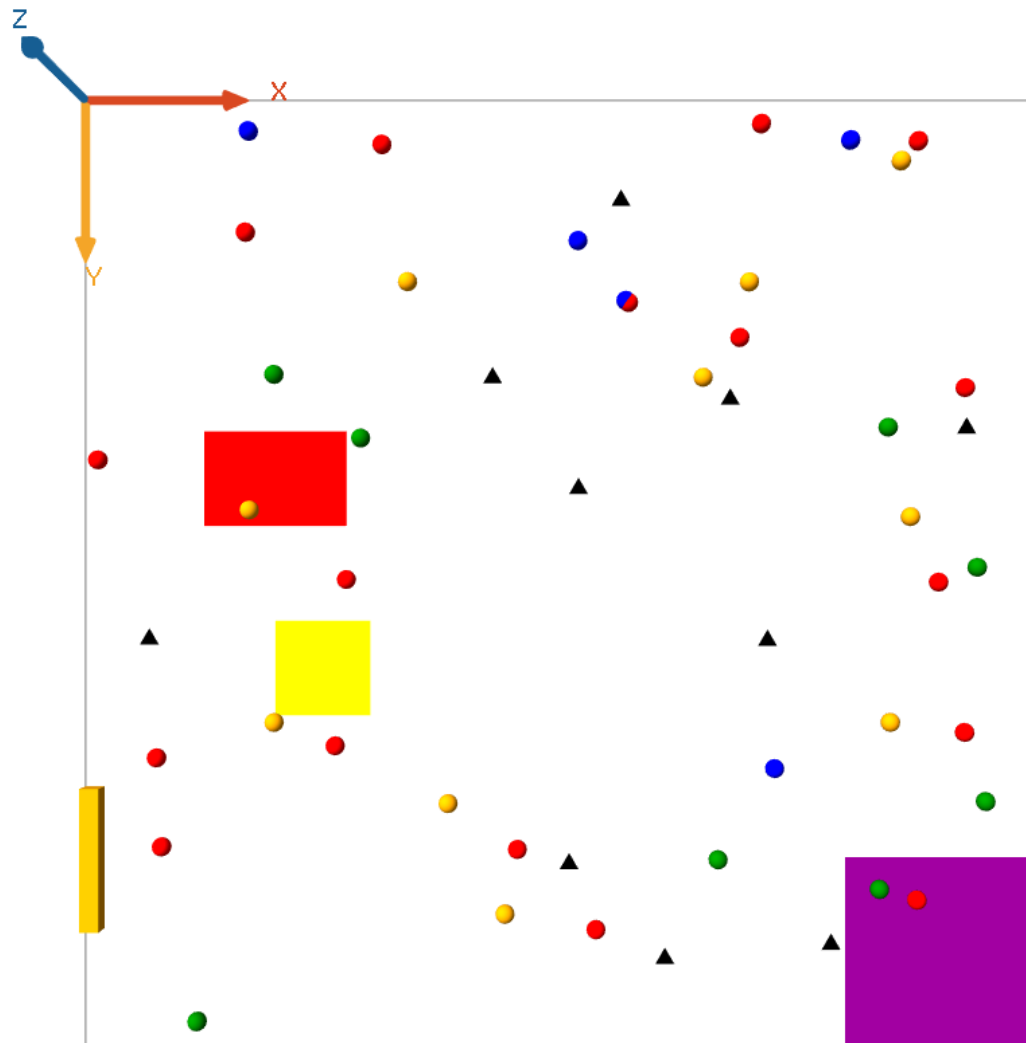


Final Project: The Festival



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1. Introduction

The final project assigned for the course ID2209: Distributed Artificial Intelligence and Intelligent Agents regards the creation of an environment where different agents interact one with each other in some way, behave depending on personal parameters and decide different actions depending on the mentioned interactions and their desire.

In this specific project, the scenario that is presented is a Festival, where we can find several agents that behave and interact in different manners.

In the next section we will describe the overall scenario of the Festival.

