UCL Open-Illumiroom V2 User Manual

Introduction

Welcome to the UCL Open-Illumiroom V2 User Manual!

To get up and running with our software, please ensure your setup fulfils the requirements, then follow our instructions listed below.

Requirements

To test the system in full, please ensure that you have the following equipment and software installed. Links to requirements, where necessary, can be found at the end of the document.

Requirement	Recommendation	Tested with
PC with Windows installed	Must be capable of casual gaming as some of the rendering requires computation.	Dell XPS 15, Intel i5-8300H, NVIDIA GTX 1050
Digital Projector	Resolution 1080P. Expected to be relatively cheap	ELEPHAS Mini Projector Full HD 1080P [1]
TV, against a wall	Ideally 1080P, display output should be set to 1080p if possible	65 Inch 4k Samsung TV, 1080P Hisense TV
Method to connect TV, Projector, and PC	If PC has 2 HDMI outputs, then use that. Otherwise eg if using a laptop, a dock or USB-C to HDMI adapters may be required	Lenovo Thinkpad USB-C dock.
Software downloaded and extracted.	-	-

Additional non-necessary requirements:

The system relies on audio and visual input from the PC on which the software is run. This means that the system is compatible with other devices, such as an Xbox. There are 2 methods that we have found to achieve this:

1. Using a display capture card and OBS

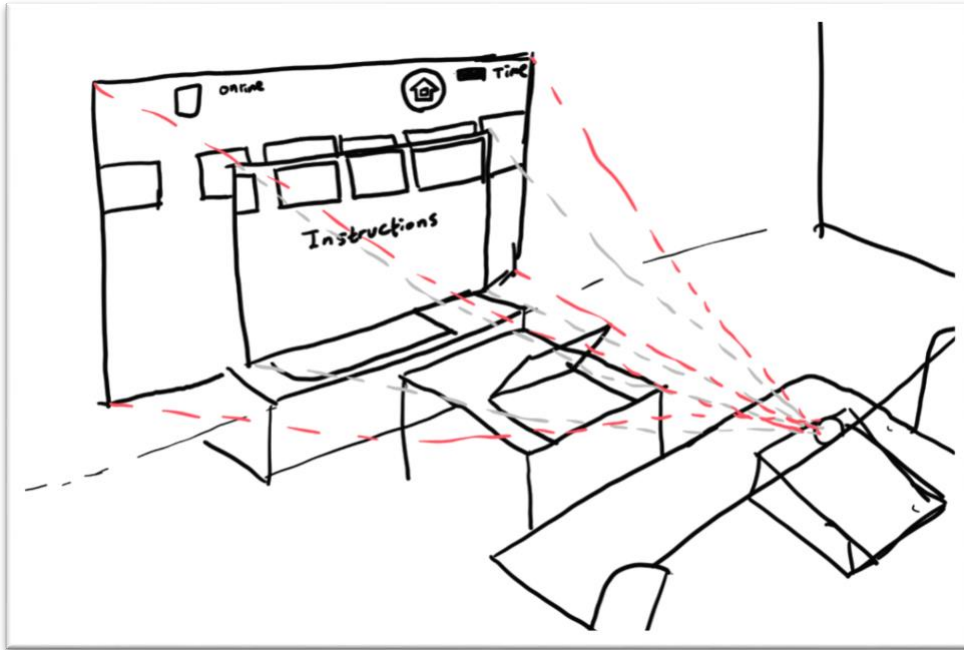| Requirement	Recommendation	Tested with
Xbox	Any recent Xbox, eg Xbox One, Xbox Series S/X, Xbox One X	Xbox One, Xbox Series S
Display Capture Card	Must be capable of 1080p game capture and video/audio passthrough.	Capture Card 4k HDMI to USB, Video Capture Card USB3.0, Game Capture Card [2]
OBS installed	-	-

2. Using Xbox Remote play.

Requirement	Recommendation	Tested with
Xbox and PC Connected to the internet.	Ideally Xbox should be on the same network.	See above

Other non-necessary requirements:

