

Flight Simulation over Desert Airport



Team:

Hubert Kyeremateng-Boateng

Veronica Boateng

OVERVIEW

- The project will create a virtual flight simulation to train amateur pilots and as a game tool for kids.
- The project shows first-hand perspective of the controls of a jet airplane and the desert airport landscape



Goal and Objectives



- To develop a flight simulator controlled by a single first-person controller simulator.
- To create a simulator that mimics a military base desert airport used to train amateur pilots on how to fly a jet airplane.
- To show that Virtual reality tools can be used to develop application to train pilots before flying operational jet airplane.

Benefits

- The application can be used by the military to train recruit pilots
- Both commercial airlines and non-commercial or private flight instructors can use in teaching how to fly a plane.
- Application can be used to teach students how a plane take's off, maneuver, navigate and land a plane in flight.

Modelling



Modelling

- The Flight take-off simulator environment is a desert military bases.
- The pilots use the keyboard key codes to fly the plane from the runway and the landing on the runway.
- There are two runways in the environment and the pilot always takes off from the larger runway but can land the plane on any of the runways.
- Since the virtual environment of the simulation is a military base, there are military jeeps, transport planes, military helicopter, fighter jets, and aircraft hangers on the base.

Modelling

- **Main Building**
Military base one-level building structures where training preparation and coaching are done before the flight training sessions.
- **Runways**
The environment has two north-south parallel runways, one large and small runways separated by 7600 feet.
- **Obstacles**
Birds flying over across plane while in flight
A Mast located near the base for which player has to avoid.
- **Day and Night flight times**
Player selects Daytime and Nighttime flight sessions
- **Three Military Men:** - Trainers walking towards the main building
- **Military supervisor:** For Security purpose enforcing safety rules
- **Vehicles**
Military jeeps, transport planes conveying trainees to the training base

Modelling

- **Jet Airplanes:** - One jet airplane for the plane take off and plane landing, the other jet air planes that will move next will swing flaps awaiting signals to proceed to fly in due course
- **Bounding Box:** - Assigned to jet airplane so that birds don't hit the plane.
- **Birds:** - used to show the intelligent behavior and animation.
- **Masts:** player to avoid flying close to the mast or danger zone
- **Tower:** server as a guide to player and ease of identification of base on landing the jet airplane. ,
- **Level Manager:** Used to smoothen the rocky and sandy ground to level the ground for the airport base.

Flight Operations Simulated - Flight Take off

Jet airplane accelerates on the runway, at the rotation speed, the player uses down arrow key to control elevators to pitch-up the airplane when the nose wheel lifts off the ground



Climb the Airplane

Climbing is performed using outside visual references, the engine power settings and pitch attitudes. Player should avoid obstacles birds, mast, tower, mountain



Flight Operation Simulated

- Turning Maneuvers

Basic flight maneuvers are adopted during flying including straight-and-level flight, turns, climbs, and descents

- Descend the Airplane

Player descend the Jet airplane by changing flightpath from level to an inclined plane and uses the power settings and pitch attitudes to produce the partial power descent and descent at minimum safe airspeed conditions

Perform A Landing

Throttle is used to control and adjust altitude, player can manage the approach with throttle and with very little use of elevator before the touchdown