2. The Festival

Our agents find themselves inside a Festival, characterised by the presence of a big **Bar**, where the agents will go to have a drink when they are thirsty, and by a **Stage**, where the agents will join an event to dance and have some fun. Another relevant location is the **Shop**, where our agents can meet to buy different articles.

Depending on the situation, the agents will interact and communicate between them, and the outcome of their behaviour and intentions strongly depends not only on the type, but also on their personal characteristics and parameters, for instance how much they are *generous*, *friendly* or even *rich*. The interactions between the agents is more explained in section 4.

The type of the festival guests are the following: *Party*, *Chill*, *Shopaholic*, *Criminal*, *Introvert*. Each one of these agent types have their own parameters values that make them behave in different ways, but in general the overall logic between the different desires. The different desires range from the willingness to drink, to dance and to buy gadgets at the shop. The main characteristics of these agents inside our festival is mainly addressed in the next section, section 3.

Furthermore, inside this project we keep track of some global indicators regarding the mood of the festival, named global happiness and global sadness, discussed in section 5.

Let's now dive into the different agents inside our simulation and how they are presented.

3. The Agents and relevant spots

This the list with the different agents and spots and how they are different one with each other:

- **Locations:**
 - **Entrance:** the entrance to the festival, located in the lower-left part of the map and represented as an **orange** rectangle.
 - **Bar:** a common place where the agents will go when they are thirsty to get a drink, each agent has a preference at the beginning of the simulation. Depending on the occasion, here the agents will start an interaction/communication, the logic behind it will be explained with the description of the agents themselves. In the simulation, it is represented as a **red box** on the central-left of the map.
 - **Stage:** another common place, the logic behind it is very similar to the bar, if the agents want to attend the event it will join it. Again, here depending on the occasion the agents will start a communication between them. The Stage is represented as a **purple zone** in the lower-right part of the map.
 - **Shop:** a common place where the agents will go when they want to buy some gadgets. Again, depending on the occasion and personal traits and characteristics, here the agents will start an interaction/communication, the logic behind it will be explained with the description of the agents themselves. In the simulation, it is represented as a **yellow box** on the central-left of the map.
- **Agents:**
 - **Party:** The party person likes to be at the bar as he likes to drink. But since he can only go to the bar if someone accompanies him, he starts talking to people in close proximity to him. Depending on its position and personal characteristics, it will behave in different ways, interacting and communicating with the other agents, mainly offering drinks at the bar, thus also affecting the global mood (generally increasing the global happiness) of the festival as it is explained in the next section. In the simulation is presented as a **red** sphere.
 - **Chill:** The main interest of the Chill agents type is to attend the stage to attend a concert and have fun by dancing. Despite this, they are put in random locations in order to interact with other types of festival guests. Hence, they start talking to other people to ask them to join them for a dance at the stage. If they are already at the stage, they still have to interact so that they can contribute to the increase in global happiness, as

it is discussed next.

In the simulation is presented as a **blue** sphere.

- **Shopaholic:** This type of agent, as the name suggests, has only one main interest in the festival, which is shopping and buying gadgets at the Shop. Like the Cgill type of festival guests, they are put in random locations in order to interact with other agents and invite them to go shopping together. If they are already at the shop, they still have to interact so that they can contribute to the increase in global happiness.

In the simulation is presented as an **orange** sphere.

