

# Lab #1: Robotic Arm Multi-Camera Monitoring and Remote Control Webpage Design

## Objective:

1. Write a simple sets of web pages to monitor the robotic arm with three cameras from different angles, together with the remote control.
2. Build the web server to host the web pages.

## Equipment:

- Computer: a generic computer with Windows system (Win 7 or Win 10) installed
- Three USB cameras

## Safety Rules:

1. Turn off power supply BEFORE disconnecting power line.
2. Don't touch any power source when your hands are wet.

## Step 1: Multi-camera live streaming using OBS Studio on YouTube

1. To have three cameras in the same video live streaming, it is essential to an external program to handle the signal. Download OBS Studio at: <https://cdn-fastly.obsproject.com/downloads/OBS-Studio-22.0.2-Full-Installer-x64.exe> and install it.
2. Run OBS Studio.
3. It should prompt to "Auto-configuration Wizard". If not, go menu -> Tool -> Auto-configuration Wizard.
4. Choose "Optimize for streaming" and use default settings for next page.
5. When asking Steam Information, choose "YouTube".
6. Open [https://www.youtube.com/live\\_dashboard](https://www.youtube.com/live_dashboard) with web browser and login. Copy the "Stream name/key" at the very end of the page:

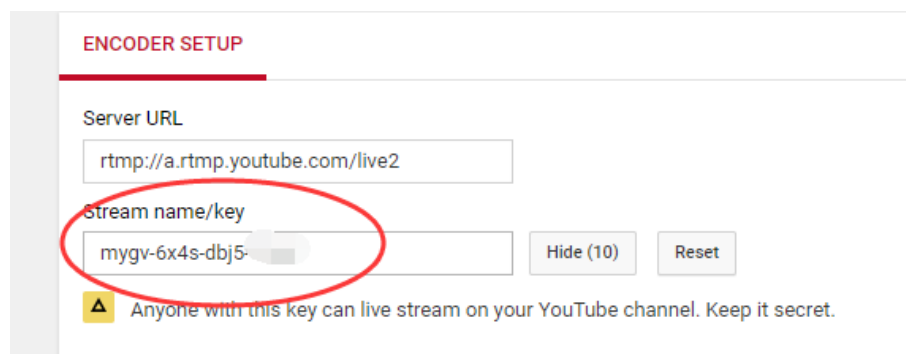


Figure 1 Find YouTube stream name/key

7. Go back to OBS Studio and paste the key in:

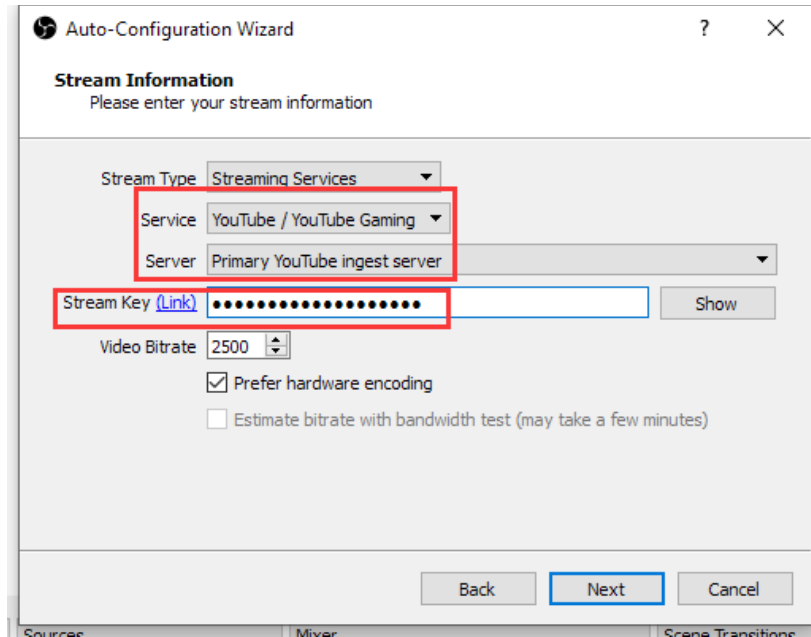


Figure 2 Configure OBS with your YouTube stream key

8. Click “Next” and then “Apply settings”.
9. In the main interface of OBS Studio, click “+” in the second left part of the bottom and choose “Video Capture Device”

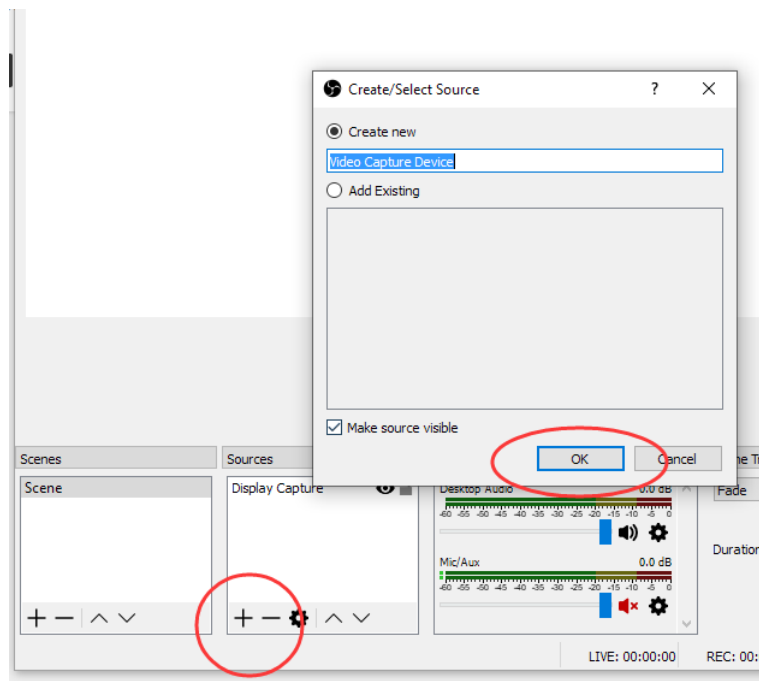


Figure 3 Add new video capture device(s) on canvas

10. Choose one of the cameras in “Device”, and set a lower custom resolution (recommended: 480x360). Setting the resolution too high will exhaust the bandwidth of USB bus when using three cameras.

