Space Engineers

Andreas Holzapfel*
FH Hagenberg, Mobile Computing Department

ABSTRACT

This paper is about the Space Engineers project which was developed within the course of the Augmented Reality lecture. Space Engineers is a game for the Microsoft Hololens.

1 INTRODUCTION

The Space Engineers game for the Microsoft Hololens is about building a fleet of space ships with finding the needed resources. Every ship needs a certain amount of different resources to be built. The resources are placed randomly in a room and can be seen with he help of the Hololens. When a resource is found it can be collected by tapping the button on the Hololens, afterwords it is added to the inventory. When the needed amount is collected, a ship can be constructed and sent away to collect resources on it's own. With taking certain markers into the focus of the Hololens the ships come back to the focused marker.

2 CREATING THE RESOURCES

There is a bunch of different resources which are needed for a ship to be built:

- Glass

  Glass plates for the windows of the ship.

- Steel plates

  Steel plates for the body of the space ship.

- Computer

  Computers to control the ship.

- Cables

  To connect energy supply and control elements.

- Different kinds of pipes

  For different usages.

- Uranium

  For energy supply.

The resources were created or edited with different 3D modeling programs, like Blender, Substance Painter or the Unity ProBuilder plugin. More complex resources like computer or the pipes were taken from packages out of the Asset Store. The prefabs can be seen in figure 1.

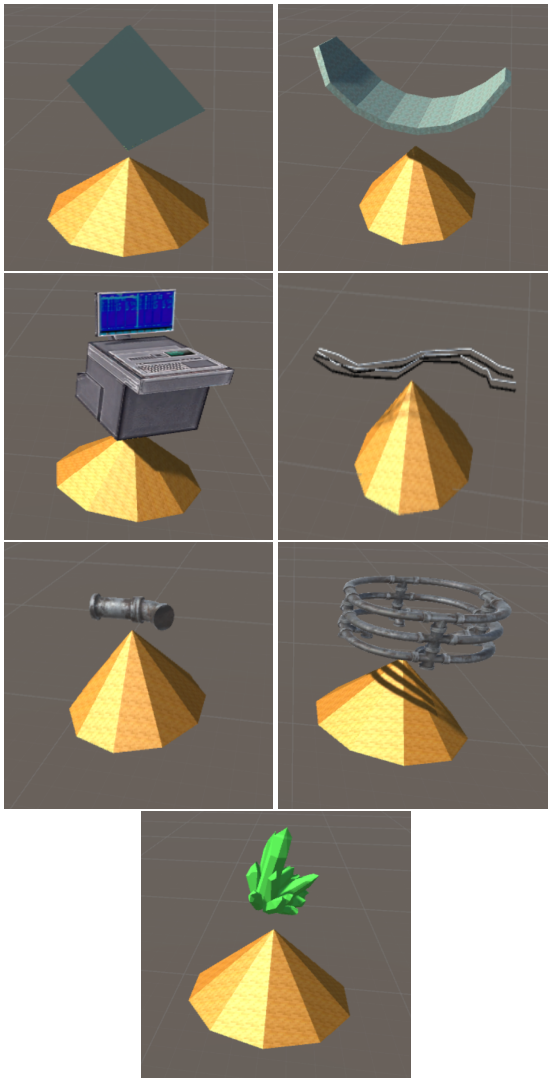

Figure 1: Prefabs of the different resources.

The underground for the prefabs is built with the ProBuilder and represents a wooden cone which "'holds"' the different elements.

3 SPACESHIPS AND THEIR HOLOGRAMS

If the resources don't cover the needs to build a space ship, it is represented as a hologram. The hologram is created with using Blender and Substance Painter. The ships were found on the Asset Store. The .obj-file of the ship are imported into Blender. For a better hologram effect a wireframe is added to the ship. Therefore the ship is duplicated and the Wireframe-modifier added to the duplicated ship. The result is shown in 2.

*a.holzapfel16@gmail.com

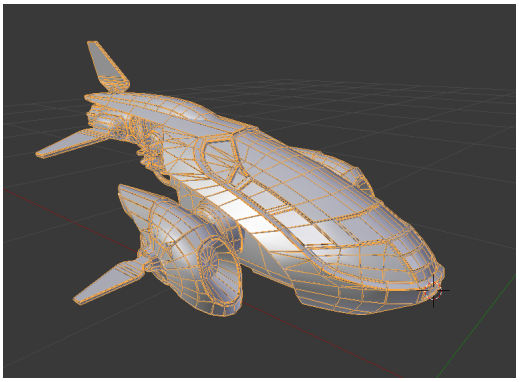

Figure 2: The space ship holo in Blender.

Now the ship has to be exported into a .fbx-file. The .fbx-file of the space ship should be imported into the Substance Painter to create the blue, slightly transparent design which can be seen in 4.

