Virtual Reality Driving Simulator

designing a customizable driving simulator in Unity

Overview: Driving simulators are integral to conducting research on driving safety and human-vehicle interaction. However, the technical complexity, physical size and cost of driving simulators put them out of reach to most research teams. This project designed and created a low-cost, coding-free alternative to a traditional driving simulators inside a VR headset.

My role: I was the **Lead Research Assistant** on the project. My responsibilties included defining the scope of the project, ideating solutions, designing the task and prototyping the interface in Unity as well as managing four student team members.

USER RESEARCH

Identifying the Problem

The main goal of this preliminary research was to understand the motivations and pain points of the user as well as determine the different use cases of a driving simulator in a research setting.

User Interviews

We conducted four semi-stuctured with two professionals and two graduate students

Market Research

We read over 40 driving simulator studies to understand the different use cases and researched major manufacturers and software providers.

USER PERSONAS

Understanding the User

To understand who we were designing for, two user personas were created to synthesize what we had learned from the interviews and market research.. A shortened version of one user persona created for this project is displayed below.

Name: Wendy Ruthers **Age:** 24

Occupation: Psychology Masters Student at University of Michigan

> "I want to do simple things like have a car stop at a cross-walk without having to copy and paste code I don't understand."

Goals

- Create custom driving simulations based on research goals
- Customize car behavior in the simulation
- Run participants through

Pain Points

- Too many steps and mouse clicks to create custom car behaviors
- Not comfortable customizing example code or coding generally
- Physically getting to the simulator is hard to schedule

EXPERIENCE MAPPING

Creating a Driving Simulation

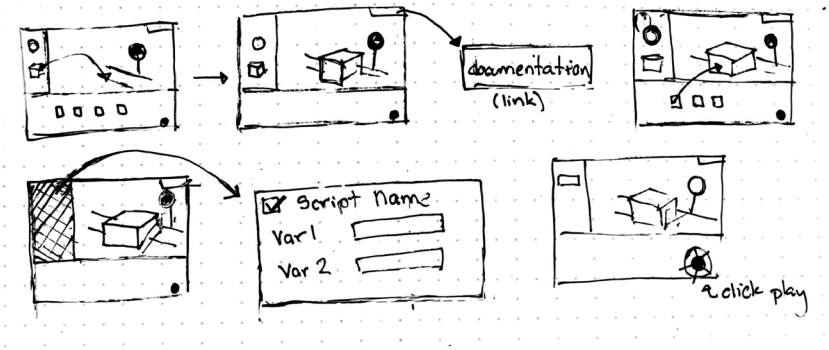
I observed a researcher create a simulation using SimVista, a common driving simulator software package. Displayed below is an abbreviated experience map describing the step to make a pedestrian cross the street when a car reaches a stop sign.

Customer Experience	Placing Ped	Nesting Path Object	Placing Trigger	Coding Movement + Interaction	Compiling
Touchpoints	Assets Panel Ped Subfolder Scene View	Assets Panel Hierarchy Window Asset Inspector	Geometry Window Scene View	Asset Inspector SimVista Text Editor	Scene View Compile Button
Thoughts + Feelings	▸ Rotating in Scene View is unreliable ▸ So many subfolders ▸ Forget where everything is located ▸ Hard to tell if pedestrian is floating or not	▸ "I always forget this step!" ▸ Hierarchy Window is cluttered ▸ Too many options and fields inside the Asset Inspector	▸ Simplest part of the whole process ▸ Dragging and dropping is easier than choosing X-Y-Z position	▸ So confusing deciding what example code to copy and paste ▸ "I'm always afraid I'm going to break everything with my code" ▸ Very repitive step - which there was a way to repeat this across all pedestrians ▸ Text editor doesn't tell you if you forgot a semi-colon	▸ Button is self-explanatory ▸ Compiling takes forever so making mistakes is extra time consuming

WIREFRAMING

Sketching a Design

Based on user feedback, I tested several designs that minimized the number of steps required to create a movement in the driving simulation.

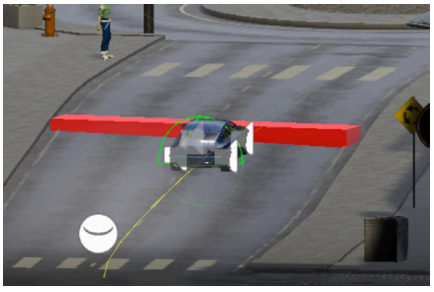


IMPLEMENTED DESIGN

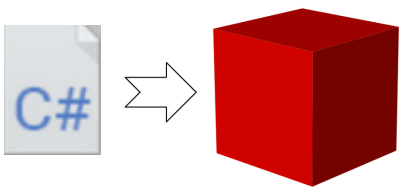
The Three Step Solution

After several rounds of usability testing with both paper prototypes and a low fidelity interactive application, a much simpler work-flow was developed. Instead of taking approximately eight step to create an interaction, users could create an interaction three steps.

