

# Final Project – Behavior of Different Agents

*Group 27*

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# Introduction

## *Football Festival Personalities*

For the final project we create different types of agents, each type has its own behavior. Additionally, agents can interact between each other, and the interactions between agents have a set of rules, depending on what type of agents they interact with is the rule that applies. These rules are conditioned by different traits, for example, Supporters have a Hooligan level that affects if one invites a drink to another. Finally, all these interactions between agents can be carried out in different areas around the map.

Depending on the area where the interactions are carried the result of the interaction is different. In other words, a player may probably want a noisy supporter in the Stadium, but not in a bar where he may go with his family. As a result, different attributes are assigned to the different agents, in order to obtain a virtual world as close to a football festival as we may think.

In addition to the basic project, a creative idea has been developed, our idea was the world on betting, which is clearly into sports. So we decided that the supporters can bet on the match, but not only on who wins. We simulated a match, with a 5 minutes step, and decide what has happened within those 5 minutes, goals, corners, yellow cards, red cards, possession of the bal. And based on those they can place a bet, to gain money or to get broke...

The environment used for the project is Gamma, and tools as FIPA protocol for communication when the guests are not in a certain distance is mandatory.

# Approach

The football festival is a place where different agents come and hangout to see their favorites teams play, in the first edition of the Football Festival the classic is hosted, the playing teams are Barca-Real. There is a total of nine types of agents the Supporters, Players, Security, Journalists, Vendors, Stadium, Fan-zone, Bar, and Hotel. Furthermore, each type of agent has special traits, for example the Supporters have hooligan level, generosity, noisy, and more. Also, the agents have a happiness level, depending on how the interactions on the Festival go is how it is reflected.

Usually, the supporters are hanging out in their fan-zones, otherwise they are in the bar, shopping or watching the game. Regarding the journalists they behave similarly to the Supporters, but they cannot shop, but their main trait is the interviews to either the Players or the Supporters. Concerning the players, they are usually in their hotel, in the bar or playing in the field. Vendors are standing always in the same spot, selling their merchandize to the Supports that pass by. If any of the supporters gets triggered by other Supporter or Journalist, it can call the Security guy. The security can take out all the reported agents by following them and killing them, however it is not always happening their mood might influence their decision. Finally, the Stadium is the host of the event, therefore, it is the one that notifies with messages to all the agents regarding the football matches.

The communication between all these agents are different, for long distance communication the messages are sent via the FIPA protocol, and for short distance they ask the agent directly without any protocol. The target of the Football Festival is that the agents have a good time watching their favorite teams, interacting properly with their fellow team followers, journalists, players, and vendors, and that their personalities and places change their interactions.

The project has more than 5 different types of agents, and in scenery it is used more than 50 agents. Also, the agents have at least 1 different set of rules on how they interact with other types and have at least 3 personal traits that affect these rules. Moreover, they have more than 2 different types of places where agents can meet. Finally, there is a chart which reflect the happiness of the agents with respect of time.

# Species

## Stadium

The Stadium is in charge of notifying the Journalists, Players and Supporters the status of the game. At a random time, it sends an inform to all the previous agents with the location stating that the game is starting. When the game is over, it sends another inform to all the agents mentioned and the score of the game.

## Supporters

The Supporters are the agents which have the most interactions and attributes of all the agents in scenery. These agents are the core of the festival, since without them there would not be a festival at all. The agents have these next attributes which englobe their personalities noisy, hooligan level, generosity, happiness, and consumism.

These agents have multiple actions next all of them are presented. They check their budget constantly which influences their happiness level and generosity. They update their happiness level in case they are lower or higher than the threshold. They choose randomly if they are thirsty, want to go to any fan-zone (his or opponents) or shopping. They receive FIPA messages from the stadium regarding the matches, if it is starting or finishing with the respective scores, and updates happiness depending the final score.

