

COS426 Final Project: A Walk Down Nassau Street

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Abstract—This project aims to create a graphical representation of Nassau Street, specifically the following shops: Hamilton Jewelers, Starbucks, Landau, Tacoria, Princeton University Store, and Labyrinth Books. We include an avatar that can walk around on the sidewalk in front of the shops. The user may move the view down the street and take a closer look at the buildings and objects by zooming in or using mouse controls.

Index Terms—graphics, Three.js, JavaScript, assets

I. INTRODUCTION

A. Goals

A "Walk Down Nassau Street" (NS) is a 3D model of the buildings on Nassau Street, starting from Hamilton Jewelers and going down to Labyrinth Books. The user has three options for exploring the model: they can walk through the scene by controlling the camera using the arrow keys on the keyboard, following an avatar using the keys W, A, S, and D, and viewing the complete scene with a birds eye view by zooming out completely.

The purpose of this model is to allow users to explore this portion of Nassau Street to anyone interested in learning more about this area. We hope users will have fun playing around with the avatar and enjoy the first person camera point of view to walk down this virtual street. Long term, we hope this project can serve as a virtual tour of the areas surrounding Princeton for incoming students and their families. There's often a lot of emphasis on the Princeton buildings and the campus itself when it comes to providing tours and getting a sense of the four years those students will spend at the university, but we believe Nassau Street is also an important part of the Princeton experience and hope to share the beautiful scenery with everyone outside of the Princeton community.

B. Previous Works

For "A Walk Down Nassau Street," we were inspired by some examples offered as part of the Three.js documentation page. One of the projects, called "Littlest Tokyo" and created by user Glen Fox, offers an extremely detailed model of a Tokyo city block [1]. Another project in that same list provides a short demo of Minecraft, where the user can move through the space in the same first-person point of view as in the original game [2]. There were also a few demos which provided a panorama look of some buildings and streets [3]. Looking through these projects,

we were inspired to create a model of a city block which the user can navigate from a first-person perspective like in Minecraft.

Many of these projects are a lot of fun to explore and provide some familiarity for the user with a location that they might not already know very well. As we brainstormed potential places to model, we thought it would be a good contribution to this creative workspace to model an area near and dear to the hearts of many Princeton students in their four years here - Nassau Street. This adds a Princeton touch to the previous works focused on modeling different locations, providing a touch of familiarity for the Princeton community and introducing others outside of the community to areas near the University.

II. APPROACH

To display the three dimensional model of Nassau Street, we utilized Three.JS. As shown in Figure 1, our project is structured with app.js as the main file to control many aspects: in this file, we set up the SeedScene, renderer, camera, and animation. This includes loading animations which allow for the avatar to move around in the scene and for the camera to allow the user to both zoom in and out but also simulate moving down the street. The SeedScene.js file is responsible for displaying the scene which includes all the buildings and other objects like benches.

III. METHODOLOGY

A. Scene

Our Nassau Street model was built on top of the provided starter code including land and some basic camera and lights setup. The complete scene consists of a land, on which there is a road—Nassau Street—running down the middle, with sidewalk, buildings, and other small details on the right of the road.

B. Buildings and Other Objects

Because this model is Princeton-specific, all the buildings were created as meshes on our own as GLTF (Graphics Language Transmission Format) files using Blender. We used the Google Maps street view of Nassau Street as our main point of reference when creating the building models and determining the scale and shape of the objects. The benches, trees, and trashcans were created using tutorials on YouTube. To create the road and sidewalk surfaces, we used texture mapping in Blender.

