Public Transport Mobility Simulation

APP USER MANUAL

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1. Overview

Welcome to the City Simulation Python Script, a versatile tool for simulating the complex interactions between buses, bus stops, passengers, and urban disturbances. This comprehensive guide will delve into the script's structure, functionality, customization options, and guide you through a step-by-step understanding of the provided use case.

2. Script Structure

2.1 City Class

The City class represents the city's layout, incorporating a grid system to model roads and a list of bus stops. It includes methods to disconnect and repair roads, allowing dynamic changes to the city's infrastructure during the simulation

2.2 BusStop Class

The BusStop class models individual bus stops, featuring coordinates and a list of passengers waiting for buses. It provides methods to add, remove, and board passengers onto buses.

2. Script Structure

2.3 Passenger Class

The Passenger class encapsulates the behavior of individual passengers, including their origin, destination, current location, and mode of transport. Passengers dynamically switch between walking and taking the bus based on certain conditions.

2.4 PublicTransportVehicle Class

The PublicTransportVehicle class represents buses in the simulation. It has attributes such as a name, route, timetable, capacity, current location, and a list of passengers on board. The class includes methods for moving, breaking down, repairing, boarding, and disembarking passengers.

2.5 CitySimulation Class

The CitySimulation class serves as the orchestrator of the simulation. It manages passengers, vehicles, bus stops, disturbances, and facilitates the step-wise progression of the simulation. The class also includes methods for adding simulation states and plotting the simulation.

3. Simulation Steps

3.1 Understanding Simulation Steps

The simulation happens step by step, like snapshots in time. Each step is like a picture of the city moving. We can see passengers going places and vehicles following their routes.

3.2 Time in the Simulation

Imagine time as a conductor of a music band. Each step is like a beat in the song, showing how the city changes over time. Passengers get closer to where they want to go, and vehicles go on their journeys, making the city alive.

3.3 Passengers' Moves

Passengers do different things in the simulation. They choose whether to walk or take a bus and decide when to switch. It's like a dance of choices that makes the city interesting.

3.4 Surprises in the City

Sometimes, unexpected things happen, like roads getting disconnected or vehicles breaking down. These surprises make the simulation more exciting, just like unexpected moments in real life.

4. How to operate the App

4.1 Building a City

In this example, we create a city. Think of it like drawing a picture of a city on paper. We decide how wide and tall it should be, creating the roads and intersections.

4.2 Bus Stops: Important Places

Bus stops are like important spots in the city. They help passengers get on and off buses. We pick where these stops are, ensuring they help people move around efficiently.

4.3 Passengers: People in the City

Now, we add people - passengers - to the city. They start from one place and want to reach another. We decide where they start, where they want to go, and how they travel.

4.4 Vehicles: Moving Around

Vehicles, like buses, move on specific paths. We decide on these paths, guiding the vehicles through stops and turns. They become the main way people travel in the city.

4.5 Getting Ready for the Simulation

Now, we're ready to start the simulation. We create a story by bringing together the bus stops, passengers, and vehicles. It's like starting a play with different characters and scenes.

4. How to operate the App

4.6 Making It Real

We pay attention to making things real. Passengers have specific places to start and go to. Buses follow fixed routes. We start the simulation and see a busy city coming to life.

4.7 Watching the City Move

As the simulation begins, we watch how passengers and vehicles move. The city becomes dynamic, responding to surprises. This use case is not just a script; it's like watching a city come alive step by step.

4.8 Making It Your Own

You can change things in this example. Try different paths, add surprises, and see how the city changes. It's like having your own city to explore and play with.

4.9 Looking Closely

Keep a close eye on the simulation. See how the city changes, learn from it, and discover interesting patterns. It's like being a detective in a city full of stories.

4.10 City Life Unfolds

As we end the use case, we see the city's drama – passengers moving, vehicles following routes, and surprises happening. The simulation is like a play, and you're the audience watching the lively city unfold.

5. How to Run

Executing the simulation is simple. Run the script using a Python interpreter:

python v1_mas.py

As the simulation unfolds, real-time updates will be printed to the console, providing insights into the movements of passengers and vehicles and the occurrence and resolution of disturbances.

How to operate the script

4.1 Initialization Steps

Details the steps users need to follow to initialize the script, including setting up the city, bus stops, passengers, and vehicles.

4.2 Moving Elements

Explains how passengers and vehicles move within the city, considering walking, bus transportation, and decision-making processes.

4.3 Handling Disturbances

Describes how disturbances are introduced and managed in the simulation, adding an element of unpredictability.

4.4 Monitoring and Interaction

Discusses how users can monitor the simulation, interact with the evolving narrative, and potentially customize elements during runtime.

4.5 Conclusion of Simulation

Guides users through the conclusion of the simulation, emphasizing the analysis of results and insights gained from the simulated urban dynamics.

6. Animation

The script includes an optional animation feature for a more visual understanding of the simulation. After the simulation, a series of plots will be generated, visually displaying the status of each step.

7. Customization

The script is highly customizable, allowing users to experiment with different scenarios. Key parameters such as city dimensions, bus routes, passenger destinations, and disturbance probabilities can be adjusted to observe various simulation outcomes.

8. Troubleshooting

If any issues arise during execution, carefully review the script for proper syntax, class definitions, and variable usage. Additionally, ensure that simulation parameters are correctly specified to avoid unexpected behavior.

9. Results Analysis

After running the simulation, users can analyze the results by reviewing the printed updates, examining the animated plots, and considering the overall behavior of passengers and vehicles. This analysis can provide valuable insights into urban transportation dynamics.

10. Further Experimentation

Encourage users to further experiment with the script by modifying parameters, introducing new disturbances, or extending the city layout. By conducting multiple simulations with varied configurations, users can better understand how different factors impact the simulated urban environment.

11. Additional Features

The script can be extended with additional features, such as different vehicle types, advanced passenger behaviors, or interactive user interfaces. Developers can explore these possibilities to enhance the simulation's realism and complexity.

12. Conclusion

The City Simulation Python Script offers a rich and interactive environment for exploring the dynamic interactions within a simulated urban setting. By experimenting with different configurations, users can gain valuable insights into how passengers and vehicles navigate the intricacies of the city.

Thank you for choosing the City Simulation Python Script! Should you have any questions, encounter issues, or seek further assistance, our support team is ready to provide guidance. Enjoy your simulation journey!

Thank you
for you

ATTENTION