Daytime and Nighttime Sessions

Day time Simulation

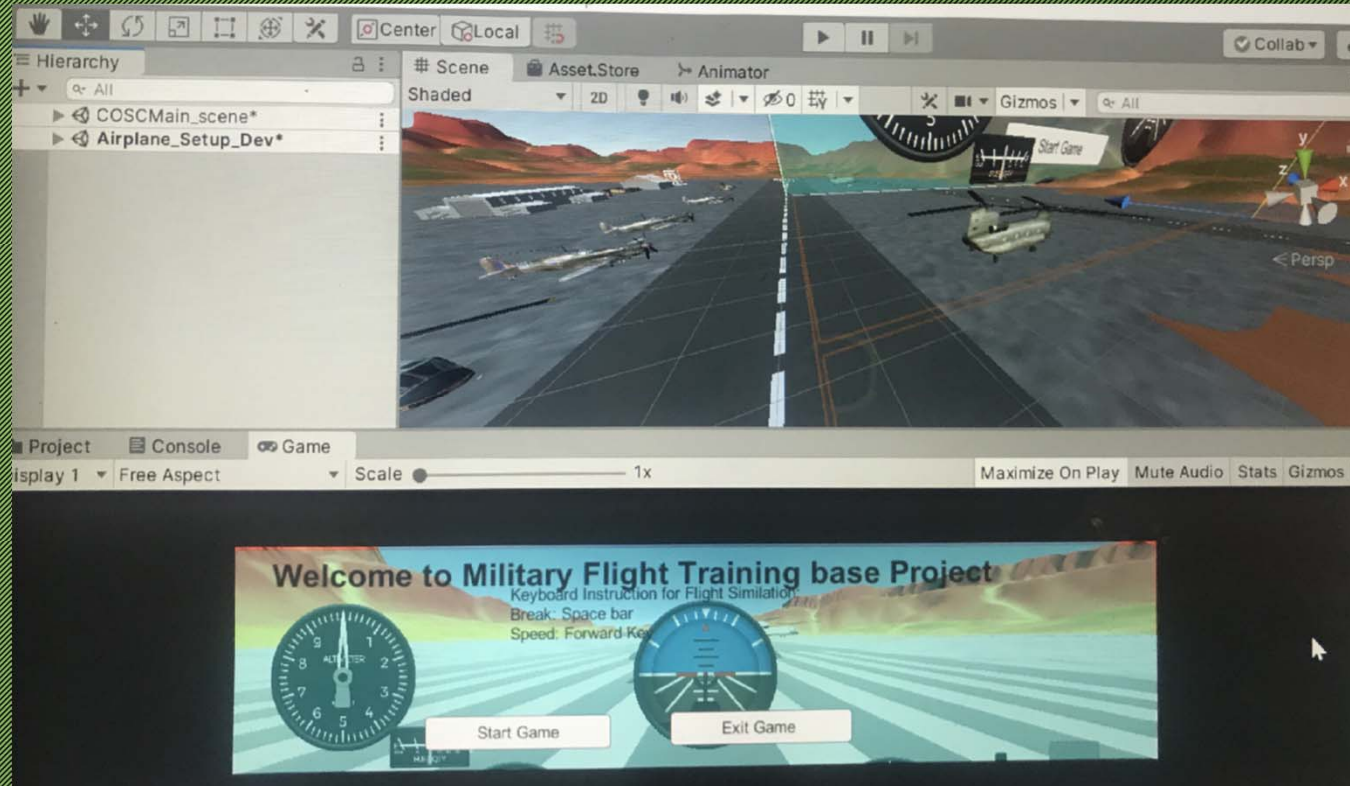


Night time Simulation



PROGRAMMING

The simulator was built using Unity3D 2019.3.11f development engine and platform with the programming language used is C# programming language in Microsoft Visual Studio.



FUNCTIONALITY

- **Sound** - There is a sound of the plane's engine. There is also the increase/decrease in the sound pitch of the plane when the engine throttle is increase/decrease respectively.
- **Interactively** - The user selects whether to fly the plane in the daytime or night time environment. The user also interact with the simulator by taking off the plane, maneuvering in the air to prevent the plane from hitting a bird and also landing the plane.
- **Animation** - Animations in the virtual environment include transport helicopter blades rotating, bird flying.
- **Vision** - Models from Google Sketchup and 3D Max were included in the environment. Also models from third-party Indie was used especially the plane used in the simulation
- **Avatars** - 10 avatars, 2 Security Men, 8 Military trainees
- **Sensors:** Implemented is proximity, time, touch,

Control Keys - Flight Controls

- Vertical
 - Increase/positive: key code Up ↑
 - Decrease/negative: Key code Down ↓
- Horizontal
 - Increase: Key code **A**
 - Decrease: Key code **D**
- Yaw
 - Left: Arrow left key ←
 - Right: Arrow right key →
- Throttle
 - Increase: Key code: **W**
 - Decrease: Key Code: **S**

Flight Controls - Continue

- Restart
 - Key Code: **R**
- Light - Daytime/ Night-time
 - Key Code: **L**
- Flaps
 - Down: Key code **F**
 - Up: Key code **G**
- Engine Cutoff:
 - Key Code: **O**

References

- Indie Pixel - <https://www.indie-pixel.com/unityCourses/Intro-to-Airplane-Physics-in-Unity-2018>
- Unity Scripting Reference - <https://docs.unity3d.com/ScriptReference>