ID2209 – Distributed Artificial Intelligence and Intelligent Agents

Project

Group 17

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2019.12.22

Introduction

The Main purpose of this project is to simulate a festival with different types of guests wherein we get to observe their interactions and behaviour as a result of their traits and personality values. When different agents meet in such a manner what would be the expected outcome? That is one of the prime questions we are trying to answer . In addition to their traits even the location where the agents meet can influence how they behave in the situation. We have used the concepts learnt and the source codes from the assignments in previous weeks as our base and to arrive at our conclusions we have monitored the results of the simulation as instructed. There are some minimal requirements to be met in order to pass and we have implemented the solutions for the same.

In addition to the first question we have also implemented the Challenge for simulating Belief,Desire and Intentional behaviour which takes us deeper into concepts of formalization of intention from an agent. We have also included a creative addition to this festival which will be described later in the report.

Approach

Festival Personalities- The Agents

The minimal requirements states the involvement of atleast 5 types of Festival Guests for which we have chosen the following actors with their colours listed in brackets :

1. The Normal(Green): Chill,unassuming just a generic festival goer who doesn't really want any trouble and there to have a good time. This agent will be like the basis for all the other agents behaviours as they are the neutral ones. They might be up for interactions with anyone given the right attribute values.
2. The PartyEnthusiast(White): The loud and crazy wildchilds at every festival who just want to have an insane time raving. Hard to miss their energy and hard to avoid them completely too!! Find them at the watering holes or the party places.
3. The Chill People(Dark Gray) : The right amount of cool can be found in these guests. They are there for the music and just having a peaceful time, can find them in all the zones except for party areas as they would like a mellow evening. Wont get into any arguments or issues with other agent types for sure.
4. Gambler(Black) : With an addiction to making a quick buck and blowing their savings, gamblers just cannot help themselves and we have created a gambling area to accommodate their needs, will mostly not venture out of this for anything but food probably.
5. Weirdos(Red) : True to their name weirdos are the ones whose behaviour can never be predicted. They are in their own zones when it comes to experiencing any event and in terms of interactions you will never know what you get with them and we have tried to simulate this randomness as much as possible.

In addition to these agents we have created the following areas for them to meet and interact in- PartyPlace(Red) where the music,dancing and general revelry takes place, Drinks_Chill_Place(green) A chill spot which consists of a pub for drinking and just lounging about and passing out, FoodCourt(yellow) food options for the festival goers, GamblingArea(blue) for the casino kind of setting where guests can enjoy some gambling if they wish.

We have allotted the traits to quantify generosity,Wealthy and talkative behaviour exhibited by the agents. Based on a combination of utility values of the traits and the location they are interacting in the nature of the agents interactions will differ. The agents will be communicating with one another using the FIPA protocol.