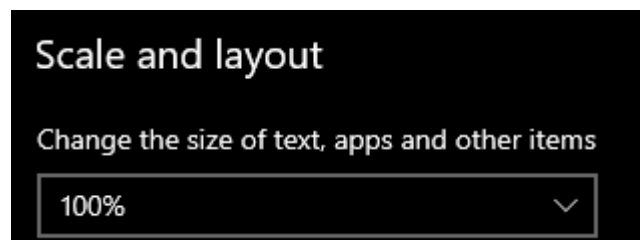| Requirement	Recommendation	Tested with
Controller to connect to PC (when not using an Xbox)	Any controller that can connect to the PC to facilitate sofa entertainment	Xbox Series S/X controller (with Bluetooth)

System Setup - Standard

To setup the system, please follow the following instructions. The result should look like the diagram.

Initial hardware setup

1) Place the projector such that it projects onto the background around the TV. The TV should be approximately in the center.
2) Connect the projector and TV to the PC. If a dock or adapters are required, plug the devices into them.
3) Turn on the PC and projector and go to the display settings in windows – this can be done by searching in the taskbar – *Duplicate or extend to a connected display*.
   a. Ensure all required displays show up, 2 if a PC with no other monitor is used, 3 if a laptop is used.
   b. Ensure that both the TV and the projector display resolution are the same (if they are not, resizing will be done by the software in some cases, however this impacts performance) and ensure that display scaling is set to 100%
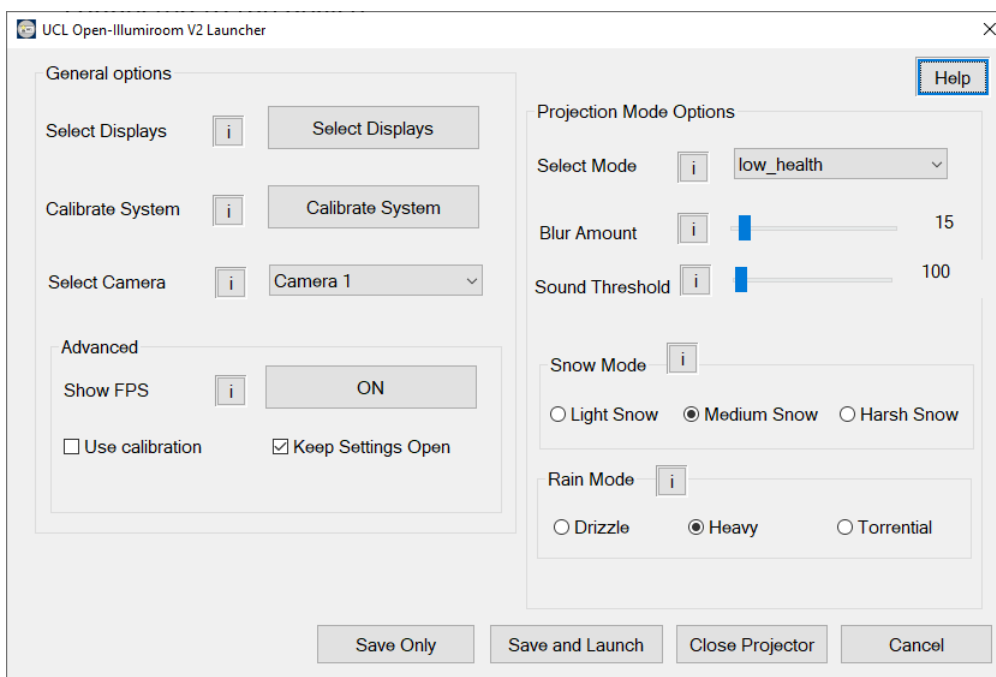
Software setup

1) **Download** the provided software and extract the zip file in a convenient location.

2) **UCL Open-Illumiroom V2 Launcher**
   Click into the folder *UCL Open-Illumiroom V2*, then run the *UCL Open-Illumiroom V2 Launcher*. Your antivirus or Windows Defender SmartScreen may warn you against running the software. This is because the system software is unknown to the antivirus companies. You should proceed, allowing the software to run. If your antivirus prompts you to exclude the process/allow it to run, again you should do so.