These agents can interact between themselves if they are in three specific zones the bar, the fan-zone, and the stadium. Enter fan-zone and the stadium, in these two places the agents can interact with each other. If the agents are in the same or different team, their happiness is reflected respectively. For example, there are three hooligan levels high, normal and low, and depending on with whom they interact is on how it will affect them both. Also, the agent can get warned or reported to the security guards in both places, depending if they are being noisy, or in the wrong zone, and so on.

When they enter a bar, they are going to buy a drink for themselves, and if some elements of their personality and the ones around make a perfect fit the agent will buy a drink to another agent (Supporter or Journalist). The elements that are take in consideration for buying a drink to someone else are its generosity, their hooligan level, its budget, and their happiness, these have to make a fit to between their personalities.

When the agents are in the fan-zones, the bar or on the way to another place they can choose to go shopping, also if they are passing by a shop. The way to choose if they are going to buy something or not is by a heuristic where consumism, budget, noise and intensiveness play a role. If the heuristic does apply, then the Vendor and the Supporters check if they support the same or different team, and the price of the merchandize will depend on it, hooligan level and budget play a role in this heuristic.

Each Supporters is constantly checking if there is either another Supporter or Journalist that are near which have had many drinks and are very noisy, meaning they are drunk and irritating. The Journalists can have up to 6 drinks since the Supporters invite them a lot of drinks. Regarding the Supporters they can have up to 4 drinks to be drunk. If any Supporter is noisy and drunk, the supporter sends a message to the Security guard reporting the irritating agent, and the journalist have to be only drunk in order to get reported.

## Players

The Players have multiple actions next all of them are presented. They update their happiness level in case they are lower or higher than the threshold. They choose randomly if they are going to be thirsty going to the bar, going to fan-zone or the hotel. They receive FIPA messages from the stadium regarding the matches, if it is starting or finishing with the respective scores, and updates happiness depending the final score, if they win their happiness goes to the upper threshold and if the loose it goes to the lower threshold.

These agents can interact with all of the Supporters if they are in three specific zones the bar, the fan-zone, and the stadium. Enter fan-zone and the stadium, in these two places the agents can interact with the supporters. If the agents are in the same or different team, their happiness is reflected respectively. For example, there are three hooligan levels high, normal and low, and depending on with whom they interact is on how it will affect them both.

When they enter a bar, they are going to wait for someone to buy them a drink, the supporters, and if some elements of their personality and the ones around make a perfect fit the agent will change their happiness value. The elements that are take in consideration for happiness their hooligan level, its budget, and their happiness, these have to make a fit to between their personalities.

When the agents are in the fan-zones or Hotel, they are going to wait for someone to buy them a drink, the supporters, and if some elements of their personality and the ones around make a perfect fit the agent will change their happiness value. The elements that are take in consideration for happiness their hooligan level, its budget, and their happiness, these have to make a fit to between their personalities.

## Journalists

The Journalists change places randomly, in order to cover all the areas in the scenery. Their main job is to ask the Supporters and Players for interviews, but off course getting an interview is as easy as it seems. All the Journalists have different favorite teams, as the Supporters, and obviously the Players. They can perform the interviews everywhere.

In order to get an interview with the Supporters and Players several facts have to be considered; the Journalists ask for an interview if it feels like it (randomly). Then, if the

Supporters and the Journalist have the same team, the interview goes ahead, but if not, both hooligan level are measured to see if they are compatible, their happiness's, noisy and intensity level also have a weight on their decision. Moreover, they can interview Players, if the Players and the Journalist have the same team, the interview goes ahead, but if not, both hooligan levels are measured to see if they are compatible, their happiness's, insensitivity and happiness also have a weight on their decision. In case of accepting an interview, both agents stand still for a random number of time and when the interview is over, they both follow the path they were supposed to follow.

This is the pseudo code of the interactions of the Fan-zone or Stadium for Journalists, Players and Supporters.

