

CineTeach  
Operational Manual  
Team 522

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## About the Product

CineTeach is a tactile virtual camera controller that was designed to simulate sound stages in order for students to more efficiently learn filming concepts. CineTeach gives students the access they need to learn basic camera concepts and be able to apply them to a standard professional camera. Our controller performs all of these features virtually to help decrease the time and resources needed.

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## Basics

### **Acronyms**

ME - Mechanical Engineer

MVP - Minimum Viable Product

EE - Electrical Engineer

CpE - Computer Engineer

UI - User Interface (the screen set up on the iPad that allows the user to control the virtual scene)

UE4 - Unreal Engine 4

PLA - Polylactic Acid

### **Operations**

After completing the steps under this section (except those dealing with source code or editing the UI) the user will be able to use CineTeach for its designed use, to maneuver through a virtual free space to facilitate the teaching of film concepts. If the user would like to edit this product then use the bottom two sections (How to access and edit UE4 source code and Virtual Camera UI) to help accessing the necessary assets to customize CineTeach.

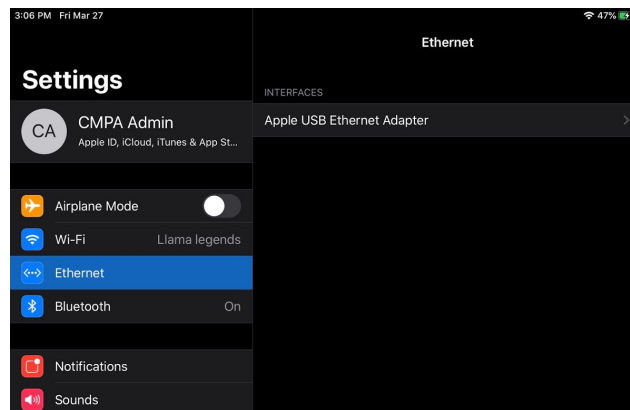
## How to Connect to the Network...

The iPad Pro is connected to a network through a wired connection. The adapters and lightning cable **MUST** be products created by Apple. Off-brand products will not communicate with the iPad. The following items are required for the connection:

- a. Ethernet cables (2), preferably over 6 ft.
- b. Lightning to USB Cable with wall adapter (6 ft or longer)
- c. Lightning to USB 3 Camera Adapter
  - i. Can be purchased at the following link:  
[https://www.apple.com/shop/product/MK0W2AM/A/lightning-to-usb-3-camera-adapter?afid=p238%7CsxGOcO7Q8-dc\\_mtid\\_1870765e38482\\_pcr\\_id\\_246386725857\\_pgrid\\_14874603490\\_&cid=aos-us-kwgo-pla-btb--slid--product-MK0W2AM/A](https://www.apple.com/shop/product/MK0W2AM/A/lightning-to-usb-3-camera-adapter?afid=p238%7CsxGOcO7Q8-dc_mtid_1870765e38482_pcr_id_246386725857_pgrid_14874603490_&cid=aos-us-kwgo-pla-btb--slid--product-MK0W2AM/A)
- d. Apple USB Ethernet Adapter
  - i. Can be purchased at the following link:  
[https://www.apple.com/shop/product/MC704LL/A/apple-usb-ethernet-adapter?afid=p238%7CssemIT80T-dc\\_mtid\\_1870765e38482\\_pcr\\_id\\_246386725857\\_pgrid\\_14874603490\\_&cid=aos-us-kwgo-pla-btb--slid---product-MC704LL/A](https://www.apple.com/shop/product/MC704LL/A/apple-usb-ethernet-adapter?afid=p238%7CssemIT80T-dc_mtid_1870765e38482_pcr_id_246386725857_pgrid_14874603490_&cid=aos-us-kwgo-pla-btb--slid---product-MC704LL/A)

## Physical Connection

1. Connect the computer running UE4 to the router using one of the ethernet cables. Use the shorter of the two cables for this connection.
2. Plug in the Apple USB Ethernet adapter to the Lightning to USB 3 Camera Adapter.
3. Plug in the second ethernet cable to the Apple USB Ethernet Adapter.
4. Finally, plug in the Lightning to USB cable with the wall adapter to the Lightning to USB 3 Camera Adapter and connect to the iPad.
5. In the iPad settings, there should be an “Ethernet” option as shown in the screen below. This should show the iPad connection to the network via the ethernet connection.