3) The launcher window will open, and the following window will be shown.

The launcher is the place from which settings can be changed. This includes selecting a display, choosing a projection mode, changing projection mode settings and more.

4) Select Displays

Before running the UCL Open-Illumiroom V2 system, you must first select your displays. Press the *Select Displays* button.

A window will open, potentially after a short while the first time the system is run. The opened window should look like this, with either 2 or 3 displays, 1 for each connected to the device.

Figure 1 Select Displays shown in real life. The laptop is display 1, projector is display 2 and TV is display 3
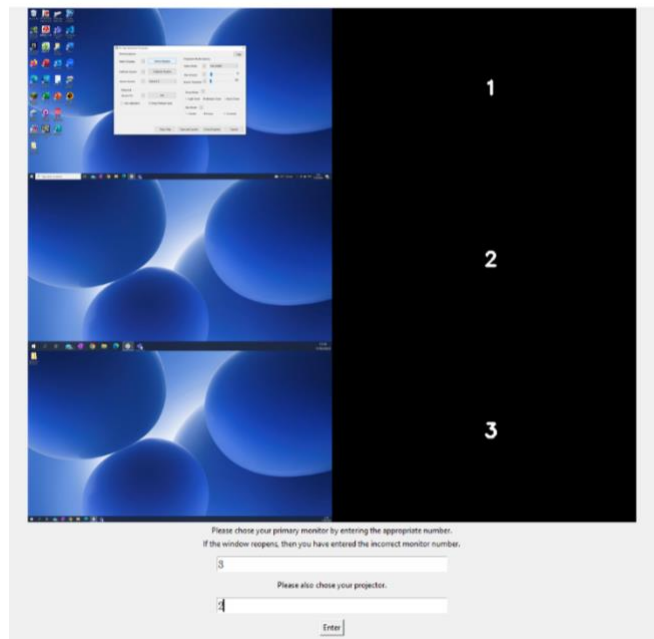

Figure 2 Select Displays window shown to the user.

Please follow the instructions on screen and enter the numbers for the primary TV display (in this case 3) and the projector display (in this case 2).

Press Enter to save your display settings, returning to the main menu.

5) **Calibration**.

The UCL Open-Illumiroom V2 system supports a calibrated mode. It will correct for any obstacles or bumps on the background wall and centres the primary TV display within the projection. To calibrate your system, press *Calibrate System* in the launcher.

Please then follow the instructions shown on your primary display/TV.
First, place the webcam approximately in the same position where you wish to watch content from. To check if your camera is pointed correctly at the TV, you could use the Camera app on your computer, ensure that the projection area and primary display/TV are approximately in the centre of the image.

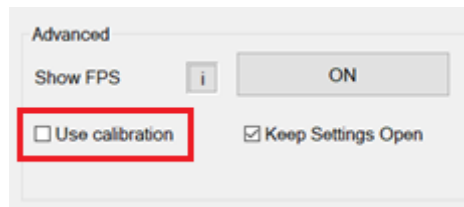*Figure 3 View from the Camera App - Projection display and TV is approximately centred*

Do not forget to close the camera app once you have centred your camera. After setting up the webcam, press *Space*.
Then, if the correct camera is displayed, press *y* (for 'yes'). If the incorrect camera is displayed, press *n* (for 'no'), and select the next camera in the list in the launcher.
Do not move the webcam or projector and stay out of the camera view while the calibration is taking place. Calibration can take some time on certain devices.

Continue following the instructions on the primary display/TV, until the calibration process is complete.

You may choose whether to use the calibrated mode, this option can be changed in the launcher. With calibration turned on, the

projection will be corrected to centre the TV and show the projection modes from your point of view. Without it, projection effects will be rendered from the projector's POV.

6) **Select Mode**
Select the mode which you would like to use. We recommend that you try the blur mode first. Choose an appropriate blur amount setting, e.g., 50 with the blur slider.