- Correct fan-zone
  - if hooligan high
    - if fans in correct zone
      - happiness +++ \* hooligan level
    - if fans in wrong zone
      - happiness -2
      - warning or security
  - if hooligan medium
    - if fans in correct zone
      - happiness +++ \* hooligan level
    - if fans in wrong zone
      - happiness -1.5
      - warning or security
  - if hooligan low
    - if fans in correct zone
      - happiness +++ \* hooligan level
    - if fans in wrong zone
      - happiness -1
      - warning or security
- Incorrect fan-zone
  - if hooligan high
    - if fans in incorrect zone but find same team people
      - happiness +++
    - if fans in incorrect zone but find different team people
      - happiness -2
      - warning or security
  - if hooligan medium
    - if fans in incorrect zone but find same team people
      - happiness +++
      - warning or security
    - if fans in incorrect zone but find different team people
      - happiness -1.5
      - warning or security
  - if hooligan low
    - if fans in incorrect zone but find same team people
      - happiness +++
    - if fans in incorrect zone but find different team people
      - happiness -1
      - warning or security

## Security

There are two Security guards, each one is a fan of a team (different). The security is chilling at a random place, when a supporter gets annoyed by someone the security guard is called through the FIPA protocol. When the agents receive the information, they decide randomly which one should go to get the annoying agent. They can kill journalists who are very drunk, which had above 5 drinks. Also, they can kill Supporters who had more than 3 drinks, or Supporters which have 2 or more warnings.

Since each Security guard has a favorite team, their decisions can be based upon this. For example, when the agents are reported the guard, it evaluates if they reported agents are good within their own terms. The terms evaluated by the guard are the happiness level, and the favorite team. If the guard and the reported agent have the same favorite team and the happiness level of the guard is high, the guard lets the reported guy go and take away all its warnings. Otherwise, the guard kills the agent by chasing him and when he reaches him, the agent dies. Additionally, if the guard is requested to kill another agent while he is doing a job, there is a queue and right after the present job is done, he starts the next one.

## Bar

The Bar is where all the Players, Journalists and Supporters come and get a drink, it can be before a game starts or afterwards but no during, during the matches all of the agents mentioned before go to the field to watch the game.

## Fan-Zone

The Fan-zone is where most of the Supporters hang around when a match is not going on. In this zone the agents can meet their favorite Players. Additionally, the journalists also make an occurrence and randomly ask for interviews to both Players and Supporters. There are two Fan-zones one for the Barca team and one for the Real team.

## Hotel

The Hotels host all the Players, they go there whenever a match is finished or after the bar, etc. There exists two Hotels one for each team, they separated by teams.

## Experiments and Results

In *Figure 1* it can be observed that the Supporter41 accepts the interview at the time 888 because they have the same team, Barca. Also, Supporter12 declines the interview, it might be because their team was not the same, their hooligan level might not be similar or just because it decided to decline it. Then the Supporter46 accepts an interview the Journalist0 at the time 905.

```
Supporters41(Barca) accepts interview to because is on my team: Journalists5(Barca)
Time: 808.0
Supporters12 declines interview to: Journalists8
Supporters46(Real) accepts interview to because is on my team: Journalists0(Real)
Time: 826.0
```

*Figure 1*

*Figure 2* shows when the interviews from the above are over, and it also shown the time. Additionally, it can be seen that other Supporters rejected the interviews.

```
Supporters41 finished interview: Journalists5
Time: 888.0
Supporters20 declines interview to: Journalists9
Supporters29 declines interview to: Journalists7
Supporters46 finished interview: Journalists0
Time: 905.0
```

*Figure 2*

Next, *Figure 3* illustrates when the interview done is between two agents that do not have the same team, but what happened is that the intensiveness level of the Journalist was low, and the happiness of the Supporter was high. Therefore, an interview could be performed while the agents had different behaviors.

```
Supporters39(Barca) accepts interview even is not on my team to: Journalists0(Real)
Time: 1730.0
```

