Moonbase Omega

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Abstract

This project utilizes the Unity game development engine to create a virtual reality game, based on Moonbase Alpha, a joint project by the Army Game Studio, America's Army, Virtual Heroes, and NASA Learning Technologies.

1. Introduction

Moonbase Alpha is a game that was released in 2010 by the Army Game Studio, in conjuction with America's Army, Virtual Heroes, and NASA Learning Technologies. The game took off in popularity; it was particularly known for its text-to-speech engine, which became a notable element of culture, passed from one individual to another by nongenetic means, also known as a meme.

2. Story

The context of the game is: you are an astronaut living on the moon, and there has been a meteor strike that destroys many things. Your job is to accomplish certain tasks—such as repairing certain equipment and fixing space suits—before time runs out.

3. How to Play

The game begins after the meteor strike, and you are standing on the moon. You can look around the crater that you're stuck in and see different pieces of equipment scattered around the terrain. The instructions list 4 objectives. These objectives will remain on the screen for ten seconds.

Control your player with the WASD keys, jump with the spacebar, and sprint with the shift key. Use the VR headset to look around the environment for objects you might be able to pick up.

When you have successfully accomplished all the necessary tasks in a timely manner, you will be congratulated. If you fail to complete the tasks in time, you will receive a message of disappointment.

4. How It Works

4.1. VRduino

The VRduino is equipped with an inertial measurement unit (IMU), which tracks the rotation of the head and neck. This data is streamed to the computer through a serial port, and it is used to adjust the rotation of the environment around the head. We modified the provided `ReadUSB` script to get a smoother user experience.

4.2. Terrain Design

The terrain was built with Unity's Terrain Engine. With the provided tools, we first painted the shape of the crater, before applying the texture we wanted from a freely distributed moon texture Unity Asset.

4.3. Retrievable Objects

The objects that can be picked up are the hammer, pistol grip tool (PGT), spare glove, wrench, and tool bag. The meshes for these objects were freely distributed Unity Assets. We gave each object RigidBody properties to react to physical interactions and gravity, and convex Mesh Collider properties to be able to detect collisions with the player's gloves.

When the object colliders are triggered by the player's gloves, a script runs, deactivating the objects on the ground and setting a flag that denotes that the player has picked them up. These flags are used when objects reach their proper destinations, too.

4.4. Object Destinations

The retrievable objects must reach their destinations to be used at those destination objects. These destinations include: the space suit, the space crawler, the lunar lander, and the orbital sky lab. The meshes of each of these objects have also been assigned convex Mesh Collider properties to detect collisions with the player's gloves, too. Each tasks is completed only when the user has the necessary retrievable objects in their

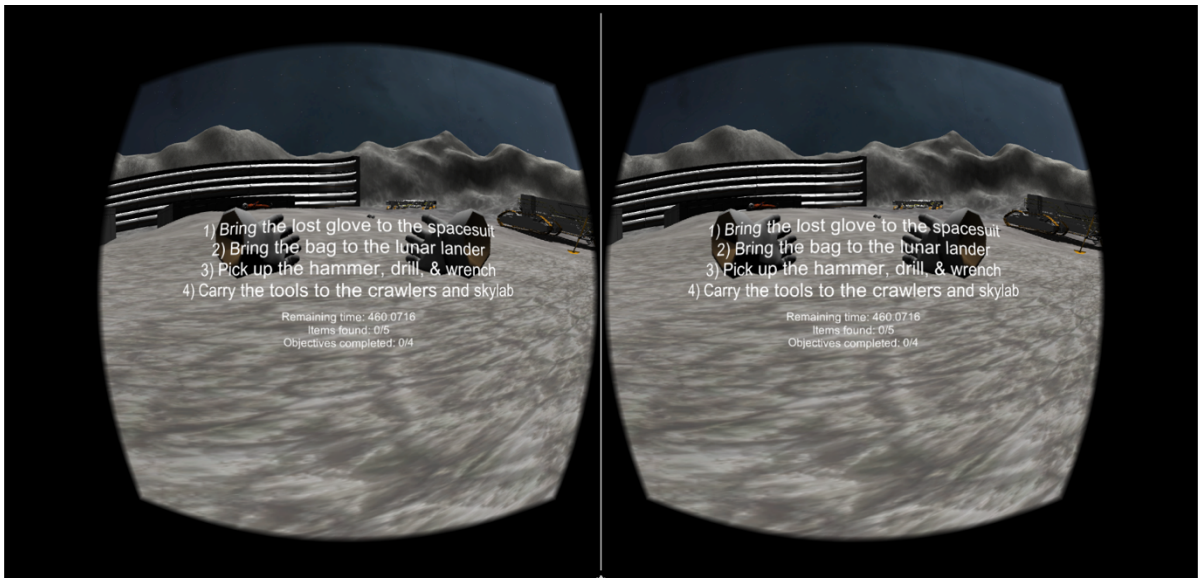

Figure 1: Screenshot of environment with the instructions.

possession when they interact with the object destinations.

4.5. Win/Lose Conditions

All tasks must be completed in a randomly generated time frame, using Unity's Random library. This randomizes the difficulty of the game and increases replayability. This time frame ranges from 20 to 50 seconds and is checked with Unity's Time library. The player is, however, not made aware of the time available, which increases the uncertainty to maximize entertainment value.

If all the tasks are completed in time, then a panel will be set active that displays a congratulatory message. If the tasks are not completed in time, a panel will be set active that displays a message of disappointment.

References

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Assets

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