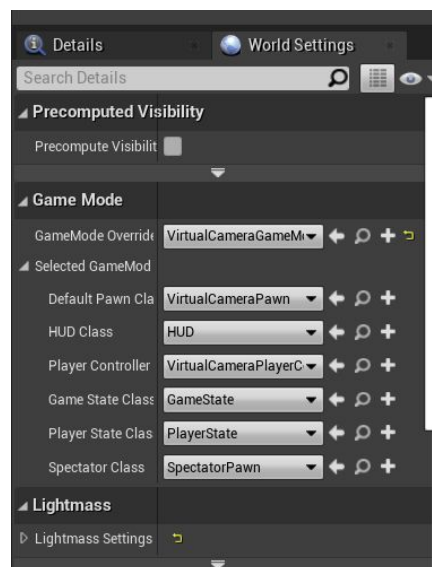
iPad Settings

## How to Set Up UE4...

1. Download Unreal Engine 4.
  - a. Go to the following link (<https://www.unrealengine.com/en-US/>) and click “Get Started”
  - b. Then select “Creator’s Licence”
    - i. This requires you to get an Epic Games account and allows you to download the newest version of UE4.

## How to Access Plugins...

1. To activate the appropriate plugins:
  - a. Go to the UE4 edit tab and select plugins
  - b. From the plugin menu, enable VirtualCamera under Virtual Production
  - c. Also enable Apple ARKit and Remote Session
2. Once this is done, restart UE4. After the initial setup, this process does not have to be repeated.
3. Once restarted, go to *Editor Preferences* (Edit >> Editor Preferences).
4. Go to *Play* >> *Game Viewport Settings* and change the *New Viewport Resolution* from *Common Resolution* to *Tablet* >> *iPad Pro* (version that matches the iPad provided).
5. Exit *Editor Preferences* and go to *World Settings*. Change the *GameMode Override* to *VirtualCameraGameMode* as seen below. The following panel should appear on the right of the UE4 interface, under *World Outliner*.



After completing these steps, load any assets to filming into UE4. For help with this step go to the UE4 documentation (<https://docs.unrealengine.com/en-US/index.html>).

## How to Connect iPad to System...

Once the iPad is connected to the network, the computer is connected to the network, and the computer has UE4 downloaded with the correct plugins selected complete the following steps:

1. Download the Unreal Remote 2 for iPad on the iPad App store (this should be free).
2. Once downloaded find the IP address of your computer (for Windows type “ipconfig” into the command prompt).
3. Select *Play* in the control bar on UE4 and be sure that *New Editor Window (PIE)* is selected.
4. On the iPad in the Unreal Remote type in the IP address and press connect.
5. The iPad should be connected and the user should be able to move freely through their virtual world.

## How to Place iPad in Controller...

1. Separate wiring system from each side
2. Place iPad inside of controller
3. Make sure connection is made between the lightning cable and the iPad
4. Reconnect frame and wiring
5. Ensure that power supply is on and charging

## How to Access and Edit UE4 Source Code...

To access UE4 source code a GitHub account and Visual Studio 2017 (or newer) is required. Follow the in the following link to link GitHub and Unreal Engine, check if the computer being used as the correct specifications and to download UE4 source code:

<https://docs.unrealengine.com/en-US/GettingStarted/DownloadingUnrealEngine/index.html>.

To download Visual Studio (Community version will suffice):

<https://visualstudio.microsoft.com/downloads/>

Once this is downloaded the source code of this plugin will be under UnrealEngine\Engine\Plugins\Experimental\VirtualCamera\Source\VirtualCamera. The entire project will be visible in the *Solution Explorer* in Visual Studios.