*Figure 3*

In *Figure 4* it can be observed that the Player21 accepts the interview at the time 177 because they have the same team, Barca. Then, the interview is over, and it shown the time.

```
Players21 accepts interview to: Journalists9
Time: 177.0
```

```
Players21 finished interview: Journalists9
Time: 257.0
```

*Figure 4*



In figure 5 it can be observed that the Supporter number 4 gave a warning to supporter 7, this could have happened for two reasons, because it might have gone to the wrong fan-zone or because it was the wrong cheerleading side of the stadium. In figure b, the Supporter30 calls the security since the Supporter7 did any of the two options above. Then the Security0 was assigned randomly to get the guy. Sadly, since it was not a good mood, or they did not cheer for the same team, Security0 killed the agent Supporter7.

```
Supporters4: get the hell out of here Supporters7
Supporters30: calling security Supporters7 has 2 warnings
Security0: going to get: Supporters(7)
Security0 killed: Supporters7--
```

*Figure 5*

In the next case *Figure 6*, the Supporter29 reports Supporter44 because he was too drunk, it drank 4 drinks. The Security0 gets the information of the Supporter; nonetheless, the Supporter44 and Security0 cheer for the same team, and the security guy is in a good mood. Therefore, the Security0 does not kill the agent.

```
Supporters29: send name to guard of Supporters44, he drank 4
Security0: he is not a bad guy, I let Supporters44(Barca) go!
```

*Figure 6*

In the next case *Figure 7*, the Supporter8 reports Supporter3 because he has 2 warnings. The Security0 gets the information of the Supporter; nonetheless, the Supporter3 and Security0 cheer for the same team, and the security guy is in a good mood. Therefore, the Security0 does not kill the agent and reset their warnings to zero.

```
Supporters8: calling security Supporters3 has 2 warnings
Supporters3 number of warnings 2
Security0: he is not a bad guy, I let Supporters3(Barca) go!
Supporters3 number of warnings 0
```

*Figure 7*

The vendors are constantly selling their merchandize, in Figure 8 it can be observed the money they have earned so far with the t-shirt selling. The purchase of merchandise is not that often, therefore many iterations have to pass to see results. The Supporters have the choice either to go to the store because they want to buy something or because they were passing by and the seller convinced them!

```
The Vendors0 has: 36.36914497013885 euros
The Vendors1 has: 0.0 euros
The Vendors2 has: 0.0 euros
The Vendors3 has: 0.0 euros
The Vendors4 has: 68.49576810885519 euros
```

Figure 8

## Charts

Chart 1 make reference to the number of people that are happy and sad over the time, also how the events make the fluctuation of the chart more visible, happiness of the people is reflected or changed when an event happens. For example, a drastic change is when the score of the matches are released since it evolves everyone's happiness.

