_Couple0says: Ah.. I'm thirsty.
Guest_Couple1says: Ah.. I'm thirsty.
```

Step 3: They go to **InformationCentre** to ask where to grab a drink and gets informed about where to go.

```
Guest_Couple0says: Ah.. I'm thirsty.
Guest_Couple0says: We're informed
Guest_Couple1says: Ah.. I'm thirsty.
Guest_Couple1says: We're informed
```

Step 4: **Guest_Couple** moves to the target location given from **InformationCentre**. After they finish drinking they get back to dance.

```
Guest_Couple0says: Oooohhhh... Lets dance again.
Guest_Couple1says: Oooohhhh... Lets dance again.
```

Step 5: They get hungry.

```
Guest_Couple0says: Ah.. I'm hungry.
Guest_Couple1says: Ah.. I'm hungry.
```

Step 6: They find restaurant locations from **InformationCentre** again.

```
Guest_Couple0says: Ah.. I'm hungry.
Guest_Couple0says: We're informed
Guest_Couple1says: Ah.. I'm hungry.
Guest_Couple1says: We're informed
```

Step 7: After replenishing their hunger, they are set to dance again.

```
Guest_Couple0says: Oooohhhh... Lets dance again.
Guest_Couple1says: Oooohhhh... Lets dance again.
```

Step 8: Go to WC when their WC threshold is lapsed.

```
Guest_Couple0says: OMG.. I've to pee/poo.
Guest_Couple1says: OMG.. I've to pee/poo.
```

Step 9: After replenishing their WC needs, they are set to dance again.

