FlowLogic: Traffic Flow Simulator

Sprint 2 Planning

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

Sprint Overview

During this sprint, we will be developing the simulation system for the app. This includes the car control system as well as the actual simulation rendering with frames and steps. Additionally, we will be re-implementing a few things from the last sprint.

Scrum Master: Isaac Hallman

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

Risks & Challenges

What will make this sprint tough is that a majority of the time will be spent working on the traffic simulator, but most everything else needs to be completed before work can begin on it. For this reason, it will be hard to coordinate when to begin work on that compared to the other parts of the project.

Current Sprint Details

User Story #1

As a designer, I would like to be able to adjust the width (# of lanes) on roads.

#	Description	Est. Time	Owner
1	Fully implement two lane roads	2 hrs	Isaac
2	Create a multi-lane road container class	3 hrs	Isaac
3	Refactor existing code to work with container class	2 hrs	Isaac
4	Add option to expand road (add lanes)	2 hrs	Isaac
5	Save multi-lane road container class to save file	2 hrs	Colin
6	Add multi-road class to the grid to graph	2 hrs	Dominic
7	Test two lane roads and communication of container classes	2 hrs	Isaac

Acceptance Criteria:

1. When two roads are placed side by side in the same direction, they are added to the multi-lane container.
2. When a lane is added to a road, it is added into the multi-lane container.
3. When a file is saved/loaded, the multi-lane container is maintained.

User Story #2

As a designer and a viewer, I would like to delete and rename saved layouts.

#	Description	Est. Time	Owner
1	Implement renaming save files in the backend	2 hrs	Dylan
2	Implement deleting save files in the backend	2 hrs	Dylan

3	Implement renaming save files in the frontend	1 hr	Dylan
4	Implement deleting save files in the frontend	1 hr	Dylan
5	Create JUnit tests for writing, reading, & renaming save files	4 hrs	Dylan

Acceptance Criteria:

1. When you click on a file in the load menu, an option to rename it or delete it will pop up.
2. If you select to rename a file, a dialog box should pop up asking you to rename it. When you enter a new name for the file, it should change in both the front and backend (i.e. in your local directory).
3. If you select to delete a file, it should disappear from the front and backend (i.e. in your local directory).

User Story #3

As a designer, I would like to configure traffic light timings so that I can test different strategies.

#	Description	Est. Time	Owner
1	Implement front end selection and options for traffic light objects	2 hrs	Dominic
2	Implement back end editing of traffic light timings	2 hrs	Dominic
3	Implement saving of light timings	2 hrs	Dominic
4	Implement unit tests	2 hrs	Dominic

Acceptance Criteria:

1. When you click a pre-placed traffic light option, an option to change traffic light timings should appear

2. When you select a new traffic light timing option, it should keep the changes after unselecting and reselecting the object
3. When you select a new traffic light timing option, it should be reflected in the simulation

User Story #4

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

#	Description	Est. Time	Owner
1	Add Hazard class	2 hrs	Isaac
2	Implement drag and drop for hazard	2 hrs	Isaac
3	Implement “fix road” option to remove hazards	2 hrs	Isaac
4	Add to grid-to-graph method	2 hrs	Dominic
5	Add hazard class to save file	2 hrs	Colin
6	Test hazard functionality frontend, backend, and save/load file	2 hrs	Isaac

Acceptance Criteria:

1. When you drag a hazard onto the road, it should stay after it is dropped
2. When a hazard is on the road, and the user selects “fix road”, the hazard should be removed visually
3. When a hazard is on the road, no cars should drive on it during the simulation

User Story #5

I would like to adjust the direction from where traffic flows into the simulation.

#	Description	Est. Time	Owner
1	Implement front end option to set road	2 hrs	Colin

	as a vehicle entry/exit road on the grid		
2	Implement backend entry/exit roads setting	2 hrs	Colin
3	Implement vehicle entry/exit road dispersion generation	2 hrs	Colin
4	Implement unit tests	2 hrs	Dylan

Acceptance Criteria:

1. When you select a road you can set it to be an entry-road (point of entry).
2. When you select a road you can set it to be an exit-road (point of exit).
3. When the dispersion function is run, vehicles are assigned (randomly) to different entry and exit roads.

User Story #6

I would like to name roads and buildings within a layout, so that I can refer to them more easily.