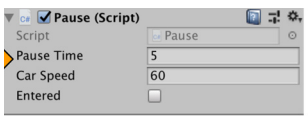
Step 1: Place Trigger



Step 2: Attach Prewritten



Step 3: Modify Variables



UrbanismX: Data Dashboard

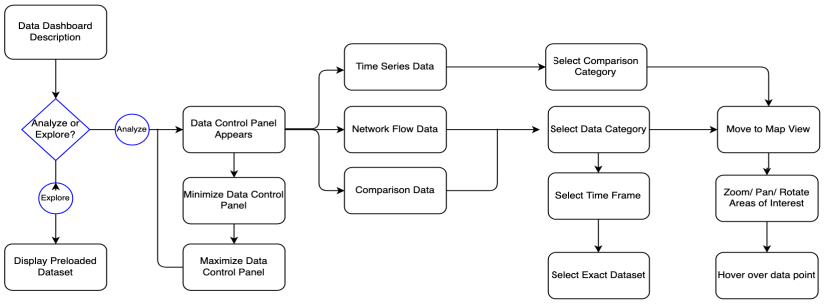
The Project

The UrbanismX research group at Tufts University had generated large transportation network data sets but needed to create a streamlined way to quickly view and understand this spatial data. Some datasets contained only point-based location data while other datasets involved network flow and change over time, so a universal visualization

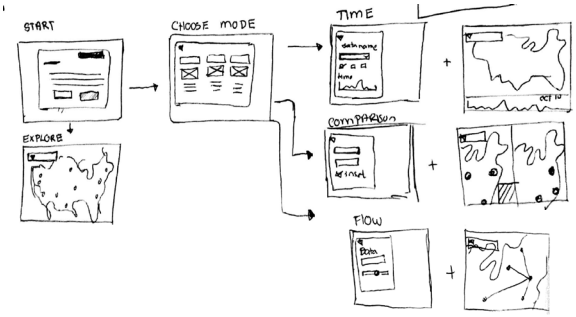
My Role

As a designer, I interviewed researchers and observed their current work flow to define the main features of the application. Once the project scope was defined, I designed user flow and created low-fidelity wireframes before developing an interactive prototype using React to test the data dashboard's usability.

Flow Diagram



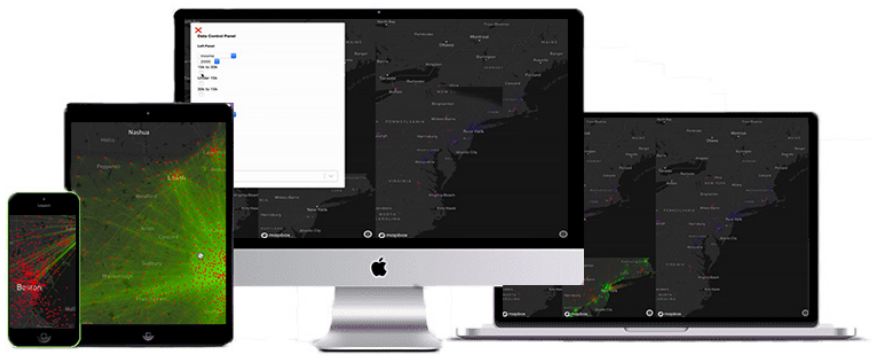
Sketches



Wireframe

The dropdown menus were interactive while the map was static. This model was used for an initial usability test.

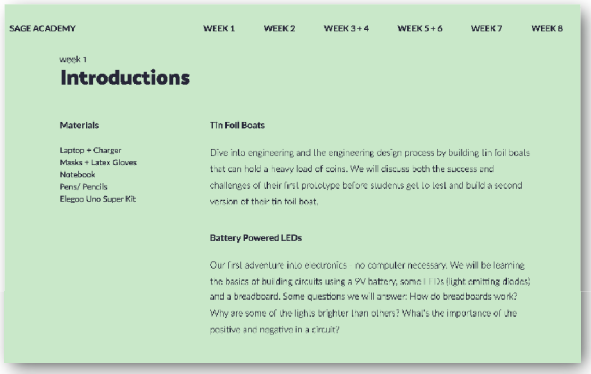
Interactive Prototype

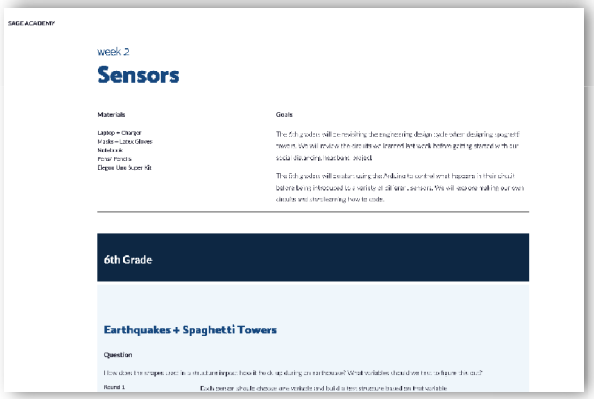


Selected Work

Sage Academy Website

A minimalist, grid-based website design for Sage Academy, a 6th and 8th grade homeschool. The website displays weekly curriculum summaries before expanding into more detailed lesson breakdown.





Mobile Login

Displayed below is the process to design the log-in page for a mobile applications. Shown are the initial sketch, low fidelity wireframe as well as the final design - made in Adobe Illustrator.