## How to Access and Edit Virtual Camera UI...

The Virtual Camera UI was edited using the Unreal Engine UMG UI Designer. To access these files under the *Content Browser* window click button to the left of the *Search Path* search bar. This is the *Show or Hide the source panel* button. Once here scroll to *Virtual Camera Content*. This folder should contain the *Virtual Camera UI* asset file. Double click this file to edit the UI.

To learn more about how to use the UMG UI Designer go to

<https://docs.unrealengine.com/en-US/Engine/UMG/index.html>.

## CAD/UI Layout

### CAD

**Tactile Controller:** The controller is a PLA 3D printed design that encases an iPad Pro. The electrical components were individually designed into the controller. It is the main control device that allows the user to move and film in the virtual space. The buttons and switches will mimic the UI's buttons' function.



## Button Controls: Tactile

#	Control	Description
1	Joystick 1	Controls the direction of tilt on camera.
2	Attachment Bars	Allows for added physical features and mounts for camera control.
3	Record	Records screen when pressed.
4	Joystick 2	Controls the movement of the camera.
5	Programmable Buttons	Will have functions such as camera placement, lens change, camera deletion and other desired features.
6	Slider	Controls the pan of the camera in the x, y, or z axis.
7	Frame	Encases the iPad and hardware.
8	Axis Controls	Controls the camera movement in the x and y directions.
9	Menu Navigation	Allows movement through menus of features. Includes scenes, lens, etc.



## UI Modes

**Place Camera Mode:** This mode allows the user to freely place a camera anywhere in the scene using the controls and the place camera button. This is the initial setting when the controller is started.



Mode 1: Place Camera

**Switch Camera Mode:** This mode is activated by pressing the “Switch Cam” button. When in this mode, the rotation controlled by moving the iPad is locked. The user is also able to delete the current camera location..



Mode 2: Change Camera

## Button Controls: Virtual

#	Control	Description
1	Hide Interface	Hides all the UI buttons to clear the field of view. Enabled when the controller is connected.
2	Settings	Opens the setting options for the virtual camera.
3	Change Lens	Rotates through the lens setting when the button is pressed. Cycles through the 25 mm, 35 mm, 50 mm, 75 mm, and 100 mm lens.
4	Change Aperture	Rotates through the aperture setting when the button is pressed. Cycles through the 1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, and 32 apertures.
5	Switch Cam	Switches between the cameras that have been placed by the user.
6	New Cam	Creates a new camera. Saves the lens, aperture, location and rotation settings of the users current place in the virtual space.
7	Record	Begins recording the scene. Shows in the sequencer on the desktop UE4 is running on.
8	Joystick	Controls the camera movement in the X and Y directions.
9	Slider	Controls the camera movement in the Z directions.
10	Place Camera Mode Icon	Shows that the controller is in free camera mode. <b>This is not a button.</b>
11	Mode/Camera Name	States "Place Camera" when in place camera mode. States name of current camera shown when in switch camera mode.(Difference is seen in Mode 1 and 2)
12	Switch Mode	Unfreezes the axis and goes back to Place Camera Mode.
13	Delete Camera	Deletes the current camera shown in Control 11. Only shown in Switch Camera Mode.

# Troubleshooting

## *Connection from controller not sending to iPad*

1. Start by making sure iPad is fully connected to lightning connection
2. Ensure power sources are on and charged
3. Look for wire damage
4. Disconnect iPad and reconnect

## *Movement of the camera does not line up with the controller*

1. Check to see if latch is connected and that the iPad is not being compressed
2. Remove the iPad from the controller, does UE4 still run?
  - a. Yes: verify if movement is still not behaving properly
    - i. There could be error with data transfer from iPad to Unreal
  - b. No: see *UE4 will not start on iPad*

## *UE4 will not start on iPad*

1. Disconnect iPad from controller
2. Try to run system on mother computer
3. Restart system on mother computer and reconnect

## *UE4 Crashing after building from source code*

1. Go to the folder where the UE4 project file is (Visual Studio file).
2. Run the *GenerateProcectFiles* batch file.
3. Restart Visual Studio
4. Rebuild UE4.