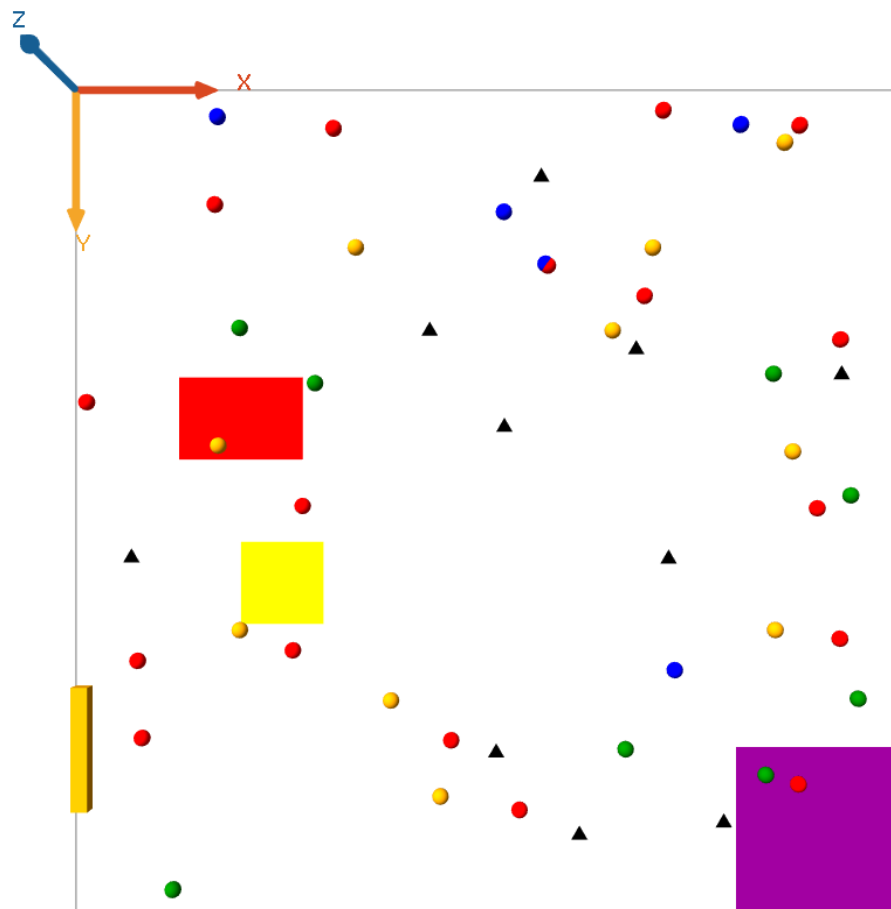
- **Criminal:** It's not a real festival if there are no evil and bad-behaving agents that like to disturb and create problems. In our project, this category of agents is represented by the Criminal agents type: some of them tend to rob people, others still have the desire to actually attend at the main attractions of the festival (Bar or Stage) depending on the personal traits (being friendly and/or generous). As other agents, their actions and behaviour affects the global mood at the festival (both global happiness and sadness).

In the simulation is presented as a **black** triangle.

- **Introvert:** This type of festival guest is the least dynamic one, since its main characteristic is to have fun alone and not get bothered by other agents inside the festival. Their main activity is to roam around at the festival, no interactions happen between this type of agent and the other ones.

In the simulation is presented as a **green** sphere.

Here's an image of how the simulation will start, where the active agents will start on a random position:



How the scenario changes dynamically and the simulation of the festival is addressed in the next section about the simulation details.

4. The simulation of the Festival

In the following section the different events and interactions that happen during the simulation will be presented.

- **Summary of the approach:**

1. As mentioned in the above section, there are five different types of agents at the event. All the agents adopt different personalities/types randomly. Also, each agent has a personality trait value attached to himself.

| Personality traits | Values between |
|--------------------|----------------|
| friendly | 0 to 5 |
| generous | 0 to 5 |
| rich | 0 to 5 |

2. Every type of agent likes different places and different activities depending on their type.

| Agent | Preferred place |
|------------|-----------------|
| Party | Bar |
| Chill | Stage |
| Shopaholic | Shop |
| Criminal | No preference |
| Introvert | No preference |

3. However, we want different types of people to interact with each other. So we assign them to random places in the festival. Due to this, different people meet and interact with each other.
4. Also, unless the agents start interacting with each other, the global happiness will remain zero and they will have to start mingling with others to increase the global happiness of the festival world.
5. The only way they can go to their preferred place, if they aren't there already, is if they can find a person who joins them and agrees to go with them.

