**Term Project Report - GroVR**

**Updates Based on Feedback**

* Instructor
  + So that we could focus more on the functionality of our core experience, we reduced its scope from “Interacting with multiple plants with multiple inputs and maintenance resources” to the following, provided by Dr. Bozgeyikli: “Interacting with a single plant with a representative input material and a maintenance resource.”
* In-class testing
  + Most students requested additional functionality to the plant growth operation to increase the challenge and have penalties, so we focused on more challenges.
  + We fixed the relative object positioning to an arc to prevent the common occurrence of irretrievably losing the bucket and seed behind other objects.
  + We fixed the water animation from the bucket to look more realistic.
  + We fixed scale of the bucket to be larger than the pot to prevent them from getting stuck together, as many students dropped the bucket into the pot.
  + We added random values to the plant growth parameters for each game to provide variety in growth speed and increase the challenge.
  + We improved the pot shattering functionality and animation to penalize too much growth and to provide more challenge so that players can learn to anticipate when it will break and grow the plants as large as possible before shattering.
  + We added a dynamic scoring system based on the turnip size when scored.

**Scripts**

* ControllerPositionRotation: allows Oculus Go controller position and rotation inputs for interaction
* DayNightCycle: allows gradual day-night changes to skybox color and sun position based on time
* GameManager: manages start board and end board instantiation and destruction as well as runs timer and scoring system
* GameOver: displays a dynamic end board text and score value depending on inputs
* Grab1: uses raycasting to enable grabbing of objects along with highlighting those objects to denote they are grabbable
* InteractableObject: uses booleans to run interaction behaviors
* Plant: sets random parameter values and allows interaction only once certain values are met
* PottedPlant: manages seeding, germination, and pot breaking functionality
* PourContents: manages water particle emissions and audio from bucket
* ScoreBox: plays particles and audio upon dropping a plant in the box
* Seed: makes seed object findable for grabbing
* SeedChute: instantiates a new seed upon pot breaking or plant scoring
* SoilCollision: allows interaction between the pot being watered and the plant being removed
* WaterPlant: allows interaction from the water particles to water the potted plant

**Assets (Created)**

* Greenhouse structure, glass material, startboard, endboard, seed, radio, display for score and time, seed chute, sun

**Assets (Outside)**

* (Sound, 7\_autumns\_evening\_breeze.mp3) Autumn’s Evening Breeze by The Sound Providers: <http://thesoundproviders.com/assets/audio/autumns_evening_breeze.mp3>
* (Sound, 467227\_\_derjuli\_\_watering-the-garden.wav) Watering the garden by derjuli: <https://freesound.org/people/derjuli/sounds/467227/>
* (Sound, OOT\_MagicBean.wav) Planting a Magic Bean by HelpTheWretched: <http://www.noproblo.dayjo.org/ZeldaSounds/OOT/OOT_MagicBean.wav>
* (Sound, OOT\_Pot\_Shatter.wav) A pot shattering by HelpTheWretched: <http://www.noproblo.dayjo.org/ZeldaSounds/OOT/OOT_Pot_Shatter.wav>
* (Sound, OOT\_Fanfare\_SmallItem.wav) "Get Small Item" fanfare by HelpTheWretched: <http://www.noproblo.dayjo.org/ZeldaSounds/OOT/OOT_Fanfare_SmallItem.wav>
* (Object, MBJ\_PlantPack01\_Pot01\_LOD3\_v001.fbx) Pot by MadeByJawns: <https://madebyjawns.itch.io/plantpack1>
* (Object, turnip.obj) Turnip by MCrafterzz: <https://mcrafterzz.itch.io/low-poly-farm-pack>
* (Objects, Bucket\_1\_1.prefab and Box\_2\_1.prefab) Bucket and Box by SOLUM NIGHT: <https://assetstore.unity.com/packages/3d/props/exterior/low-poly-pack-environment-lite-102039>
* (Object, Large\_round\_lamp.prefab) Large round lamp by NEW SOLUTION STUDIO: <https://assetstore.unity.com/packages/3d/props/interior/free-pbr-lamps-70181>
* (Object, sack\_010.prefab) Sack by LOWLYPOLY: <https://assetstore.unity.com/packages/3d/environments/fantasy/fantasy-treasure-pack-lite-80898>
* (Objects, Mixed\_Cactus\_01.prefab and Mixed\_Cactus\_02.prefab) Saguaro and Prickly Pear by 23 Space Robots and Counting...: <https://assetstore.unity.com/packages/3d/environments/free-low-poly-desert-pack-106709>
* (Object, FX\_Smoke.prefab) Smoke by Synty Studios: <https://assetstore.unity.com/packages/vfx/particles/simple-fx-cartoon-particles-67834>

**Discussion**

At first, we created a rather ambitious goal of a more complex core experience, and thankfully Dr. Bozgeyikli provided us with a more practical, pared-down version early in the design process. This new focus allowed us to further develop the basic functionality while adding additional nice-to-haves to flesh out the aesthetics of the environment, on which we received the most compliments during in-class testing. Also, development of the basic functionality for growing one plant is relatively modular such that the game could be further developed with less effort to provide the ability to grow multiple plants at a time. Some of the challenges from troubleshooting gameplay were that some of the game objects often were lost or became nonfunctional by either being dropped out of the field of view or by irreversibly colliding with another object such that they became stuck. These challenges were overcome by placing the objects on an arc such that they could no longer easily fall behind one another, and much of the reason this loss occurred was because we demonstrated our game at iShowcase with an Oculus Quest with 6 degrees of freedom, so users could actually move the objects in more ways than our intended use case on the Oculus Go with only 3 degrees of freedom. On the Oculus Go, the gameplay now works properly without these object bugs. Another challenge was getting the water particle system to collide with and trigger the plant growth functionality. Apparently, there was a simple drop-down menu where we had to change the setting to “Mesh” that we had overlooked, and again Dr. Bozgeyikli came to the rescue in identifying this option.

**Improvements**

1. We would add the functionality of the sun and lamp each providing input values of light to affect the plant growth process to better reflect real plant growth modeling and to increase the challenge of gameplay by having to deal with day-night cycles to keep the plant growing.
2. We would add multiple sizes of plant pots and different seed types that each have their own unique growth parameters to allow users to select which seed is appropriate for each pot to maximize their score based on final plant sizes.
3. We would add the moon and add celestial mechanics to it and the sun and instantiate them at the current relative positions of the sun and moon in Tucson, AZ, at game time.