UCL Open-Illumiroom V2 Is now set up and ready to run!

Software Run

1) Now that everything has been set up, press Save and Launch to run the application!
2) The projection mode window should open on the selected projector display and the effect should be displayed around the TV. Press 'Esc' after clicking on the projection window to exit. You will return to the launcher window.
3) To choose a different projection mode, go to the launcher, and chose a different mode. Then click Save and Launch. The projector window will close, then reopen with the newly selected mode.

Modes and settings

Currently, the following modes are operational:

- Blur
- Cartoon
- Display Image
- Low health
- Snow
- Rain
- Weather
- Wobble

Notes on Modes

Wobble may or may not work for you as expected. We unfortunately had to remove the main machine learning model-based version (which analysed audio to trigger the Wobble effect when explosive sounds like gunfire are heard in the game). This is due to incompatibility issues between a package we were using and our compiler. We hope to have Wobble work properly in a later version.

In the meantime, this mode works by listening for sounds louder than a given threshold. We recommend setting the Sound Threshold to 1 and launching the mode whilst playing your game/ watching your film. If you'd like to trigger the effect for only the louder sounds, increase the Sound Threshold value by increments of 1-5 in the launcher till you are satisfied.

Next, low health was primarily developed and tested with Call of Duty Black Ops 2 which produces a reddening screen the player is low on health. We would recommend that the mode be tested with this game, as others will indicate low health differently.

Most modes have settings that can be changed. Examples include changing the amount of blur, changing the strength of the falling snow for the Snow mode, and more.
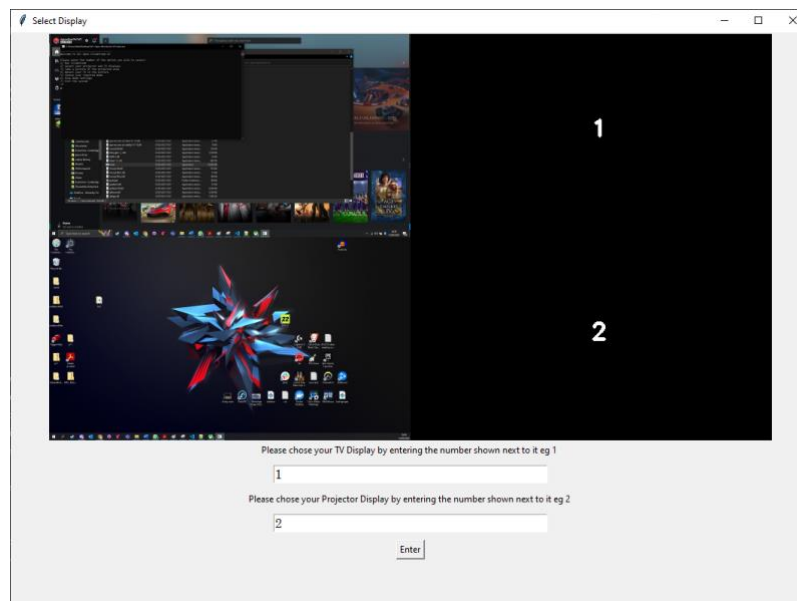
Some of these settings can be changed either in the launcher, and all of them can be manually changed in the mode_settings.json file. This can be found in the '\UCL_Open-Illumiroom_V2.dist\settings' folder.
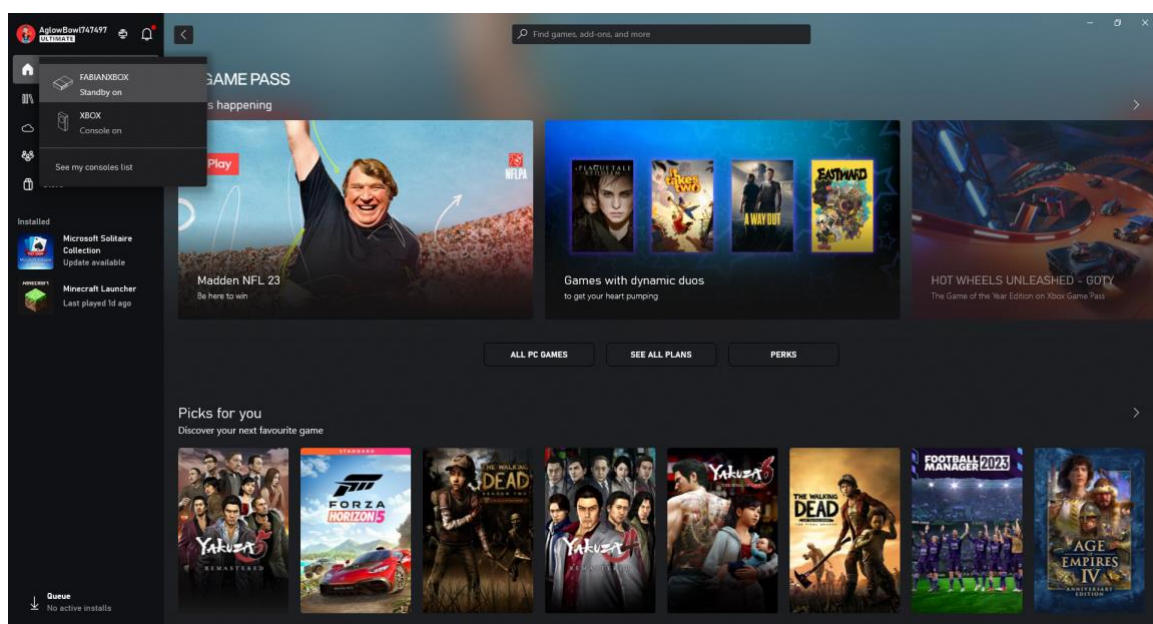
Xbox Remote Play Method Setup