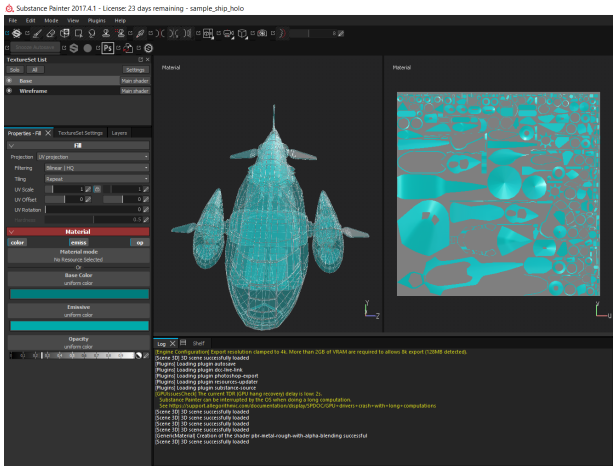

Figure 3: The space ship hologram.

The final ship hologram can be seen in **??** next to the respective ship how it should look like after collecting all resources to build it.

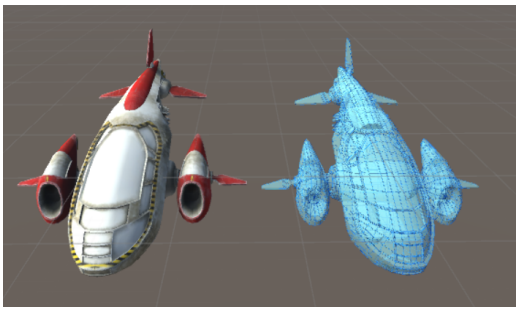

Figure 4: The space ship hologram prefab in unity.

4 Setting up project with Vuforia integration

In order to recognize markers Vuforia support is integrated into the Unity project. Therefore the Vuforia Unity package has to be downloaded from the Vuforia website. 3 markers are imported into the project, which were added into a database on the development site of the Vuforia website. The markers are a picture of stones, chips and tarmac which we got in course of the Augmented Reality lecture.

Figure 5: Supported marker.

For placing a target into the scene, Vuforias AR-Camera prefab has to be put into the game scene. The camera needs a key to be supported, this key can also be generated at the developers site on the Vuforia website. This key can be pasted into the key field on the inspector of the Vuforia configuration. When the targets are downloaded and imported into the project, they can be loaded and set active in the configuration. Now they are supported. Now a image target prefab can be dragged into the scene. When selecting the target the camera can detect this target. To display objects, in our case space ships, they have to be made children of the image target. Now the elements are shown when the camera detects the target image.

5 Ship Movement Behavior

When a ship is built and on a resource collecting mission, they can be called back with focusing an image target with the Hololens. Therefore a script is needed, which moves the ships from their position to the position of the marker. But as the ship should only move when the Hololens is focusing the target, the Vufoias Default Trackable Event Handler has to be extended. The Default Event Handler handles changes in the tracking states and logs into Unitys console when a specific target is found or lost. With extending this script, we can add custom behavior when a target is found or lost. The ships original positions are saved in the Ship Movement Behavior script and as soon as the Hololens recognizes the target, the ship moves from it's position back to the original position. Here is a simplified, short code snippet how this works:

5.1 Code Snippet

```
public class ShipMovingBehavior : MonoBehaviour,
        ITrackableEventHandler {

 private bool targetFound = false;

 void Start()
  {
   mTrackableBehaviour = GetComponent<TrackableBehaviour>();
   if (mTrackableBehaviour){
   mTrackableBehaviour.RegisterTrackableEventHandler(this);
  }

  shipOriginalPosition = ship.transform.position;

  ship.transform.position = outsidePosition.transform.position;
 }


 // Update is called once per frame
 void Update () {
  if (targetFound) {
   ship.transform.position = Vector3.MoveTowards (ship.transform.position,
         shipOriginalPosition, speed * Time.deltaTime);
  }
 }

 public void OnTrackableStateChanged(
  TrackableBehaviour.Status previousStatus,
  TrackableBehaviour.Status newStatus) {
  if (newStatus == TrackableBehaviour.Status.DETECTED ||
   newStatus == TrackableBehaviour.Status.TRACKED ||
   newStatus == TrackableBehaviour.Status.EXTENDED_TRACKED) {
    OnTrackingFound();
   }
   else {
    OnTrackingLost();
  }
 }

 private void OnTrackingFound() {
  ...
  targetFound = true;
}

 private void OnTrackingLost() {
  ...
  targetFound = false;
 }

}
```

6 Conclusion

A lot of design work had to be done in order to create all game elements. As I have lack of knowledge on Blender, Substance Painter and the Unitys ProBuilder this was a very time consuming work. But a game without effects and fancy looking elements isn't worth very much. And I'm very sorry but the code listings function didn't work at all, i gave it up finally as i couldn't find any solution to show it in one column.

Acknowledgments

The author wishes to thank Felix Boxleitner as the team member for the cooperation.