

Design Proposal

Project Description

Name: AR Simcity

Description: Use AR to build virtual buildings at given 'floor' in the real 'world' and edit them based on the options given. There will be population, revenue, and costs change during the whole process.

Competitive Analysis

My idea borrows from the game 'Simcity'; however, instead of using a keyboard and mouse as inputs, my game uses the camera as an input to interact with game users. Since I use AR technology, game users can build 3D buildings in the 'real' world. During the process, game users can build houses by pointing at random locations or edit an existing building by choosing different options given. What's more, there will be a real-time interface showing the parameters the city has and the diagram of the city.

Structural Plan

My game includes three main parts, 'Camera,' 'City,' and 'Viewer.' The Camera class is to interact with the real world so that game users can build or edit buildings in the real world on the ground given. The City class is to store all the information about buildings and options users can have to edit or build buildings. While users do some actions, the viewer class will draw all the actions meantime on the ground in the real world.

Algorithmic Plan

I plan to use the camera as the input to build or edit buildings in the real world. Game users can use the 'pen' to point at a random location to do some actions based on the options, which is also can be chosen by using the 'pen' pointing at them given. The camera class is to capture the real-time video and transport them back to my interface with undistortion images. Meanwhile, it will detect the ground and the pointer in order to let game users to take actions. The viewer class will draw the whole interface and building game users built. Besides, it will also draw the diagram and the parameter panel of the city. I'll use Tkinter to create an interface that will show all the movements users made in the real world.

Timeline Plan

- 3 – 4.16 Finalize design plan; prepare materials needed(whiteboard, webcam); camera setup (get camera's intrinsic matrix and transform into camera's extrinsic matrix to get the 'world' coordinate system)
- 4.16 – 4.20 Hand detection (get users' coordinate system and the ground and transform into camera coordinate system)
- 4.20 – 4.23 Build the city and buildings model(Class); Build the interface
- 4.23 – 4.27 Use Tkinter and OpenCV to build and edit city in the 'real' world
- 4.27 – 4.29 Fix all the bugs and finalize my game

Version Control Plan

I use Google Drive to store all the versions based on the checkpoint time since my timeline plan is also based on the checkpoint.

▶	TP_0	🕒	Apr 9, 2020 at 16:41	--	Folder
▶	TP_1	🕒	Apr 13, 2020 at 13:26	--	Folder
▶	TP_2	🕒	Today at 16:18	--	Folder

Module List

OpenCV

Tkinter

Storyboard

See storyboard.pdf

TP3 Update

1. Game users can select at any random location and take actions based the options given(user can use the hand the build, upgrade, demolish building by hand detecting when selected).
2. Build a population and revenue control model, the population, cost, revenue, and score of the current building and my city will be influenced by the neighbor blocks, neighbor blocks number, the location of current building, the total population of the city has, the real-time city level. Besides, there are many constrains of building blocks in my city based on the total population, different types of buildings' number and etc. Meanwhile, the Tkinter interface will show the real-time parameters which my city and the current building have.