The remote play method works best in setups that involve a laptop, as there is no need to connect to the TV.

Remote play method:

1) Enable Xbox Remote play on the Xbox being used.
2) Set the laptop display to be the primary display (TV) input in the system software.

3) Connect to the Xbox via remote play using the PC using the Xbox App.

4) Keeping the remote play window open on the laptop, select the required projection mode, then run.
5) The projections will be displayed on the projector, and there will be no latency for the user playing since they will play directly on the TV.
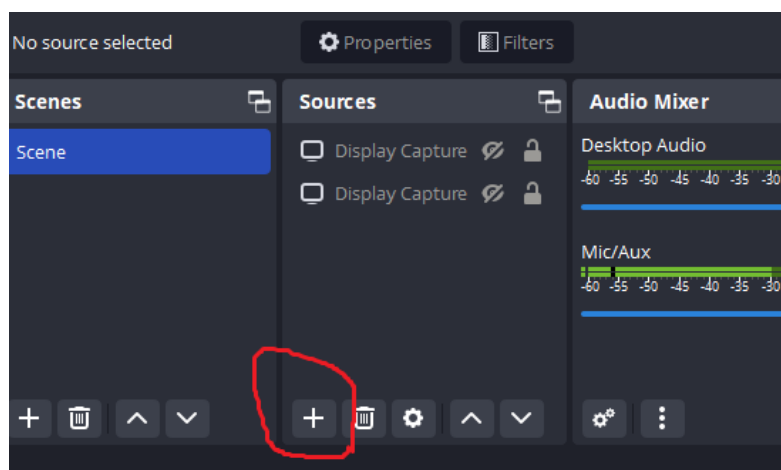

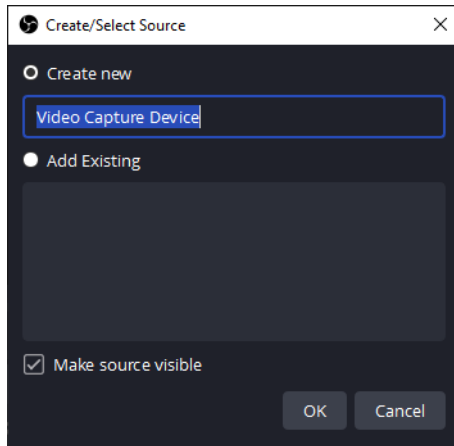Game sound will be passed to the PC, allowing this to be detected for the Wobble mode.