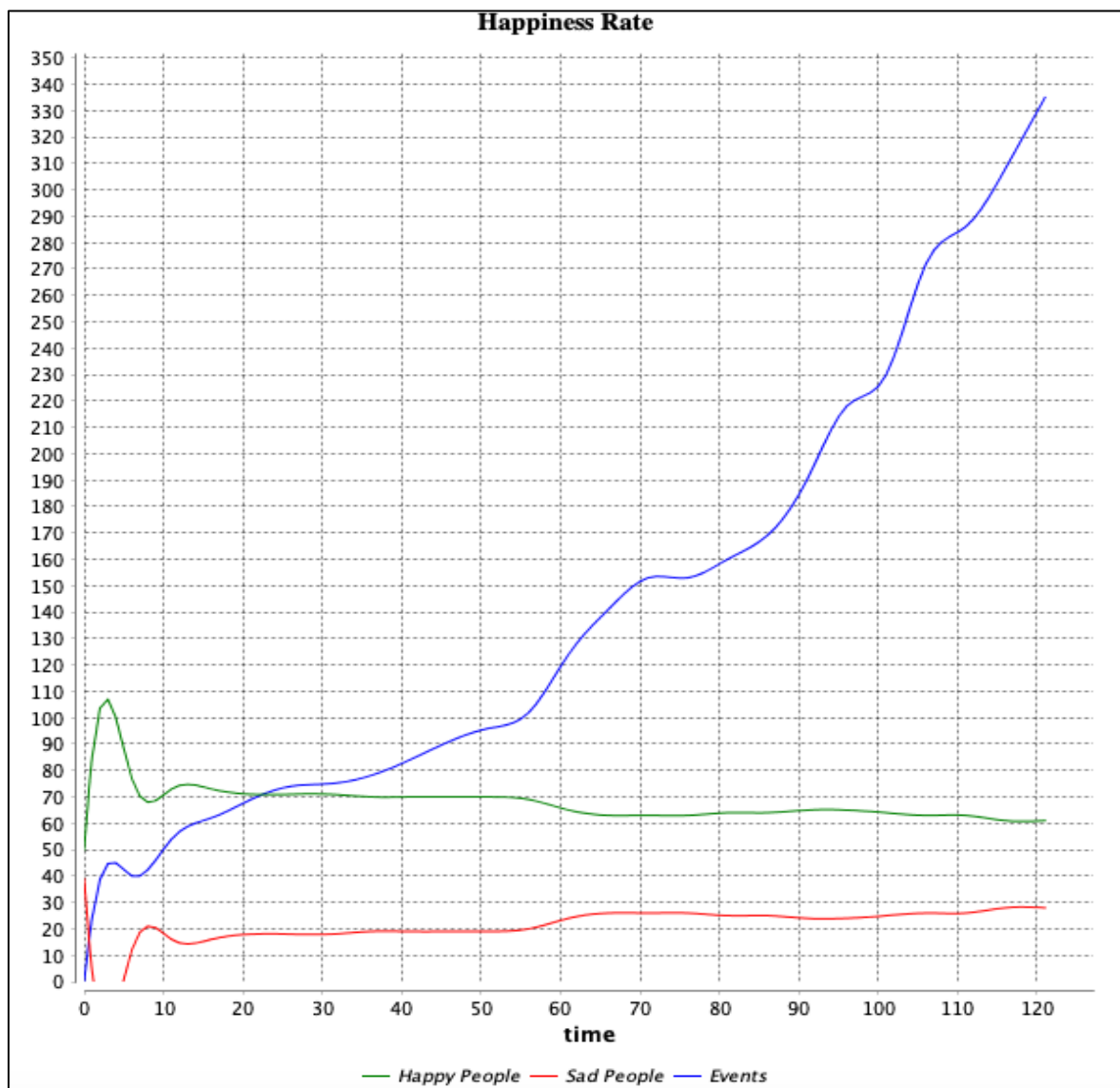


Chart 1

Chart 2 make reference to the number of people that are happy and sad presented in a pie chart, every 5 iterations the chart changes its values.