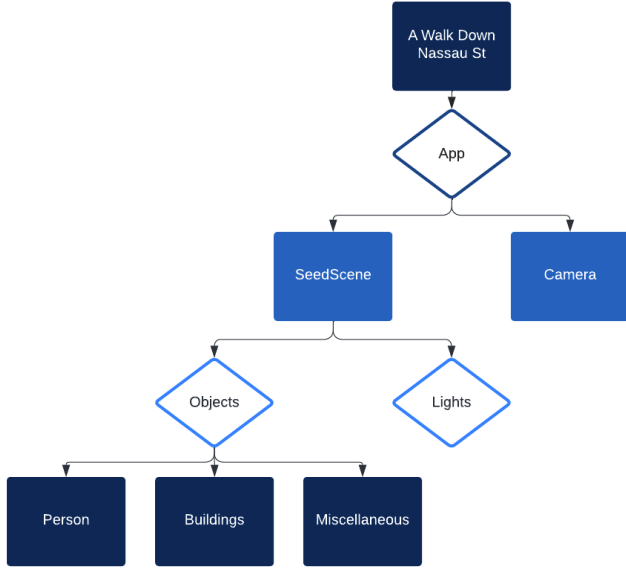


Fig. 1. Project Architecture

C. Camera and Navigation Controls

Initially, we utilized the existing orbital controls from the starter code. However, we were not very satisfied with only having the option to see the model from a birds-eye point of view, so we switched to a perspective camera so that it can simulate a third person point of view of the avatar. The user can control the camera by using the left, right, up and down arrow keys. The user can control the avatar using the w (move forward), s (move backwards), a (rotate left), and d (rotate right) keys. The perspective and character control was developed based on an existing Three.JS tutorial by SimonDev. In addition, we added functionality such that the camera follows the avatar as it walks.

D. Challenges

1) *Texture*: One challenge that we faced involved the creation of textures. Because every building is distinct, we had to create many different textures and materials. However, when we incorporated the meshes into the scene, the textures were not visible. We then repeated the process but applied UV unwrapping on the meshes. Although this process allowed us to view the new textures/materials, they are not as clean as before.

2) *Animation*: In terms of animating the avatar, we borrowed animations from the THREE.js tutorial, which were obtained from Mixamo. Specifically, we borrowed the girl, the idle, and the walk animation.

3) *Camera Motion*: Another challenge that we encountered was moving the avatar. After a few failed attempts, we were able to follow and adapt the aforementioned THREE.js tutorial to implement motion.

IV. RESULTS

Throughout the creation process of this model, we had a few of our friends try it out to see if it was comfortable for them to use and what they'd prefer and adjusted according to their feedback. Early on, for example, we were only working with a 3D orbit view of the model but one of the biggest feedbacks we received was that it would be ideal to have some sort of first person or third person perspective on the actual street instead of looking from the birds-eye view. Our target group is mostly people outside of the Princeton community who would like to explore some sections of Nassau Street, so having our friends outside of Princeton trying the model and giving feedback was key to the process of developing this project. Because they aligned with the target group, we felt their experiences and views with NS were a good reflection of what future users might feel or experience. The feedback was positive, with some expressing that it was fun to play with the avatar and to explore the street. They also commented that they felt it would be even more enjoyable if we were to expand by including more sections of the street. Overall, their reactions were a great indication that we have met our goal of creating a model of Nassau Street that people outside of Princeton can enjoy and use to become more familiar with the areas surrounding Princeton University.

V. DISCUSSION

Our NS project simulated a tour of Nassau Street by allowing users to explore the block of the street from an orbit view, a closer view from down on the street, and by guiding an avatar around. Through this project, we were able to learn more about how to use Three.js and create custom assets. We also learned a lot about what goes into making a full custom scene and the texture mapping that is key to making the buildings look the way they do in the final NS version. Overall, we believe this project was a success and our approach allowed us to learn a lot while exploring a few reach goals that we ended up being able to implement.

VI. CONCLUSION

We were able to successfully create meshes for each of the buildings described in our Minimum Viable Product. Furthermore, we were able to write code to export, display, and integrate them into the scene. We were also able to incorporate camera and character motion to allow the user to follow the avatar around and view all of the buildings.

With more time, we would've liked to expand on the street by creating new buildings, such as Nassau Hall across the street from some of the buildings included in this model. In addition, we can extend the street and include Palmer Square. Moreover, we can implement weather controls to add rain, thunder, and snow. Perhaps we can allow the user to simulate the seasons. Some issues that need to be addressed include smoother textures and camera movement.

VII. CONTRIBUTIONS

We began by splitting up the creation of the meshes. Momataz built the Labyrinth Books and Princeton University Store buildings. Veronica created the meshes for Tacoria and the connected building containing the shops Landau, H1912, and Princeton Running Company. Zaynab made the meshes for Hamilton Jewelers and Starbucks. After creating the meshes, we regrouped and put together the buildings. Veronica added the textures to the buildings, Momataz added the functionality for the animated figure, and Zaynab worked on placing the rest of the objects. We worked together in the end to make finishing touches, debug animations, and write the final report.

ACKNOWLEDGMENTS

We would like to thank Ethan Tseng for all his guidance throughout this process.

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