Xbox Capture Card and OBS Method Setup

This method is slightly more complicated than using remote play, however it does not require WiFi network access, therefore it is more reliable. We currently have not set up this method to use sound, therefore it is best suited to the Blur mode. We are certain that this will be possible in future setups.
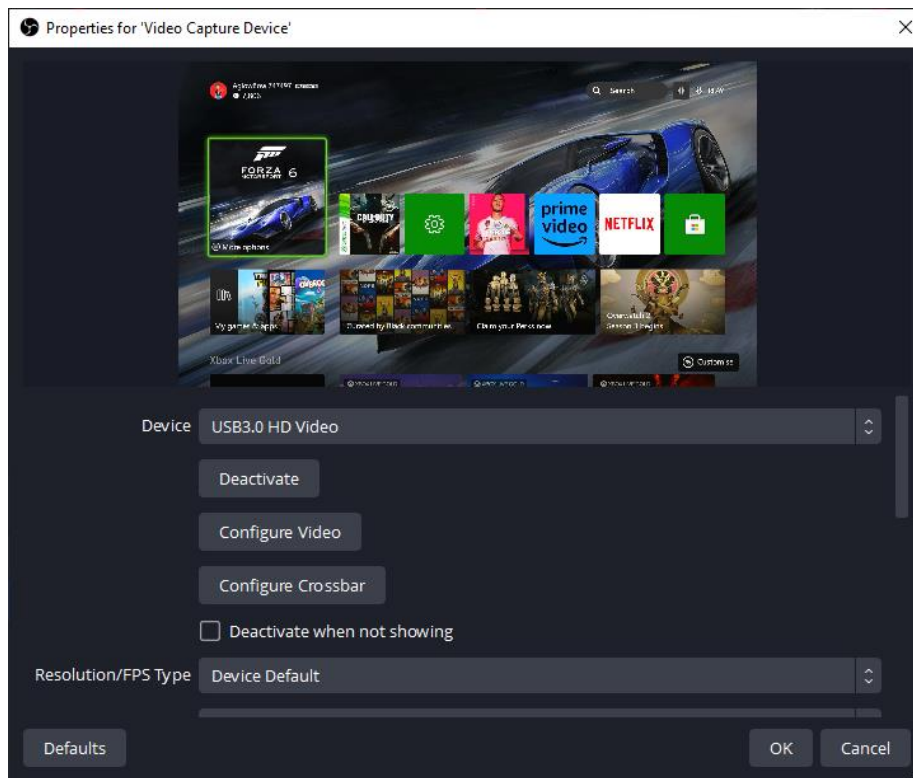
1) Connect the capture card in between the Xbox and the TV, (HDMI input and outputs) and the capture card USB to the PC.
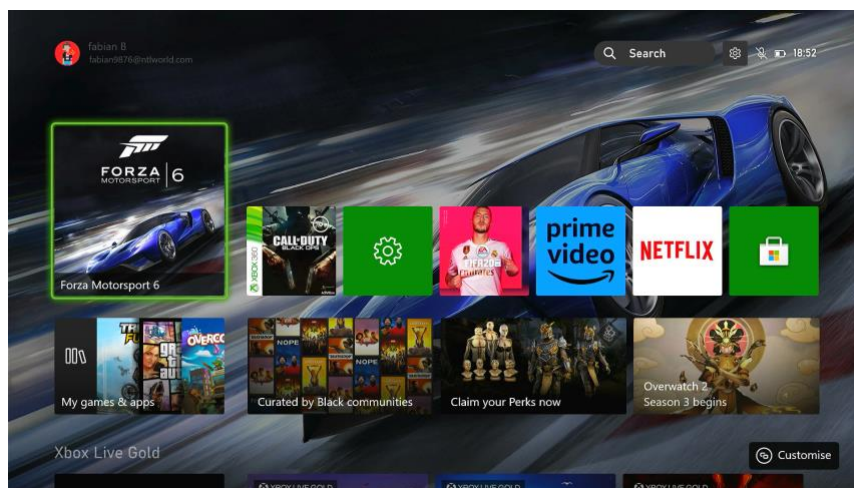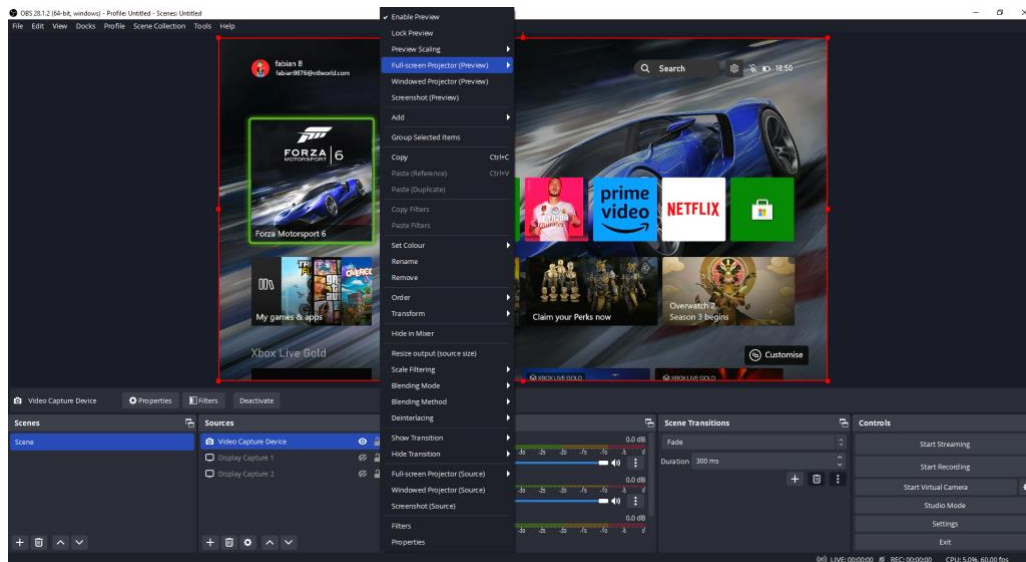
2) Start OBS, click the + in sources, and select Video Capture Device > Create new > OK.

