**Mesh Slicing**

A sword which can cut through a procedural mesh along a single plane. Any static mesh and material can be applied to the slicable mesh blueprint in order to be used as a target for the sword.

**Props**

* Sword
* (4x) Slicable blocks

**Interaction Expectations**

There is no predefined goal with the use of the sword. The user may pick up the sword and use it to cut through the provided slicable meshes to the extent they desire.

**Implementation**

The sword uses the PickupActorInterface and associated code in order to be picked up by the user, with the addition of setting a boolean on pickup to enable cutting and disabling it on drop. The actor itself consists of the desired model, in this case a dragon longsword from Runescape, and a plane object that is hidden in game and used to determine where a cut is applied. Approximately every half second a call to the custom Slice event is placed. If the sword is being held, the event uses OnComponentBeginOverlap tied to the slicing plane to determine if it is overlapping a slicable mesh. If it is, Unreal’s built in SliceProceduralMesh event is called on the overlapping actor, creating the two halves and applying a small impulse force for visual feedback. Within this process, the CanCut flag is disabled and a delay is added before reenabling it in order to prevent continuous slicing, which would impact performance. Additional blueprint code is included in the project that can be swapped out in order to have the sword cut only when pressing a secondary button, rather than continuously.

The sliceable mesh blueprint consists of a static mesh root component and child procedural mesh component. It also possesses public variables for a static mesh, material, and scale vector, allowing any static mesh to be used. In its construction script, the mesh, material, and scale variables are each applied to the blueprint’s components, and the procedural mesh is copied from the static mesh.

**Testing Guide**

* As with all other objects that can be picked up in the scene, the sword can be picked up in either hand by holding the trigger on the associated controller
* Once held, the user can manipulate their hand in order to bring the sword into contact with a slicable mesh
  + The sword does not need to travel through the entirety of the mesh in order to cut it, the mesh will be cut completely through as long as the edge of the sword blade is brought near the mesh
* Cutting the meshes an excessive amount may cause decreases in performance/frame rate drop
* If the sword is dropped to the ground, you may be unable to retrieve it if the floor level is not adjusted properly in your VR headset
  + If you cannot retrieve the sword, the application will need to be restarted

**Snowmobile**

**WARNING: This interaction may make the user particularly susceptible to motion sickness**

A snowmobile that uses hover physics which the user can drive and enter and exit at will.

**Props**

* Snowmobile
* Static obstacles

**Interaction Expectations**

The user is able to enter and exit the snowmobile at will. While driving it they can navigate the simple obstacle course that is provided and otherwise experience driving a non-wheeled vehicle that “glides” over terrain.

**Implementation**

The snowmobile actor is made up of the root static mesh model, a box collider to check if the player is nearby and several custom hover components that facilitate its floaty movement, and a sphere collider that acts as the attachment point for the user’s vr pawn. On BeginPlay, the snowmobile blueprint saves a reference to the player controller as well as the initial rotation of the snowmobile for reorientation purposes. When the player enters the boundary around the snowmobile, a text prompt will appear overhead stating the button used to enter and input is enabled for the blueprint. The opposite process occurs when the player leaves the boundary. If the player is in the boundary and they hit the right grip button, they will be moved to the attach point and their pawn attached to the snowmobile. Teleportation and view flicking is also disabled using a boolean and several branch checks that are added to the MotionControllerPawn blueprint. Once attached to the snowmobile, input using the right or left triggers will set a force value which is applied to the vehicle each tick. The axis value of the right thumbstick is also used to add a rotation to the vehicle. When applying the forward force to the vehicle, the x value of the vector is zeroed out to reduce lateral movement. The vehicle’s velocity is also clamped to help reduce erratic movement and motion sickness. If the vehicle flips upside down or on its side, pressing the left grip button will reset its rotation using the stored rotation value.

The HoverComp blueprint responsible for the snowmobile’s floating movement operates by performing a line trace to the ground from its location. The distance value retrieved from the line trace is then used in conjunction with simple spring physics calculations to apply an upward force at its location, making the object it is attached to float off the ground.

**Testing Guide**

* When within an approximately 2 meter radius of the snowmobile, you may enter it by pressing the grip button on the underside of the right hand controller
  + Use the same button in order to exit the snowmobile at any time
  + NOTE: When within this radius, view flicking will be disabled on the right hand controller but is unaffected on the left hand controller
* Once in the snowmobile, pressing the right hand trigger will cause the snowmobile to accelerate forward
  + Pressing the left hand trigger will accelerate the snowmobile backwards
  + NOTE: View flicking and teleportation will be disabled entirely while riding the snowmobile
* Moving the right hand thumbstick right and left will turn the snowmobile right and left, respectively
* If the snowmobile rolls, pressing the left hand grip button will reset the snowmobile’s orientation
* WARNING: The nature of the snowmobile’s movement may induce dizziness/motion sickness. Be aware of how you feel while using it and stop use immediately if you become uncomfortable.