#	Description	Est. Time	Owner
1	Implement selecting whole sections of road	3 hrs	Dylan
2	Implement front end option of changing of road and building names	2 hrs	Dylan
3	Implement saving of road and building names	2 hrs	Dylan
4	Visually test road naming	2 hrs	Dylan

Acceptance Criteria:

1. When you select a pre placed road, the option to change its name should appear
2. When you select a pre placed building, the option to change its name should appear

3. When you submit the change to a name of a road or building, the name should be saved for later

User Story #7

I would like to assign different types of vehicles to the simulation.

#	Description	Est. Time	Owner
1	Implement the rest of the vehicle class	2 hrs	Isaac
2	Add movement methods for vehicles to move from road to road	2 hrs	Isaac
3	Add an edit menu to the roads to select what type of vehicles/average size will enter	3 hrs	Isaac
4	Create and implement vehicle image files	2 hrs	Isaac
5	Update save file implementation to add vehicles	1 hr	Dylan
5	Test vehicle functionality and visualizations	2 hrs	Dylan

Acceptance Criteria:

1. Users can select what the average size of vehicles should be.
2. The size of vehicles can change manually or automatically.
3. Vehicles can move from road segment to road segment in both the front end and backend grid.

User Story #8

As a designer, 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.

#	Description	Est. Time	Owner
1	Implement car pathfinding	3 hr	Dominic

2	Implement Simulation, Frame, and Step Classes	3 hr	Colin
3	Implement car driving logic	3 hr	Dominic
4	Implement intersection logic	3 hr	Dominic
5	Implement front end option to run simulation	3 hr	Colin
6	Visually test simulation	2 hr	Dylan

Acceptance Criteria:

1. When a simulation runs, a path for each car should be generated.
2. When a simulation runs, cars drive to their destinations.
3. When a simulation runs, cars should stop at their parking location.

User Story #9

I would like to be able to add roundabouts.

#	Description	Est. Time	Owner
1	Implement functionality for vehicle traversal	3 hrs	Colin
2	Update functionality to work for one way roads	3 hrs	Colin
3	Update functionality to work for two way roads	3 hrs	Colin
4	Test roundabout functionality	2 hrs	Colin

Acceptance Criteria:

1. The vehicle should be able to travel to the other outroads connected to the roundabout.
2. The vehicle waits for a spot to open in the roundabout before entering.

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

User Story #10

As a designer, I would like to adjust speed limits on roads.

#	Description	Est. Time	Owner
1	Implement front end option of changing of speed limits	2 hrs	Dominic
2	Implement saving speed limits	2 hrs	Dominic
3	Visually test speed limit editing	2 hrs	Dominic

Acceptance Criteria:

1. When the user selects a road, an option to change the speed limit appears.
2. When the user changes the speed limit for a road, it changes the speed limit for all connected roads between its two intersections.
3. When the user loads/saves a file, the speed limit stays consistent.

Sprint 1 - leftover subtasks and acceptance criteria

User Story #1

As a designer, I would like to have a grid-style canvas that I can build on.

1	Implement the grid to graph algorithm, updated for the new road implementation	3 hrs	Dominic
2	Implement unit tests	3 hrs	Dominic

User Story #2

As a designer, I would like to drag and drop roads onto the grid.

1	Re-implement 2 way roads to take up 2 spaces	2 hrs	Isaac

User Story #3

As a designer, I would like to adjust intersection types so that I can control traffic flow.

1	Implement the ability to change between each intersection type	2 hrs	Dylan
2	Test switching between different intersection types	1 hr	Dylan

User Story #5

As a designer, I would like to be able to edit and remove buildings.

1	Fix the updating parking capacity feature	1 hr	Dylan
2	Fix the building growing bug	1 hr	Dominic

User Story #6

As a viewer and a designer, I would like to be presented with a menu when I open the app.

1	Add a back button to the design screen and load screen	2 hr	Colin
	Test switching between menu screens seamlessly	1 hr	Colin

Total Hours

Name	Hours
Dominic	34
Isaac	30
Dylan	30
Colin	30

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. I would like to see statistics from the traffic simulation so that I can perform an analysis of my layout.
11. I would like to receive suggestions on my layouts so that I can improve on them.
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. I would like to graphically view statistics.
~~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. I would like to be able to simulate rush hour periods.
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. I would like an undo button.

As a viewer,

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

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