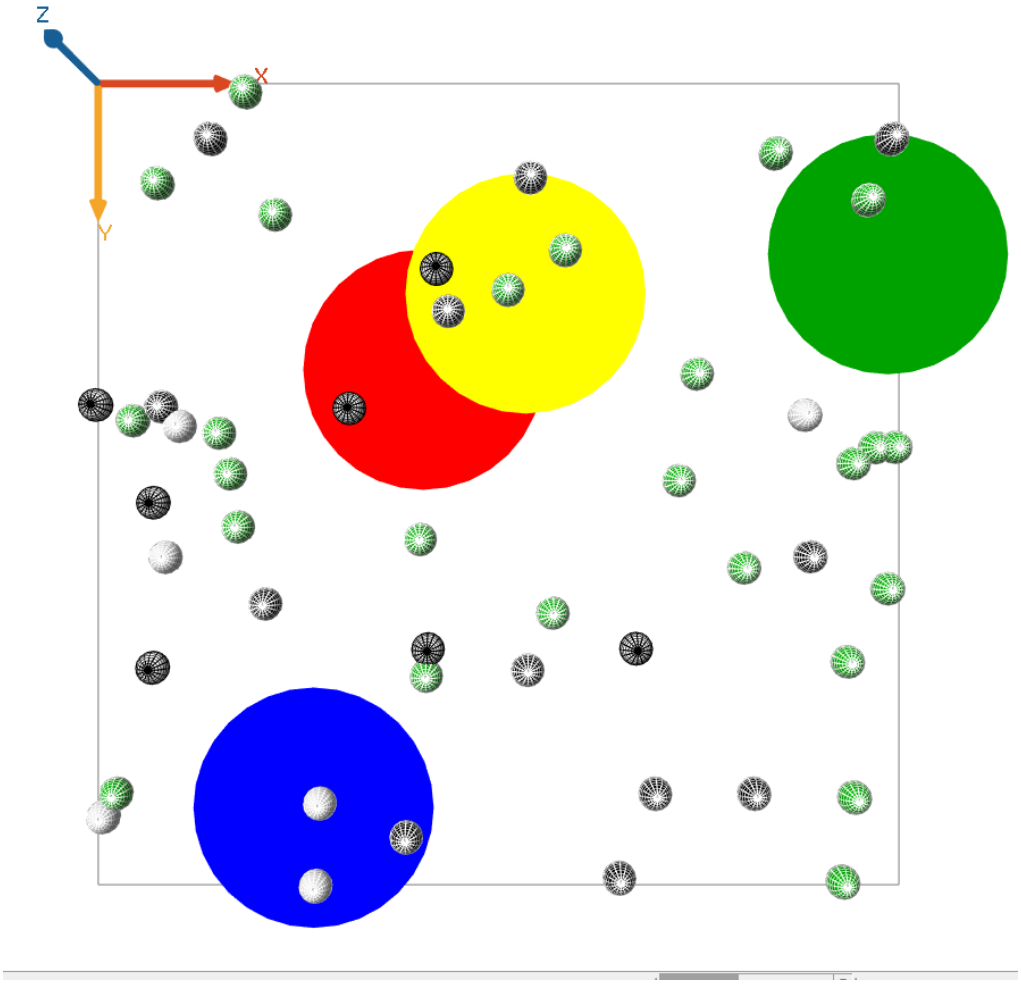


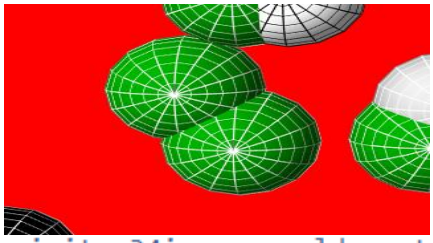
Figure 1: The layout for the festival with the agents and the regions of interaction

Interactions Described

Below we describe the interactions for our different agents on the basis of the area they are in,attributes of the interacting agents and their overall agent type.

The Normal:-

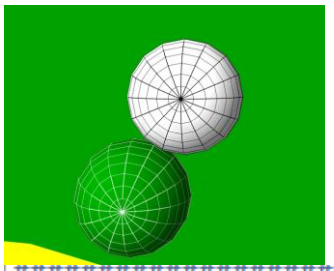
1. Party Area- a normal guest will be up for partying if the guest interacting with them has a generosity level greater than 5 and is not a weird guest. If the guest approaching them is another normal guest then they are at their happiest with a happiness level of 9 and for any other user they are in between. The guest informs the agent that they are not interested if they are of the type weird.



visitor34is anormaldoesnt want to party with normalwhose type is normal

Figure 2:Snapshot of normal agent partying with another normal agent and the log for the same

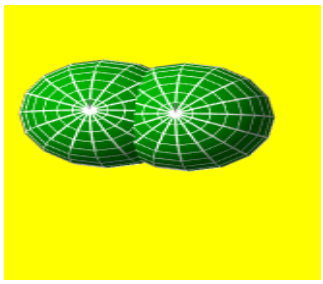
2. Chill Area- A normal guest is down to chill given that the approaching guest is not too wealthy and is not a weirdo. The wealthy rating should be less than 5 following which they are ready to chill.



visitor40is anormalchilling with chillPersonwhose type is chillPerson

Figure 3:Snapshot of normal agent chilling with a chill agent and the log entry for the same