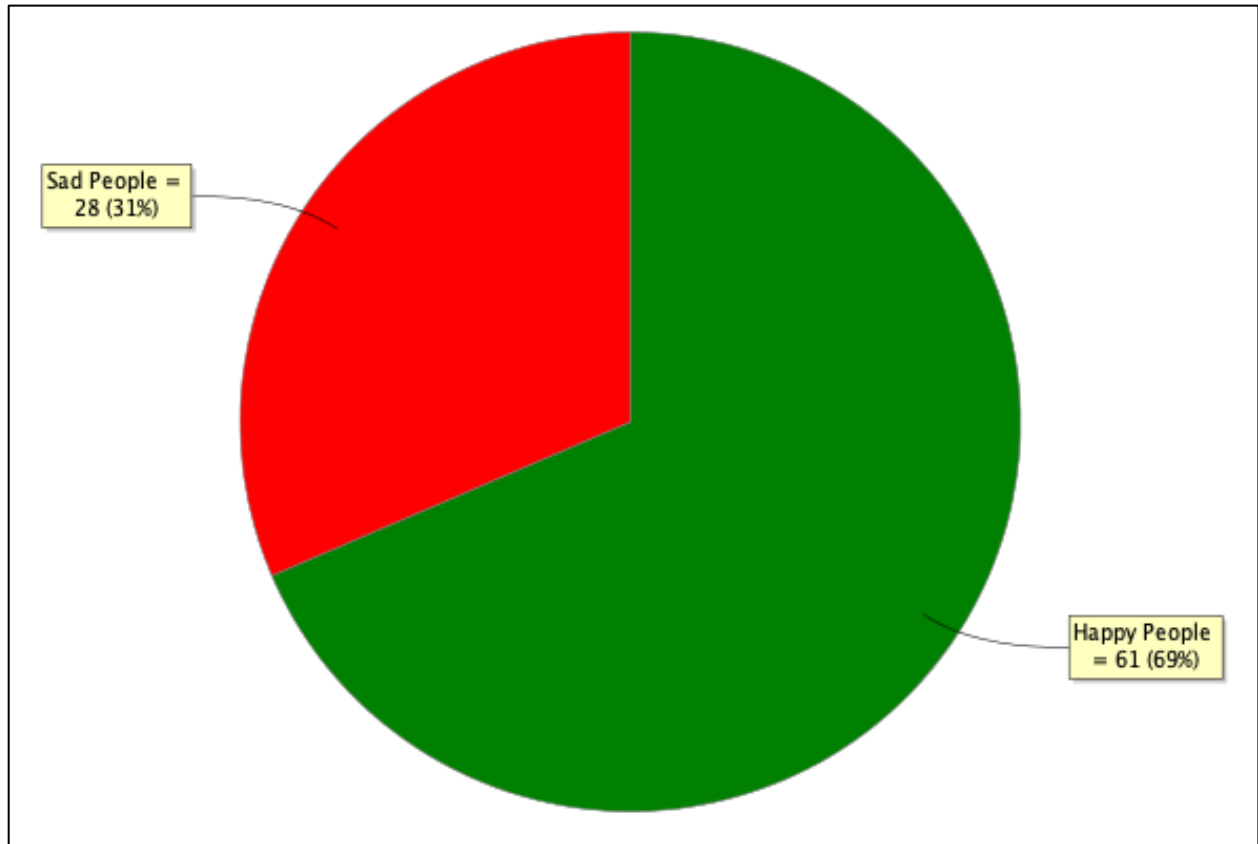


Chart 2

In chart 3, it reflects the average of the happiness of all the people, the number of happy and sad people.

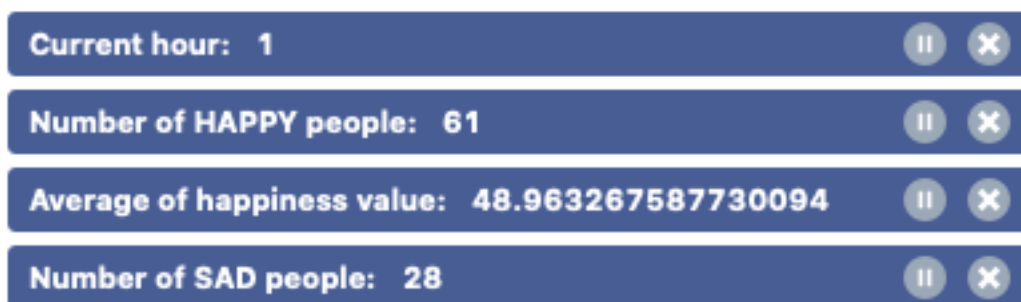


Chart 3

## Creative Part

In addition to the project, we decided to implement a creative part. In the creativity part, we decided to create a Bookie, a betting virtual page. Our supporters can bet to a large set of things. A match is simulated every 5 minutes with new events, in accordance to some variables.

