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**GAP 321 – Module 11**

**Mall Simulation AI Final – Design Proposal Document**

The team is proposing the design of a Shopping Mall Simulation, where the player can place and remove features from a mall that the shoppers can indulge themselves in. The simulation will be based on an AI in the simulation, that will react dynamically to the player changing features in the mall. Players will fill the role of the mall manager, and be able to place and remove food vendors, rest areas, social areas, and various shops around the mall space. The goal of the player will be to design the mall in such a way that it will attract and maintain more customers and bring in a larger profit.

**Gameplay**

The mall will begin as an empty sandbox-like space, where the player will have an initial budget to build some features in the space. Features are locations that an AI customer can go to effect one of their many motives (See Mall AI Customers). These features will have an associated cost to them, with the player having to spend some of their initial budget. Better features will have a higher associated cost to them. In addition to the cost of the feature, some features might have an income associated with them for whenever an AI customer interacts with them. Some example features might be:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Motive | Feature | Cost | Commodity | Income/Customer |
| Rest | Bench | $ 50 | 10 Energy | $ 0 |
| Rest | Massage Chair | $ 150 | 25 Energy | $ 3 |
| Rest | Massage Table | $ 250 | 40 Energy | $ 8 |
| Food | Hot Dog Stand | $ 100 | 10 Hunger | $ 3 |
| Food | Taco Bar | $ 300 | 25 Hunger | $ 9 |
| Shop | Clothing Outlet | $ 1,750 | 15 Shop Desire | $ 59 |
| Shop | Fancy Pant-sy | $ 2,825 | 30 Shop Desire | $ 180 |
| Decor | Fountain | $ 500 | 15 Social | $ 1 |

Of course, these are examples and all values will be tunable by the designer. Some of these features may also provide dual utility – fulfilling two types or agent motives, like a massage parlor might provide rest and shop desire.

The mall will have a popularity level that will be related to the number of features the mall has, and how luxurious those features are. A higher popularity rate will increase the agent spawn rate per minute of the mall. The mall will have a designer tunable maximum population. The current population will have an effect on the customers within the mall, likely increasing their frustration as the mall becomes crowded.

The player themselves will be able to select any agent within the mall and “watch” their motives, traits, and current state of the agent. They will also be able to cycle through a list of placeable features and place them within the mall space, if they can afford the cost of the feature.

**Mall AI Customers**

The mall AI will use a combination of utility AI and a form of state machine. The agent will enter/spawn into the mall with a series of (tunable) randomized motive values, such as, hunger, energy, or frustration. These motives will provide a utility score for the desired action the agent wishes to take. The agent will then take an action based on the score of its motive and the weight of its traits, as each agent will desire certain motives over others. This utility system will be based heavily on the utility system defined in the contents of the EGrover\_321\_Technical\_Doc that is attached.

When an agent reaches its destination, it will enter into a state relating to that destination. An example: When an agent enters a shop, it would enter a shopping state with a state-enter condition of b-lining to a random part of the shop, a state-update condition of wandering throughout the shop, and a state-exit condition of paying at the register.

Agents will have a series of Motives and Traits that will define an agent’s behaviors. Motives are the ‘stats’ of an agent/shopper, and a trait is something unique to the shopper that affects these motives. These might include:

* Energy – Amount of rest needed by the agent.
  + Insomniac’s may not care about their energy trait as much.
* Hunger – Amount of food needed by the agent.
  + Gluttons may care about their hunger much more than other things.
* Frustration – How much the agent wants to leave the mall.
  + Irritable may get frustrated more quickly.
* Money – How much currency the agent has left to spend.
  + Penny-pincher might be less willing to spend money.
* Shop Desire – How badly the agent wants to shop.
  + Shopaholic might desire varieties of shops.
* Social – How much the agent wants to socialize.
  + Introvert may avoid social situations.

Agents will leave the mall when they have run out of money to spend in the mall, if they do not desire a free service such as socializing or resting. Every time an agents desired action is not possible, a small amount of frustration will be added to the agent, until the agent decides to leave. Agents will maintain a list of the places they have been, and that will restrict the agent from visiting that location again, possibly within a tunable timeframe. The AI be able to navigate around the mall, dynamically, to avoid obstacles, navigate to newly placed shops and handle the removal of shops.

**AI Debug Feature**

There will be a tool that will allow a developer to spawn an agent into the mall at a selected location with custom traits and motive values. The tool will also allow the developer to select an agent and tune its current motives, money, and traits, or event de-spawn the agent entirely.

**Stretch Goals**

* Allow the mall to be expanded for a fee, increasing the build space and the population cap.
* Create a “billing” cycle, where after a set time, the mall must pay bills based on the number of features within the mall, creating a “lose” condition if the player goes into a negative balance.