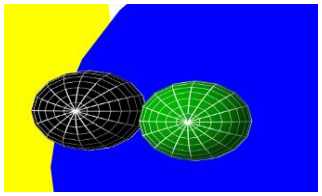
3. Food Area- When it comes to food the normal guests prefer to eat with their own type and are not open to eating with other agents regardless of their attribute values.



visitor4is anormalhaving food with normalwhose type is normal

Figure 4:Snapshot of normal agent having food with another normal agent and the log entry for the same

4.Gambling Area- When it come to gambling regardless of the agent who they are interacting with the normal guest will be ready to gamble as long as theirs and the guest interacted with's wealth attributes are greater than 5.

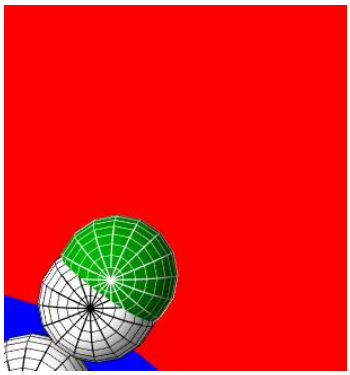


visitor44is agamblerdoesnt want to gamble with normalwho is not wealthy enough

Figure 5:Snapshot of normal agent getting rejected by a gambler

The Party Enthusiast:-

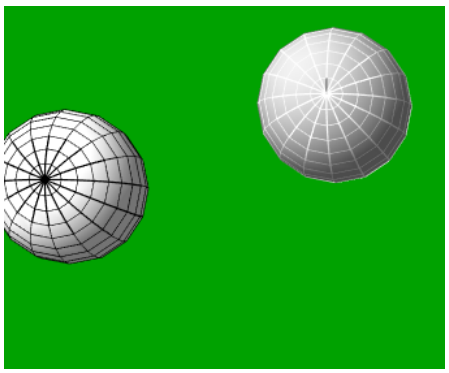
1.Party Area-The party enthusiast is up for partying with all types of agents given that their Generosity and talkative traits are high. If this is not satisfied they would rather party on their own.



visitor31 is a partyEnthusiast who doesnt want to party with visitor 9 a normal who is less generous and less talkative.

Figure 6:Snapshot of party enthusiast rejecting a normal in the party area

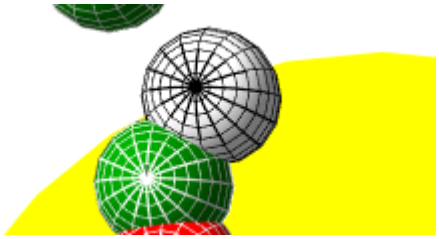
2.Chill Area- The party person will chill and have a drink with someone whose generosity is high given that they are not a weirdo or a gambler.



Visitor8 is a partyEnthusiast who doesnt want to chill with visitor 24 a chill person who is less generous and less talkative.

Figure 7:Snapshot of party enthusiast rejecting a chill person in the chilling area

3.Food Area-Similar to the normal crowd party people prefer to have food with their own and in this case they agree only if the other agent is a party person.



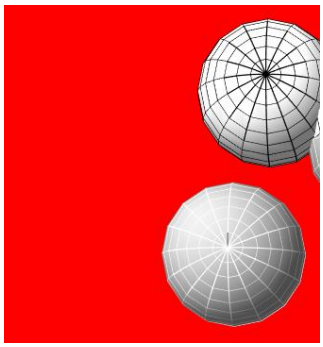
```
Visitor 21 is a partyEnthusiast and doesnt want to have food with visitor 46 whose type is normal
```

Figure 8:Snapshot of party enthusiast rejecting the offer to eat with normal guest

4.Gambling Area- The party guest will be up for some gambling only if they themselves and the guest requesting are wealthy enough i.e wealth>5.

The Chill Person:-

1.Party Area- The chill person is not up for a party and would rather keep it mellow, so they will not enter the party area with any other agent.



```
visitor0is a chillPerson and is not one for partying too much.
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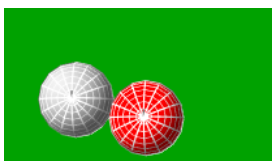
Figure 9:Snapshot of chill person rejecting the idea of partying

2.Chill Area- In their zone the chill person is ready to chill and have a drink with all agents regardless of their type or attributes.