```
Guest_Couple0says: Oooohhhh... Lets dance again.
Guest_Couple1says: Oooohhhh... Lets dance again.
```

Logs of other groups which are just similar to the couple can be seen in the simulation. This can also be demonstrated from this fancy screenshot right here.
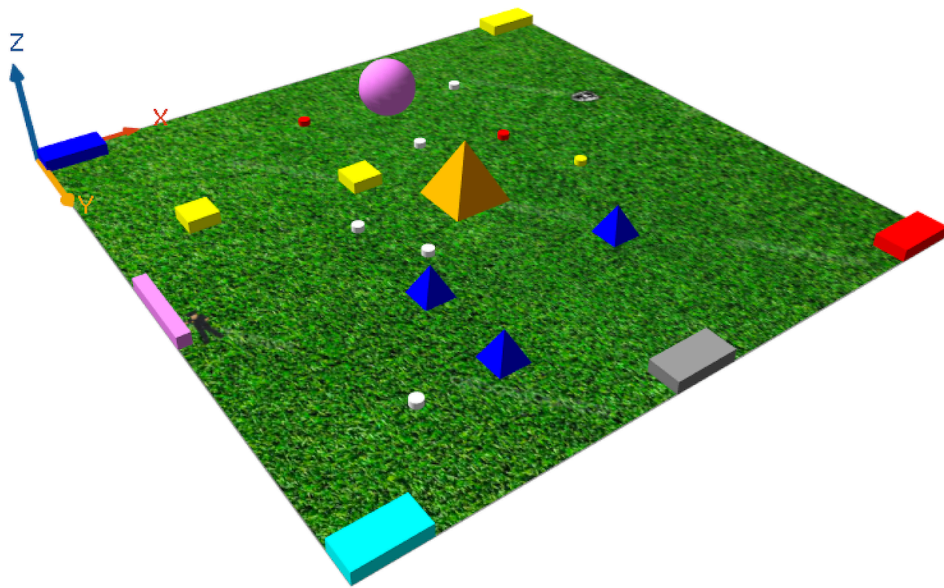

Figure 1: A screenshot of the final solution.

Challenge 1

Agents with memory in here are implemented with **Guest_Singles_WM** agents. Their detailed behaviour is explained in their corresponding section. Additionally the distance travelled by these agents are compared against those of the **Guest_Singles_WoM** agents without memory.
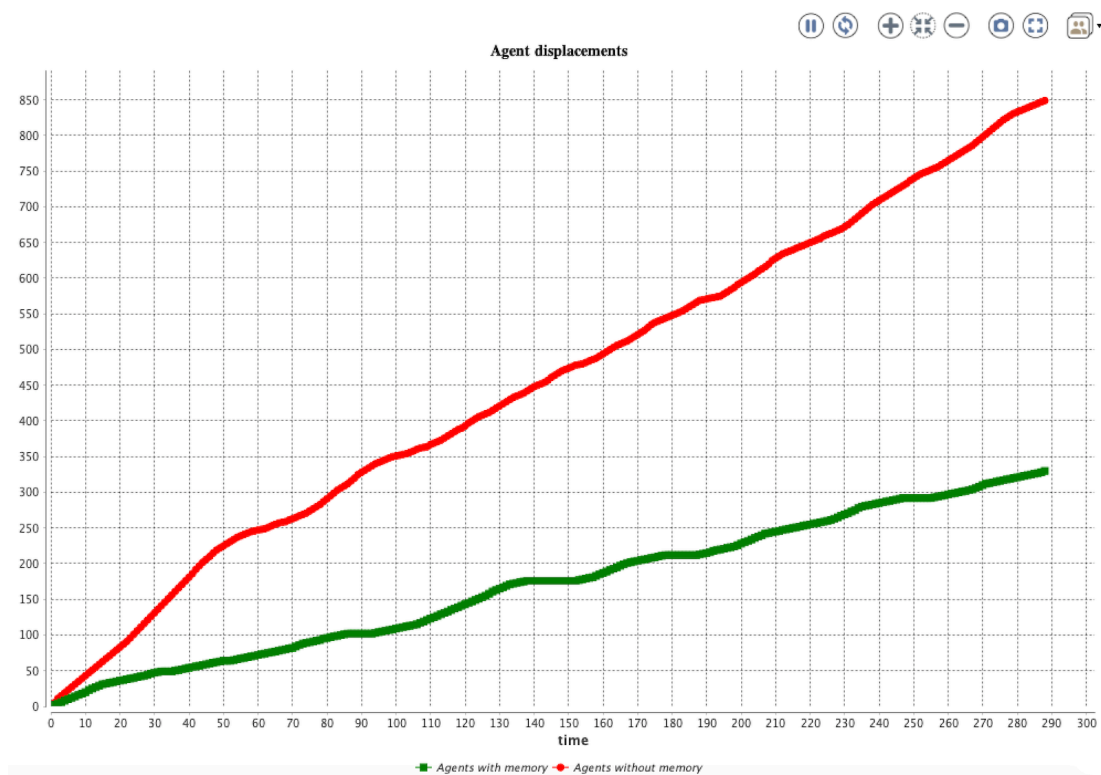

Figure 2: Displacement comparison between agents with and without memory.

Observation: As expected, agents with memory have to travel only less distance compared to those without memory.

Challenge 2

Baddy is designed with the similar attributes like other guest agents. However, once the **Guest_Baddy** gets into the **InformationCentre**, a security alert will be issued and the **SecurityGuard** will be informed that a bastard who will make damages has shown up in the Festival. **SecurityGuard** then chase the **Guest_Baddy** and escorts him out of the festival rather than killing him for Peace &Love! Detail are shown in the code and demonstration.

Creative Implementation

The creative part of our design is spread across our implementation. Our main contributions in this model can be summarised as below.

1. Wait times implemented for each agents to incorporate normal time each one of them will have to spent either in an Information Centre or Pub or a Restaurant. This time is kept constant in all cases and for all agents to keep the model simple.

2. We have grouped the guested in to couple, singles with and without memory, baddies and security guard. Each of these guest agents are given different behaviours.

3. We have build up a story of date for the couple with a short story description of meeting and dancing and roaming around together through our simulation.

4. We have implemented an emotional structure for the singles guests without memory using the *simple_bdi* control (**Guest_Singles_WoM** agent). We made the agents decide based on their emotions and desires.

5. Visual Effects: We created a green grass as the festival plat, certain images that could describe the features of our guest agents and security agents. We changed the idea of killing bad guy into escorting him out of the entrance as a part of our peace initiative.

Creative Part Feedback:

Qualitative/Quantitative questions	Answer
Time spent on finding and developing the creative part	10hours in total
In what area is your idea mostly related to...	Reproduce real life scene
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?	4

Discussion / Conclusion

All our logics and design simulates well but can be improved with more interactive agents with social and emotional structures. Overall its a good assignment which helped to learn the basics of GAMMA and feel its power. We can't wait to create a new implementation when we get back home to further explore the possibilities. Non stop learning!