This is done so that in the future (or if gamma presents less troubles when using memory), the supports could even bet live events, or just in some specific minutes.

We created a species/agent Betting page, which communicates using FIPA with the stadium, having information back and forth about the game, the betting page basically sum up the information and gives the clear information to the stadium on what to send the supporters.

What they can bet or what the match displays (Also in Halftime):

- Number of goals of each team
- Number of corners of each team
- Number of yellow cards of each team
- Number of red cards of each team
- Possession of the teams.

They have a large set of possible bets, 25. Which it is randomly decided to which ones they bet (if they are interested in betting for that specific match). Depending on the bet, and the odds that it may have, that affects the money that they will get if they win, so if it is a difficult bet, when they win they will get much more than for an easier bet. Of course, the chances are lower. That is always the trick with bets.

The happiness also is affected when they win, or they lose a bet. In figure 9, it can be seen the report of a game, both half time and the full match report.

```
HalfTime Report
Result HT: Real 1 - 0 Barca
Yellow Cards HT: Real 0 - 0 Barca
Red Cards HT: Real 0 - 0 Barca
Corners HT: Real 2 - 1 Barca
Possession HT: Real 47.666666666666664 - 52.333333333333336 Barca
FullTime Report
Result: Real 1 - 0 Barca
Yellow Cards: Real 2 - 0 Barca
Red Cards: Real 0 - 0 Barca
Corners: Real 3 - 2 Barca
Possession: Real 52.0 - 48.0 Barca
```

Figure 9

In Figure 10, below you can see how the supporters who bet for that event interact with it.

```
Supporters39 Betting 27.88798675148008 to Result4 - 5
Supporters39 Betting 27.88798675148008 Madrid to win
I won!27.88798675148008
Supporters39 Betting 27.88798675148008 to more than 2.5 goals
Supporters39 Betting 27.88798675148008 to more than 1.5 goals halftime
Supporters39 Betting 27.88798675148008 to more than 2.5 yellow cards
Supporters40 Betting 18.638547366864188 to more than 5.5 corners
Supporters41 Betting 17.62492810124344 to Halftime Result2 - 3
```

Figure 10

Supporter 39 placed 5 bets, exact result 4-5, Real Madrid to win, More than 2.5 goals, more than 1,5 goals in the halftime and more than 2,5 yellow cards. The only bet of those 5 that he won was the Madrid to win, and he obtained the benefits from it. Supporters 40, and 41 also failed in their bets. As it can be seen comparing their bets with the reports from the match.

```
Supporters3 Betting 36.5445050910738 to Real more than 9,5% possession than Barca
Supporters3 Betting 36.5445050910738 to more than 3.5 corners HT
Supporters13 Betting 22.047989043452738 to Result5 - 3
Supporters20 Betting 42.161672854204774 to Result5 - 4
Supporters20 Betting 42.161672854204774 to Number of Yellow Cards HT0
I won!126.48501856261433
Supporters20 Betting 42.161672854204774 to MADrid having more corners
I won!42.161672854204774
Supporters20 Betting 42.161672854204774 Madrid to win
I won!42.161672854204774
Supporters20 Betting 42.161672854204774 to Barca more than 8,5% possession than Real in HT
```

Figure 11

In Figure 11 we can see another example of the same match, this time we see a lucky supporter who get 3 different bets, and a sort of other different bets that exist.

## Discussion and Conclusion

Creating this project was more challenging than all of the previous assignments, since this project was of a bigger magnitude, for example, error finding was more difficult because of the number of lines of code and coherence between all the agents. Additionally, the mixture between all different assignments and at the same time having individuality was challenging.

The creative idea was fun and interesting as always, we decided to take a different perspective again and do something that we have never done or seen before. We played between the personalities of the agents and their interactions. In general, the project was exciting and different, we learned how to combine different areas of the artificial intelligence agents like interactions with the FIPA protocol, also the coordination between agents, the use of utility functions and more.