```
Visitor 48is a chillPerson chilling with visitor 25 whose type is weird.
```

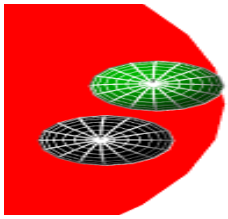
Figure 10:Snapshot of chill person rejecting the idea of partying

3.Food Area-Chill agents will have food with only other chill agents continuing the trend being followed in this area for all agents.

4.Gambling Area- Chill agents will be up for gambling with agents that are relatively wealthy but not too much, however they need to be very rich themselves(wealth>6) in order to consider it.

The Gambler:-

1.Party Area- The gambler will party given the agents generosity is high and they are not a weirdo.



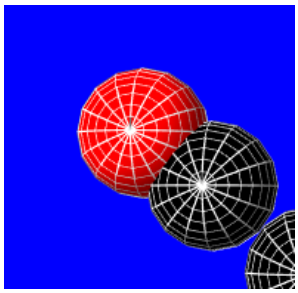
visitor47is a gambler partying with visitor 4 whose type is normal

Figure 11:Snapshot of party enthusiast rejecting the offer to eat with normal guest

2.Chill Area- True to their style the gambler will be up for chilling only if the agent's wealthy trait is high and they are not a weirdo. In addition to this however the gambler himself should have a wealth rating of 0 to accept the invitation to chill.

3.Food Area-Gamblers will enter the food area and have food only with other gamblers.

4.Gambling Area- When it comes to gambling both the gambler and the agent should be equally wealthy in order to gain the gambler's interest to play.Regardless of the agent type the gambler will be ready to play if this condition is satisfied.



Visitor 49 is a gambler gambling with visitor 41 whose type is weird and who is wealthy

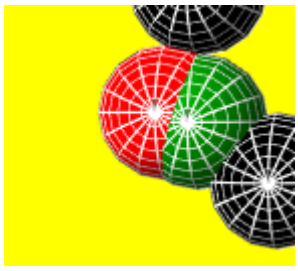
Figure 12:Snapshot of gambler engaging a weird type who is wealthy

The Weird:-

1.Party Area- Weird people are happy at the prospect of being invited to a party regardless of who it is. As a result they accept the proposal to party from any agent with any set of attribute values.

2.Chill Area- Same as when it comes to partying the weird crowd is always down for chilling with any agent regardless of their type or attribute values.

3.Food Area-Weird guests will have food only with other weird guests and not any other agent despite any trait values they might have.



```
visitor41 is weird and doesnt want to have food with visitor 5 who is normal
```

Figure 13:Snapshot of weird type visitor rejecting the normal guest for eating together

4.Gambling Area- The weird ones display some tact when it comes to gambling and they refuse to gamble with any but the wealthy agents regardless of the agent type that they are.

The Challenge: Belief Desire Intention Behaviour in Agents

We are using BDI in our challenge part of the project. It is a very useful model which defines the flow of the actions in any project. It is the concept of distributed AI which tries to bring human behavior in the agents. We have implemented a very basic model of BDI which covers its architecture consisting of it different behavior structures. We have information of the agent's desires and we need to complete those using the model. Everytime a desire is generated by an agent we use update desire action to add the desires. Perception behavior structure is used to form the belief base. we write perceive statements to store the information of the location of the party place, chilling places, gambling places and food places. Now we have desire and the location of the place where the visitors wishes to go. Next step is completing the intention. Here we use plan behavior structure of BDI. Plans are written for every intention. Following steps are followed to implement plan structure.

1. Main goal of the plan structure is to update the target location of the visitor. Firstly, it checks if the target is nill. If true, we have added a subintenstion to take values of the location from the belief and set target of the visitor to complete its intention and remove the intention.
2. If initially the target is not nil, we give command as go to target, once the desire is satisfied we set the target to nil and let the visitor think of another desire.

