FlowLogic: Traffic Flow Simulator

Sprint 3 Planning

Team 18: Colin Lappin, Dominic DeLuca, Isaac Hallman, Dylan Mitchell

Sprint Overview

During this sprint, we will be polishing the simulation so that it runs smoother and more efficiently. Once this is done, we can work on extra features to make the simulation more applicable to everyday life. Additionally, we will be adding a few things from the last sprint that were missed due to time constraints.

Scrum Master: Colin Lappin

Meeting Plan: Tuesdays & Thursdays @ 9:30 am (ZOOM)

Tuesday @ 1:30 pm (W/ Project Coordinator)

Risks & Challenges

What will make this sprint challenging is that a majority of the program requires the robustness of the simulation. Without the simulation working properly, nothing else can function. For this reason, we need to balance the time we spend implementing new functions and ensuring the correctness of the simulation.

Current Sprint Details

User Story #1

I would like to see statistics from the traffic simulation so that I can perform an analysis of my layout.

#	Description	Est. Time	Owner
1	Implement a front-end option to record statistics	3 hrs	Isaac
2	Record statistics during the simulation processing	3 hrs	Isaac
3	Process and analyze statistics	3 hrs	Isaac
4	Implement front-end statistics display	3 hrs	Dylan
5	Test statistics	2 hrs	Dylan

Acceptance Criteria:

1. At the start of a simulation, the user should be able to select an option to view statistics.
2. Statistics are recorded in the backend during simulation runtime.
3. Statistics should show up after the simulation is done running.

User Story #2

I would like to receive suggestions on my layouts so that I can improve on them.

#	Description	Est. Time	Owner
1	Implement the front-end suggestion button	2 hrs	Dylan
2	Create suggestions based on data metrics	4 hrs	Dylan
3	Implement suggestion cases	4 hrs	Dylan
4	Test suggestions	3 hrs	Dylan

Acceptance Criteria:
1. The user should be able to select a suggestion button to receive suggestions while in simulation mode.
2. The suggestions should be based on the recorded statistics.
3. The suggestion should help improve one of the statistical metrics.

User Story #3

I would like to be able to simulate rush hour periods.

#	Description	Est. Time	Owner
1	Implement front end option to simulate rush hour	3 hrs	Isaac
2	Modify the simulation to spawn cars more often	3 hrs	Colin
3	Modify the simulation to increase congestion	3 hrs	Colin
4	Test Rush hour	2 hrs	Dylan

Acceptance Criteria:
1. At the start of the simulation, the user should be able to select whether or not it will be a "rush hour period" or not.
2. If it is a rush hour period, the cars should spawn more often.
3. If it is a rush hour period, the cars should be more congested (closer to each other)

User Story #4

I would like an undo button.

#	Description	Est. Time	Owner
1	Implement Undo stack	3 hrs	Colin
2	Implement front end Undo button	3 hrs	Colin

3	Implement saving of grid states	3 hrs	Colin
4	Implement Undo functionality	3 hrs	Colin
5	Visually test undo functionality on the grid	2 hrs	Colin

Acceptance Criteria:

1. The user should be able to place a road and then immediately select undo to remove that road
2. The user should be able to remove a road and then immediately select undo to replace that road
3. The user should be able to undo up to ten previous actions

User Story #5

I would like to adjust the speed of the simulation so that I can run real-time or accelerated scenarios as needed.

#	Description	Est. Time	Owner
1	Implement the front end slider for simulation speed	3 hrs	Colin
2	Implement back end speed changes with slider	3 hrs	Colin
3	Visually test speed changes	2 hr	Colin

Acceptance Criteria:

1. The user should see an option that allows them to select the speed of the simulation
2. When the simulation is run at a higher speed, the cars should move faster.
3. The user should be able to change the speed of the simulation while it's running.

User Story #6

I would like to be able to drag and drop crosswalks onto the grid

#	Description	Est. Time	Owner
1	Create and add image file for crosswalk object	2 hrs	Isaac
	Create class for crosswalk	3 hrs	Isaac
	Implement crosswalk functionality into frontend and backend	3 hrs	Isaac
	Test crosswalk functionality	2 hrs	Isaac

Acceptance Criteria:

1. The crosswalk can be dragged and dropped onto the grid
2. The crosswalk will cause cars to slowdown or stop
3. The crosswalk stays on the grid when a grid is saved/loaded.

User Story #7

I would like to receive an error message when I set up a simulation incorrectly or try to leave without saving my progress.

#	Description	Est. Time	Owner
1	Implement an error message when attempting to run simulation without an input road selected	2 hrs	Dylan
2	Implement an error message when attempting to run simulation without a parking lot placed somewhere	2 hrs	Dylan
3	Implement an exit button on the main menu	2 hrs	Dylan
4	Implement a confirmation message whenever the user tries to exit out of the simulation build screen	4 hrs	Dylan

5	Implement a new screen to select options when starting a simulation	3 hrs	Colin

Acceptance Criteria:

1. When the simulation is run without setting an input road an error message should be shown to the user.
2. When the simulation is run without creating a parking lot as a destination, an error message should be shown to the user.
3. There should be an exit button on the main menu, which causes the program to exit when clicked.
4. There should be a confirmation before leaving without saving your progress.

User Story #8

I would like cars to detect one another so that they can avoid crashing into one another.

#	Description	Est. Time	Owner
1	Implement detection of other cars	4 hrs	Dominic
2	Implement reaction to other cars	4 hrs	Dominic
3	Visually test car to car interaction	2 hrs	Dominic

Acceptance Criteria:

1. When one car approaches another it should slow down.
2. If a car is about to run into another car it should stop.
3. If a car is stopped behind another, it should only move once the car in front of it is out of the way.