6. As they meet different people in close proximity, they ask them to join, for fulfilling their desires.
7. The other person (who is being asked) will either accept or reject their proposal to hang out. This will depend on the type of person he is and also on his personality traits.
8. Upon acceptance/positive collaboration, the global happiness increases. Upon rejection or negative experience, global sadness increases.
9. In order to ensure that they keep meeting and interacting with new people and not just the same old people, the set up is randomized every fifty cycles.

- **Defining interactions in the festival:**

For each type of festival guest, we have defined interactions with different other types of festival guests having different personality traits. In order to not make the interactions and the console too complicated, we have tried to present a lot of interesting combinations and scenarios, but not all possible combinations.

1. Party person

The party person likes to be at the bar as he likes to drink. But since he can only go to the bar if someone accompanies him, he starts talking to people in close proximity to him. If he is already at the bar, he still has to interact with people because every agent has to try to increase the global happiness of the festival world.

- I. If festival_guest_type = Party and he is also rich and generous. Party person offers to buy drinks for the people around him.
 - If the other person is friendly and his party desire is high, he agrees to go with him. Global happiness increases.
 - If the person is not friendly enough, but has a high enough party desire, then he agrees to go with him. Global happiness increases.
 - In all other cases, the person declines to go with the party person. Global sadness increases.

2. Chill person

Chill people like to go to the stage and dance at the concert. However, they are put in random locations to interact with other types of people. Hence, they start talking to other people to ask them to join them for a dance at the stage. If they

are already at the stage, they still have to interact so that they can contribute to the increase in global happiness.

- I. If *festival_guest_type* = *Chill* and he is friendly enough. The chill person desires to dance with strangers at the festival and asks the people close to him to dance with him .
 - If the other person is friendly, has a high dance desire and is not an introvert, he agrees to dance with him. Global happiness increases.
 - If his dance desire is not too high, he refuses to dance with the chill person. Global sadness increases.
 - If he is not friendly enough, but his dance desire is high, then he accepts to dance with the chill person. Global happiness increases.
 - If the person is not friendly and does not have a high dance desire then he refuses. Global sadness increases.
 - If he is an introvert, he refuses to dance with the chill person immediately. Global sadness increases.

3. Shopaholic person

Shopaholics have come to the festival only to visit the shop and to buy clothes. However, they are put in random locations to interact with other types of people. Hence, they start talking to other people to ask them to join them to go to the shop. Since they are compulsive shoppers, they are even prepared to buy something for the person who accompanies them. If they are already at the shop, they still have to interact so that they can contribute to the increase in global happiness.

- I. If *festival_guest_type* = *Shopaholic* and he is friendly enough, rich enough and generous enough. The shopaholic person desires to shop at the festival and asks the people close to him to come shopping with him.
 - If the other person is an unfriendly criminal, the criminal will try to take advantage of the situation and his desire to commit crime will go up. He will agree to it and will make the shopaholic spend a lot of money on him. Global sadness increases (Even though this is a successful collaboration, it is a negative one).
 - If the other person is not a criminal and is friendly enough, he will agree to accompany the shopaholic to the shop. Global happiness increases.

- If the person is not a criminal, not friendly or is an introvert, then he will decline the offer. Global sadness increases.

4. Criminal guest

There are many types of criminals in this festival. Some of them are here to rob people, some are friendly enough and some are here with desires to party or dance. Depending on their desires and individual personality traits, they will contribute to either global sadness or global happiness in the festival.

- I. If *festival_guest_type* = *Criminal* and he is not friendly enough, his desire to commit crime will increase. He will ask the person close to him to give away all his money.
 - If the other person is a criminal, he will try to join hands with the criminal person and together they can rob people. Global sadness will increase.
 - If the other person is not a criminal, he will be scared. Global sadness will increase.
- II. If *festival_guest_type* = *Criminal* but he is very friendly. His desire to commit crime is not his intention. He will just stay out of the way and say that he is friendly and ask them to hang out with him (print statements to recognize the friendly criminals).
 - If the other person is also a friendly criminal, he will agree to hang out with him. Global happiness will increase tremendously as this is a very good collaboration. Here, since two criminals have contributed to global happiness, we will print that, "The world just became a better place and happiness level went up by 5!"
 - If the person is not a criminal and friendly, he will accept the proposal. Global happiness will increase.