```
visitor16has intention to go towards food location
visitor17has intention to go towards party location
visitor18has intention to go towards party location
visitor19has intention to wander
visitor20has intention to go towards chill location
visitor20has chilled and thinking of other desire
visitor21has intention to wander
visitor22has intention to go towards party location
visitor23has a belief for party location
visitor23has intention to go towards party location
visitor24has intention to go towards food location
visitor25has intention to go towards chill location
visitor26has intention to go towards food location
visitor27has intention to wander
visitor28has intention to go towards food location
visitor29has intention to go towards food location
visitor30has intention to go towards party location
```

Figure 14:Snapshot of logs to show BDI being implemented

First statement in the figure which says visitor16 has intention to go towards food location. It means that the visitor first has belief of the food place location and now it has a target set to complete its intention.

If we see line number 6th in the figure which states visitor 20 has chilled and thinking of other desire. Here the visitor has completed his desire of chilling at the drinks and chill place and now has its target set to nil, so that he can think of next desire.

Line number 9 which states visitor 23 has a belief for party location. That means the visitor knows where the party place is and now he needs to set his target as the party place location and go towards it.

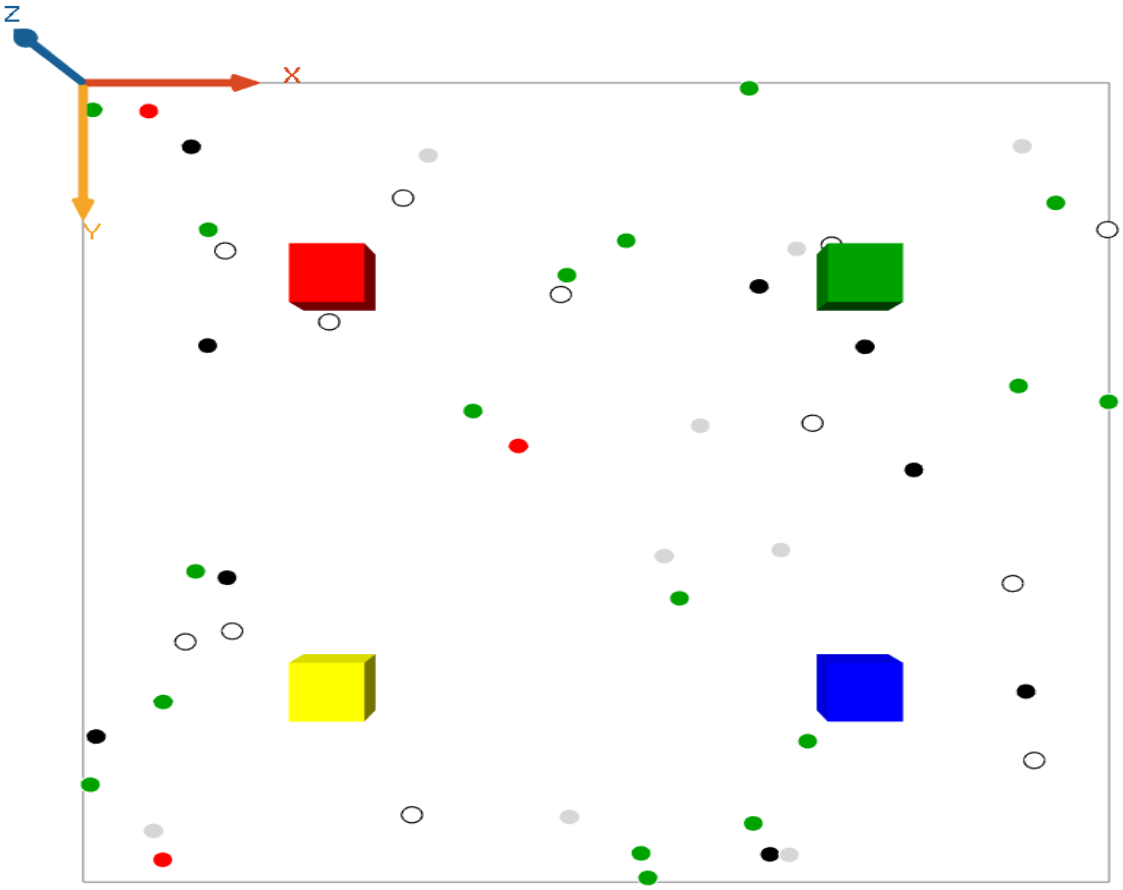


Figure 15:Map Layout for implementation of BDI

Creative Idea – Gambling Pays

The creative we have decided to implement is rewarding the ones who take the chance of gambling and go all the way and win the maximum jackpot to get the prize. The prize in question is free passes to a special VIP festival event which would cost a fortune to buy individually and also be hard to get as there are very limited of such passes.

Additionally we have implemented BDI on top of the prize so that the beliefs of the winners on winning the prize is set to them viewing this special concert and it gets translated into a desire which eventually gets acted upon as an intention.
The map setup for this scenario is as shown below:-