3) Select the capture card from the device list – in this case it is USB3.0 HD VIDEO, then press ok.

4) The capture stream should then be shown in the OBS panel. Right click on it, click *Full Screen Projector (*Preview), then select your primary display. This is most likely your laptop screen.

The Xbox screen is shown.

5) Finally, run the system as usual, and you will be able to see the projection modes as expected!

Final Note

Thank you very much for following our instructions manual, we hope you enjoy using our system. For more demo videos and information, please check out our videos on YouTube as well as our development blog!

YouTube videos: https://www.youtube.com/@fabianbindley4070

Development Blog: https://uclopenillumiroomv2.wordpress.com/

If you have any issues, please feel free to contact the lead developers Aishwarya or Fabian by email - aishwarya.bandaru.21@ucl.ac.uk / fabian.bindley.21@ucl.ac.uk

References

[1] "Projector, ELEPHAS Mini Projector Full HD 1080P with 8500 Lux, Multimedia Home Theater Movie Projector Compatible with iOS/Android Phone/Tablet/Laptop/TV Stick/USB/PS4," [Online]. Available: https://www.amazon.co.uk/Projector-ELEPHAS-Multimedia-Theater-Compatible/dp/B0BPM84JYW/ref=sr_1_4?qid=1675177713&refinements=p_89%3AELEPHAS&s=home-theater&sr=1-4.

[2] "Capture Card 4k HDMI to USB, Video Capture Card USB3.0, Game Capture Card, Video Capture Device HD 1080p 60FPS, Capture Card for Streaming, Work with PS4/PS5/Xbox/PC/Mac Linux Android Windows 10/11," [Online]. Available: https://www.amazon.co.uk/gp/product/B0BBFPMHHN/ref=ppx_yo_dt_b_asin_title_o01_s00?ie=UTF8&psc=1.