**CMSC 388G Virtual Reality Game Development**
**Programming Assignment 1: Introduction to Unreal Engine and C++**
**Due Date: 11:59 PM, February 22, 2019**

**Project Submission:**

**1) Delete the "Intermediate", "Saved" and "Binaries" folders right before submitting.**

**2) Name your folder "INSERTFULLNAME_CMSC388G_Project1.zip" and make a README.md file where you will put your answers to the questions.**

**3) Place all files for the project in the folder and ZIP up the folder. You will submit your project via the submit server. To submit a zip file, login to the submit server webpage and look for the link to make a *web submission*.**

**Before You Start**

Some people have had issues with finding the code for the project. Right click on the .uproject file and click "Generate Visual Studio project files." You should be able to click inside of the blueprint files and it should redirect you to the specific code file.

When you run in VR, you want to run in "VR Preview" mode.

In general, people have had problems with where to go specifically to find the C++ documentation for the code: Documentation

Specifically, these classes are all you need to figure out where to search:

Actor Reference
Actor Component
TArray C++

Specifically, **GetComponents()** and **FindComponentByClass** in the Actor class will be of use to you.

A lot of this has stemmed from the lack of knowledge on various topics about the syntax of Unreal Engine and how to do certain tasks, like create TArrays of various types, for instance.

I will give you all the references you will need to do this project, so that you will only have to focus on figuring out what functions to implement.

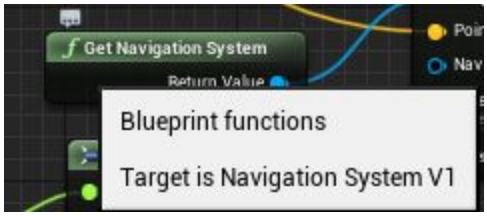
TArrays: https://docs.unrealengine.com/en-US/Programming/UnrealArchitecture/TArrays

Some people have also requested screenshots of the blueprints so that you guys know what to look at without needing to refer to the blueprint project every time and possibly plan ahead of time before testing in vr.

Clear Arc - Clear Arc
Get Actor By Hand - Get Actor By Hand

I am not giving you the Pickup Cube functions because you actually need to look in its respective blueprint in the reference project, which is in **Content/VirtualRealityBP/BP_PickupCube**

This won't give you everything though, you will still need to figure out where certain functions come from. For instance, in the example, below it comes from "NavigationSystemV1." Well, this isn't too helpful, so what can I do? I can go to the documentation and search "NavigationSystemV1" and I end up with this: https://api.unrealengine.com/INT/API/Runtime/NavigationSystem/UNavigationSystemV1/index.html




**Project Description**

The purpose of this assignment is to **get acquainted with C++ and use the VR lab space to test your project**. You will be modifying two C++ classes in order to get familiar with working in both Unreal and C++. The starter code for this project can be downloaded from the Github Repository under the folder called "Project1" (**https://github.com/MikhailSorokin/CMSC388G---Virtual-Reality-Game-Development-Class-Examples-**). The code in these projects will serve as a template for most of the projects in this course, so it is important that you read and understand what is happening. As always, feel free to ask questions in office hours or on piazza.

In Unreal Engine, there are two ways to develop. One is with blueprints and another way is with C++. In general, C++ is 10 times faster at processing code than blueprints. **Your job is to come up with several techniques to convert existing Blueprint code into C++**. You can see a reference blueprint project by:

1. Clicking the **Yellow Launch Button**
2. Going to the **New Project** tab

3. Going to **Blueprint** -> **Virtual Reality**
4. Save the project somewhere on your machine and load it.

**NOTE: You may be able to finish the project without seeing a blueprint reference, but it may be challenging to do so unless you are already familiar with the UE4 editor.**

The specific classes and functions you will have to rewrite in C++ include:

1. MotionControllerActor + Teleportation
    a. **void ClearArc()** - Clears the blue laser arc every frame.
    b. **AActor* GetActorNearHand()** - The MotionController interacts with this to get the object nearest the hand to set the animation state of the hand to “grab” or “idle.’
    c. **No longer need TraceTeleportDestination function - it will be reverted back to Blueprint code.**
2. Pickup Cube
    a. **Constructor** - Set Simulate Physics. By default, this cube doesn’t have physics simulate it. Will need to figure out how to go about doing that.
    b. **Pickup(USceneComponent* AttachTo)** - Attach the cube to the parent object of the hand controller.
    c. **Drop()** - Removes the attachment of the cube associated with the specific hand controller that you grabbed the cube object with.
    d. Placement of several cube objects into the scene with the Blue Material reference that is in the project.

The classes that are made for you are the following. What is italicized are the classes you will have to edit:

- *CustomMotionController*
- CustomPickupActorInterface
- *PickupCube*

They can be found in the following relative path to the root folder (*after generating Visual Studio project files!)*: **Source/Project1**

**Useful Functions and Classes You can Use**

Teleportation:

DoesImplementInterface(UClass* Class) - This will be useful for interacting the MotionController actor with the PickupCube.

Pickup Cube:

Simulating Physics - https://api.unrealengine.com/INT/API/Runtime/Engine/Components/UStaticMeshComponent/index.html

C++ Interfaces - https://wiki.unrealengine.com/Interfaces_in_C++

**Questions**

You have to answer these questions in a separate document to help you get a better understanding of the project. Name this document **README.md**:

(1) - What classes do APickupCube and ACustomMotionController extend, respectively?
(2) - In the MotionControllerActor blueprint, in what commented node section is “Clear Arc”? What about GetActorNearHand()?
(3) - What is the point of the “CustomPickupActorInterface” class? (This should be very brief, 2-3 sentences)

**Grading**

Your program will be graded based upon correctly performing all tasks that are mentioned above. All code that you write should be well commented. Your code is judged subjectively based on the simplicity and clarity of implementation. An implementation that is easy to understand, but has few minor bugs will be scored higher than a messy implementation with the same number of minor bugs.

**Markdown**

While you won’t really be graded on code comments and markdown style, it is important to make the Markdown readable when answering the questions.
https://github.com/adam-p/markdown-here/wiki/Markdown-Cheatsheet