5. Introvert person

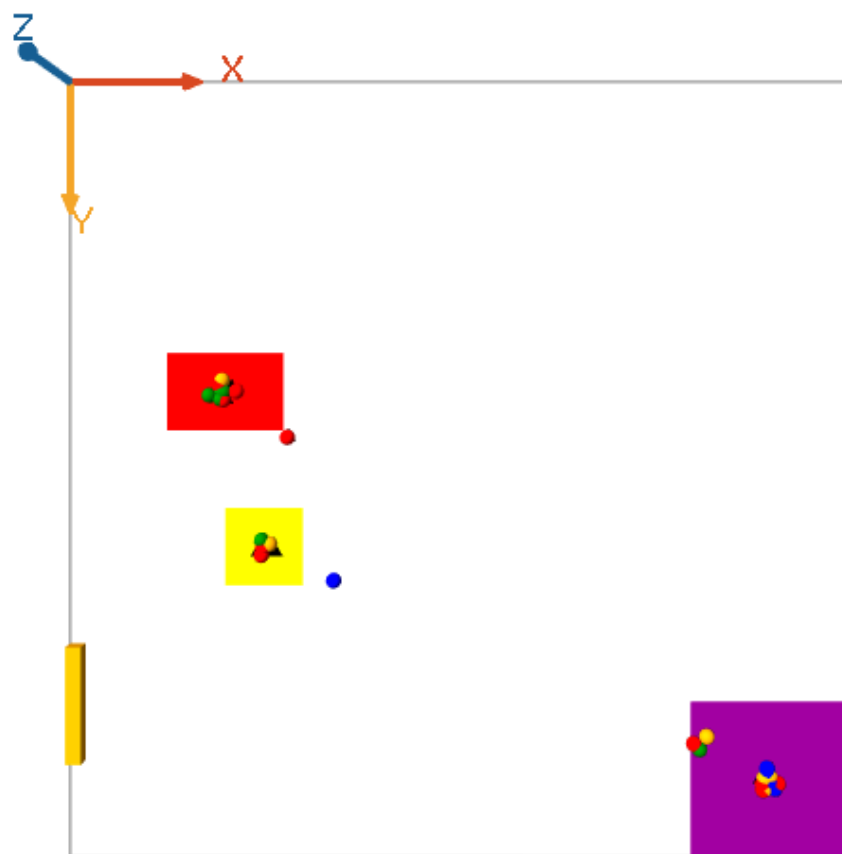
Introverts are here just to roam around and have fun alone in the festival. They do not like to be bothered and prefer to not interact. They just want to roam around so they will not try to collaborate and ask people to hang out.

- I. If *festival_guest_type* = *Introvert* and is not friendly. The introvert just wants to roam around.

- If the other person is not a criminal, and friendly, he will leave the introvert alone and let him roam around. No change in global happiness and global sadness.
- If the person is a criminal and not friendly, he will try to disturb the introvert even though he wants to be alone. So he will just declare that he is going to follow the introvert around. Global sadness will increase.
- If the person is not a criminal and not friendly, he will think that the introvert is rude and say that he still wants to talk to him. Global sadness will increase.

Here's next presented a screenshot while running the simulation, first the log with the printings of the communications and interactions between the agents and then an image of the map of the Festival:

The screenshot shows a software window titled "final_project.gaml". It has a search bar labeled "Find model..." in the top right. Below the title bar is a tab labeled "Interactive console". The console displays a log of text messages between agents in a simulation. The messages include self-declarations of agent types (e.g., "I am a criminal but I will not annoy people!", "I'm a Criminal but I am friendly", "I'm a Chill person", "I'm a Party person", "I am Introvert") and interaction requests (e.g., "Hej Festival_guest34. I'm a Criminal but I am friendly, so I will not hurt you! Let's hang out Sure, I will hang out with you!", "I have an intention to dance with strangers!", "Festival_guest48asks: Hej Festival_guest30. I'm a Chill person and I want to dance with you!", "Festival_guest30says: No, thank you Festival_guest48. I don't like to dance!"). The log is scrollable, and the window includes standard simulation controls like play, pause, and reset buttons.