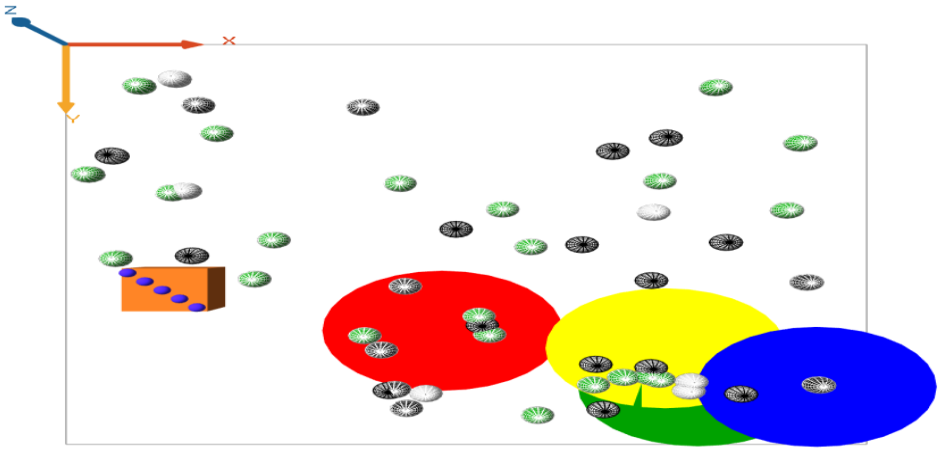


Figure 16:Map of the Creative Scenario with the square representing the Winners festival.

Experiments and Results

For the base code where it is just the interactions between the various types of agents at the festival it is seen that as a general marker that happiness is at a maximum generally for agents when they are performing activities or hanging out with other agents of the same type. There are some cases as mentioned in approach where the happiness would increase on being approached by different type of agent. To visually display this variation in happiness over time we have plotted a graph for the same which is as follows :-

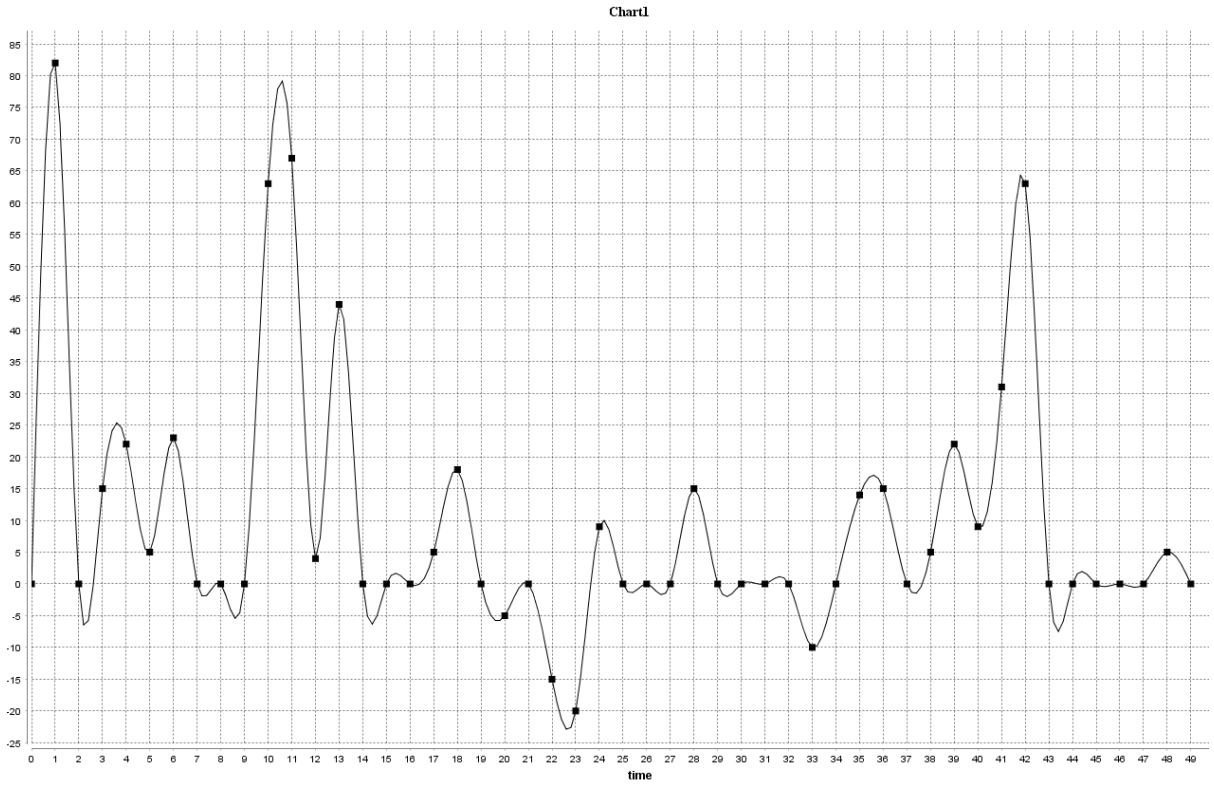


Figure 17:Measuring the Happiness as function of time.

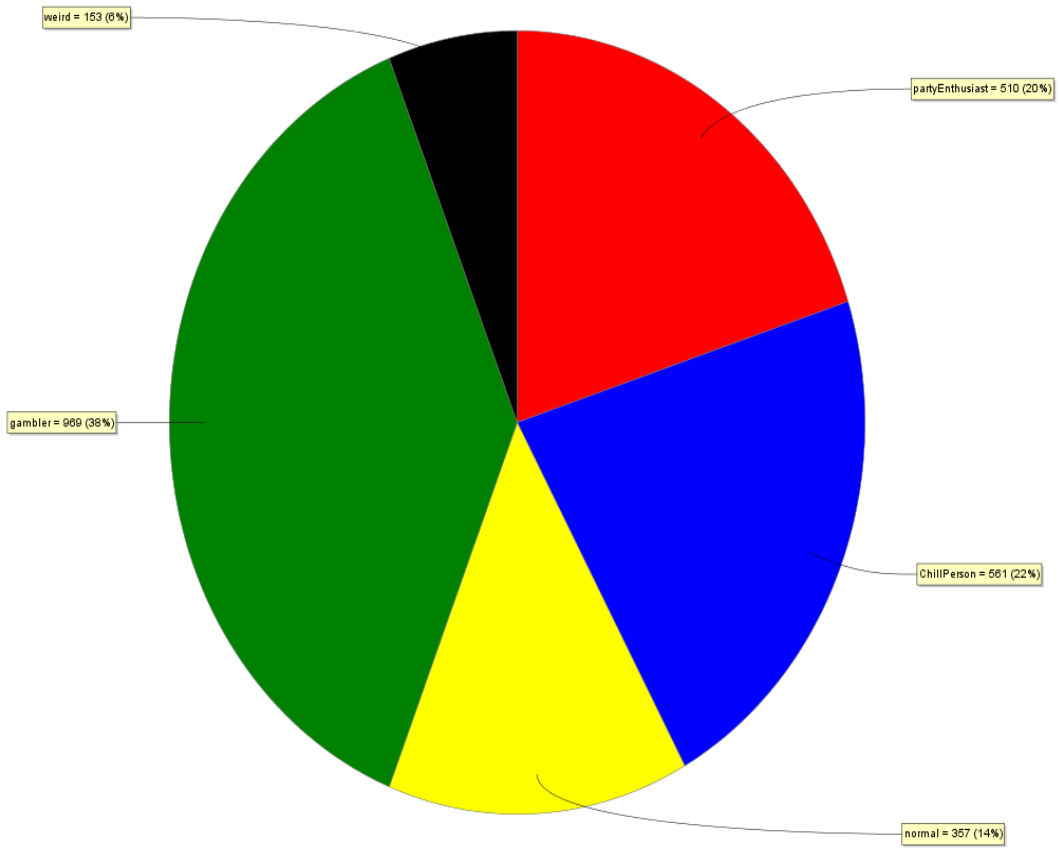


Figure 18:Distribution of the Festival Crowd.

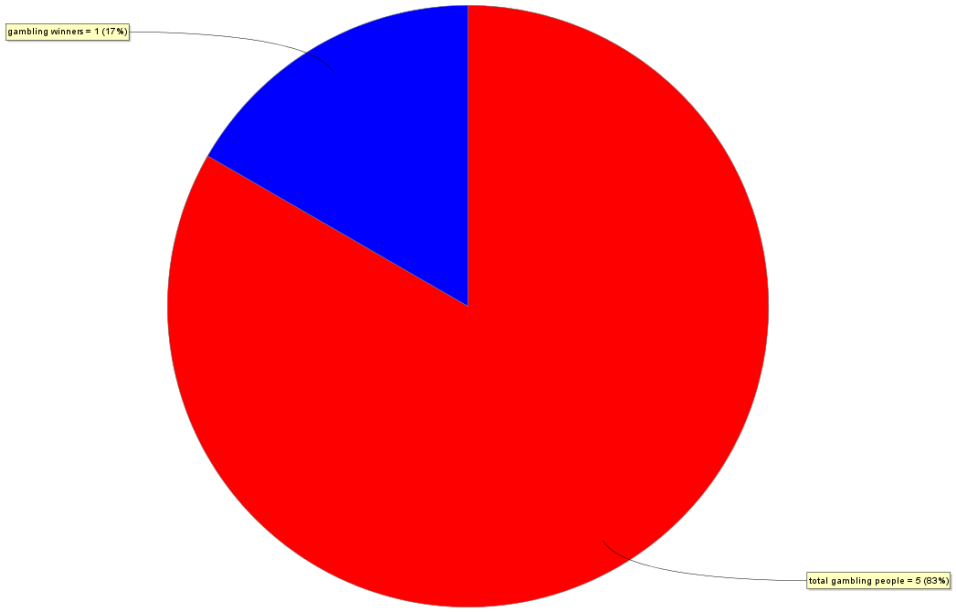


Figure 19:Distribution of the Gambling winners.

Discussions and Conclusions

The project was truly challenging mainly in part due to the sheer complexity of visualising and understanding how each interaction can take place and what path it leads on each essentially creating its own flow of events. In a way it reminded us of how AI is implemented at a simplistic level in video games such as RPG players.
The project was an amalgamation of all the concepts we picked up over the course of the assignments and it really is incredible to now look back and see how far we have come from our understandings of the fundamentals of GAMA using the Wiki.

This has now given us confidence in foundational concepts of Distributed AI and hands on expertise for the same. We have been able to observe over the course of the assignments and now the project that agents behaviour is not always as straightforward as we expect it to be as its not merely feeding our input and awaiting an expected output like we are used to,we see the negotiations and protocols at use for the same. With the help of examples from the GAMA wiki we were able to implement the BDI behaviour in agents and it was quite interesting to see how this kind of behaviour very much mirrors how we approach our daily lives. It was our first time working on something of this scale and complexity and we sincerely hope we have done justice for the same.