User Story #9

I would like cars to properly interact with traffic lights during a simulation.

#	Description	Est. Time	Owner

1	Implement detection of stop lights in cars	3 hrs	Dominic
2	Implement stopping at stop lights in cars	3 hrs	Dominic
3	Implement release of cars at stoplights	4 hrs	Dominic
4	Visually test stop lights	2 hrs	Dominic

Acceptance Criteria:

1. When a car approaches a red light, it should slow to a stop.
2. When the light turns green, cars waiting at the light should proceed through.
3. When a light is green, a car approaching at full speed should continue through the intersection as normal.

User Story #10

I would like the design of cars to change based on size.

#	Description	Est. Time	Owner
1	Add image files for multiple different size ranges	2 hrs	Isaac
2	Implement image changing based on size on the backend	2 hrs	Isaac
3	Implement image changing on the front end	2 hrs	Isaac
4	Test car design changes	2 hrs	Isaac

Acceptance Criteria:

1. The car changes design based on car size.
2. There are multiple designs the car could be.
3. The car design is consistent for a given car throughout the simulation.

Sprint 2 - leftover subtasks and acceptance criteria

User Story #9

 I would like to be able to add roundabouts.

3	Update functionality to work for two way roads	6 hrs	Dominic
4	Test roundabout functionality	2 hrs	Dominic

Acceptance Criteria:

1. The roundabout correctly expands to allow for two-way roads.

Total Hours

Name	Hours
Dominic	30
Isaac	30
Dylan	30
Colin	31

Remaining Backlog

Functional Requirements

As a designer,

1. I would like to have a grid-style canvas that I can build on
2. I would like to drag and drop roads onto the grid
3. I would like to adjust intersection types so that I can control traffic flow.
4. I would like to be able to adjust the amount of people going to each building so that I can simulate a realistic environment.
5. I would like to place parking areas with different parking capacities.
6. I would like to configure traffic light timings so that I can test different strategies.

7. ~~I would like to be able to simulate traffic flow so that I can view how my layout would work in a real world scenario.~~
8. ~~I would like to be able to import saved layouts so that I can see other's work.~~
9. ~~I would like to be able to export saved layouts so that I can share my work with others.~~
10. <mark>I would like to see statistics from the traffic simulation so that I can perform an analysis of my layout.</mark>
11. <mark>I would like to receive suggestions on my layouts so that I can improve on them.</mark>
12. ~~I would like to adjust speed limits on roads.~~
13. ~~I would like to be presented with a menu when I open the app.~~
14. ~~I would like to be able to adjust the width (# of lanes) on roads.~~
15. ~~I would like to adjust the direction from where traffic flows in the simulation.~~
16. ~~I would like an adjustable-sized map for different size layouts.~~
17. <mark>I would like to graphically view statistics.</mark>
18. ~~I would like to be able to edit and remove roads.~~
19. ~~I would like to be able to edit and remove buildings.~~
20. ~~I would like roads to automatically snap together into intersections when they meet.~~
21. ~~I would like to be able to save layouts to my computer.~~
22. ~~I would like to be able to load my saved layouts to the simulation.~~
23. ~~I would like to view my saved layouts all in one place~~
24. ~~I would like to delete and rename saved layouts.~~
25. ~~I would like to name roads and buildings within a layout, so that I can refer to them more easily.~~
26. ~~I would like to assign different types of vehicles to the simulation.~~
27. I would like to add pedestrian walkways and crosswalks if time allows.

28. ~~I would like to be able to add construction zones that impact traffic flow.~~

29. ~~I would like to be able to add one-way streets~~

30. <mark>I would like to be able to simulate rush hour periods.</mark>

31. I would like to be able to compare statistics between two saved layouts if time allows.

32. I would like to be able to set accident probabilities if time allows.

33. I would like to simulate special events (concerts, games, etc) if time allows.

34. ~~I would like to be able to add roundabouts.~~

35. I would like to be able to factor in emergency vehicles if time allows.

36. I would like to be able to add public transportation if time allows.

37. <mark>I would like an undo button.</mark>

As a viewer,

1. <mark>I would like to adjust the speed of the simulation so that I can run real-time or accelerated scenarios as needed.</mark>

2. ~~I would like to be able to simulate traffic flow so that I can view how my layout would work in a real world scenario.~~

3. ~~I would like to be able to import saved layouts so that I can see other's work.~~

4. ~~I would like to see statistics from the traffic simulation so that I can perform an analysis of my layout.~~

5. ~~I would like to be presented with a menu when I open the app.~~

6. ~~I would like to view my saved layouts all in one place~~

7. ~~I would like to delete and rename saved layouts.~~

Non-Functional Requirements

Architecture & Performance

As a developer, I want to

1. ~~Use the Java class system for backend development.~~
2. ~~Use JavaFX for frontend development.~~
3. ~~Use the Model-View-Controller Architecture, which separates the UI completely from the backend.~~
4. Handle a simulation of 20,000 cars in 5 minutes or less.

Usability & Accessibility

As a developer, I want to

1. ~~I want the grid objects to snap immediately to the grid when placed~~
2. Anyone to be able to learn the UI within 15 minutes
3. Run my application on any major OS (MacOS, Linux, Windows)

Security

As a developer, I want to

1. ~~Decrease my liability for security by keeping this app offline~~
2. ~~Allow the user to have full control over file sharing~~