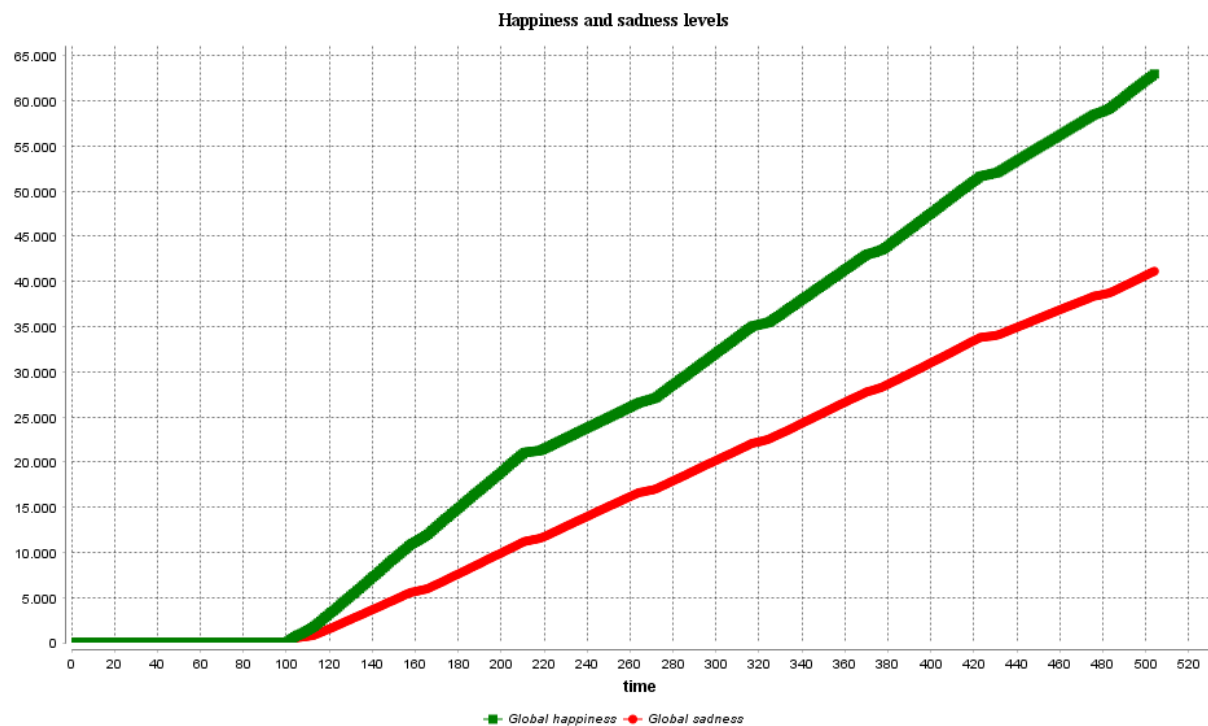


5. Analysis of some global variables

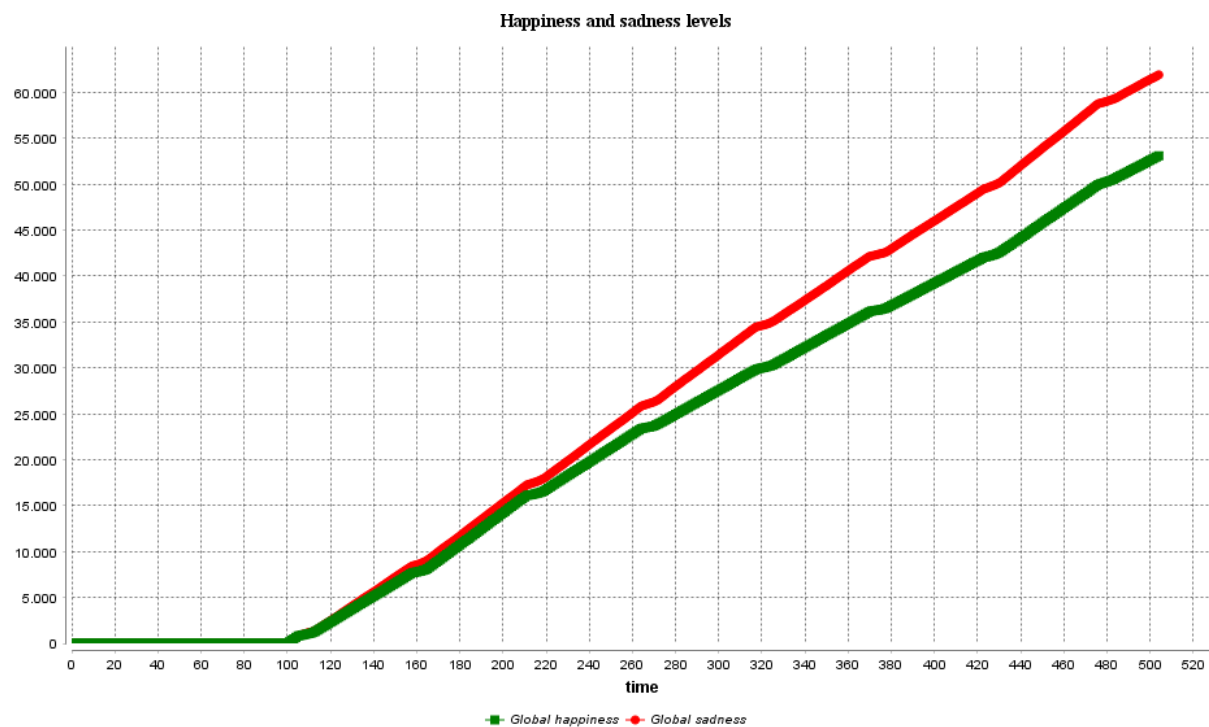
The global happiness and global sadness of the Festival

For this project, we decided to keep track of the global mood of the festival, dividing it in global happiness and global sadness, each one representing how much the good and bad behaviours of the agents affect the overall mood of the scenario. Since the various actions and behaviours of the agents are generally set based on random values and thresholds, with different simulations we can obtain different results and analysis of what is going on inside the festival.

Here are the graphs obtained after 500 cycles of the Festival simulation, where the first one shows how the overall mood is positive, meaning that the Criminals were not so numerous and also not so bad-behaving:



Next, on the other hand, we see how the overall mood of the festival can be negative in another simulation: this can be justified by the fact that the number of criminal agents and their personal characteristics are random, therefore it can happen in this scenario. Furthermore, as we can see in the second picture with the pie-chart, having an increasing amount of criminals worsen the situation.



6. Conclusion and comments about the project

This project tries to make sure that all agents interact with each other as much as possible. However, due to there being several possible combinations of agents, we have only focused on a few key behaviors of each guest type. To make it more detailed and intricate, a lot more behaviours during interactions can be added to each type of agent. Also, we can add more types of agents and their interactions, varying with their personality traits.

Extra: BDI Behaviour in agents

The BDI behaviour is characterized by each agent having their own beliefs, desires and intentions.

Belief

Belief is the information that each agent has about the world.

Desire

Every agent desires different things depending on their personality traits and type. In other words, desire is the state the agent wants to achieve.

Intention

Desires, coupled with beliefs from the world, encourage the agents to convert their desires into intentions.

In our project, we have 5 different types of agents and they all have their own desires to fulfill. However, they have to interact with each other to make their desires into intentions. For this, they use their beliefs (information about other agents) and try to make them agree with their desires so that they can become intentions. An example of this is the party person. He can try to ask as many people as possible, but until he finds a person who has similar party desires, he cannot go to the bar or contribute to world happiness. Hence, we have given personality traits to these agents so that we can play with the different parameters to change and randomize the belief system (information on other agents) of the agents.