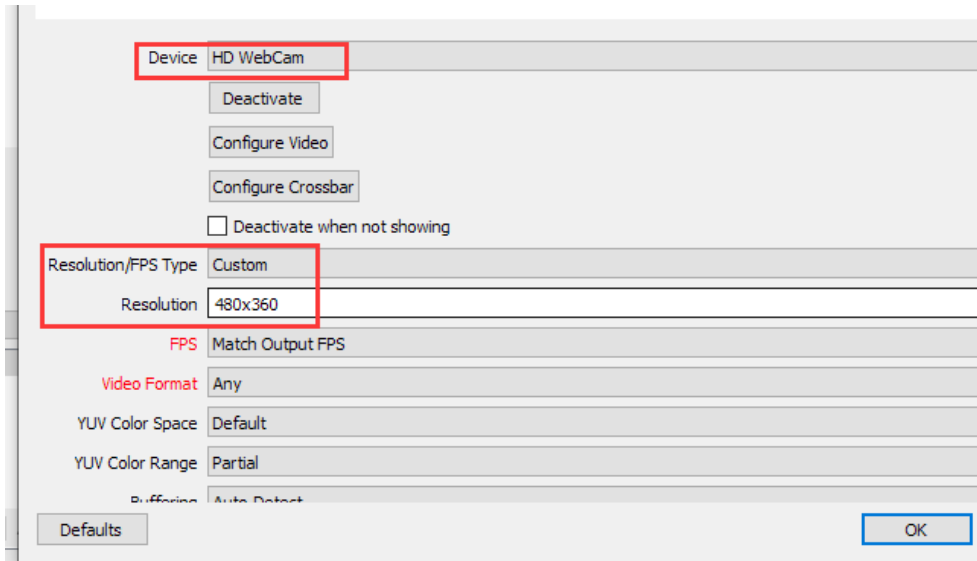


Figure 4 Reduce the resolution of each camera to save bandwidth

11. Repeat the above steps to add another two cameras to the canvas.
12. Adjust the video frame on the canvas by dragging so they arrange in the desired way:

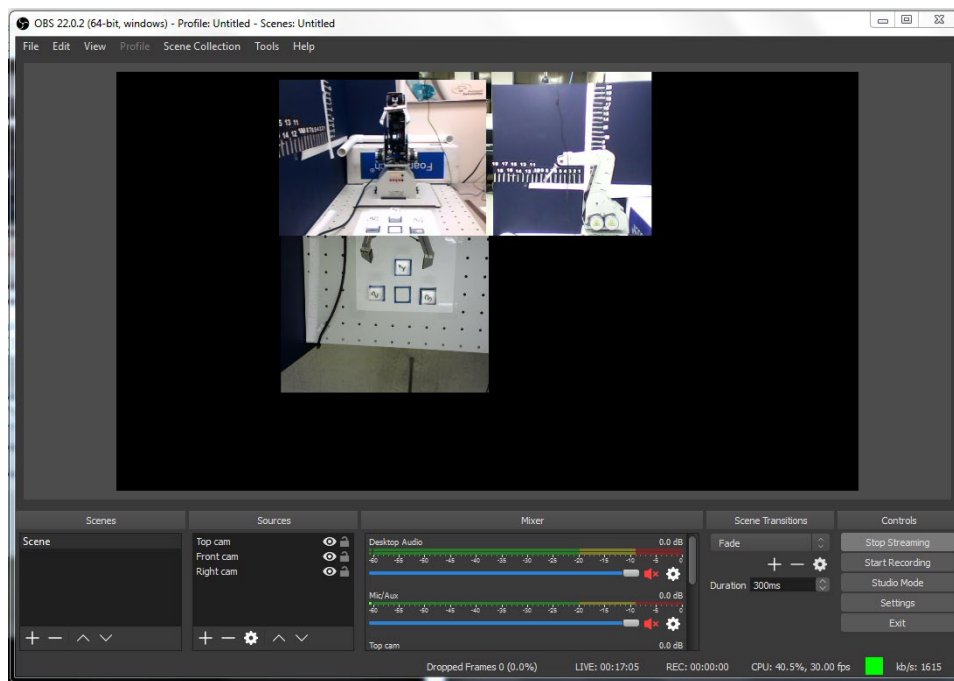


Figure 5 Final result of the canvas

13. Once finished, click “Start Streaming” button in the right bottom area.
14. Go back to [https://www.youtube.com/live\\_dashboard](https://www.youtube.com/live_dashboard) and copy the URL from the right bottom corner (Share). The URL should look like <https://www.youtube.com/watch?v=1b5ug5WDU6Q> (we need this URL later.)
15. Open it and see if you can see the video stream.

## Step 2: Web server installation

16. Download and install “xampp-win32-7.2.6-0-VC15-installer.exe” [2] and all its components.

17. Open XAMPP’s control panel:

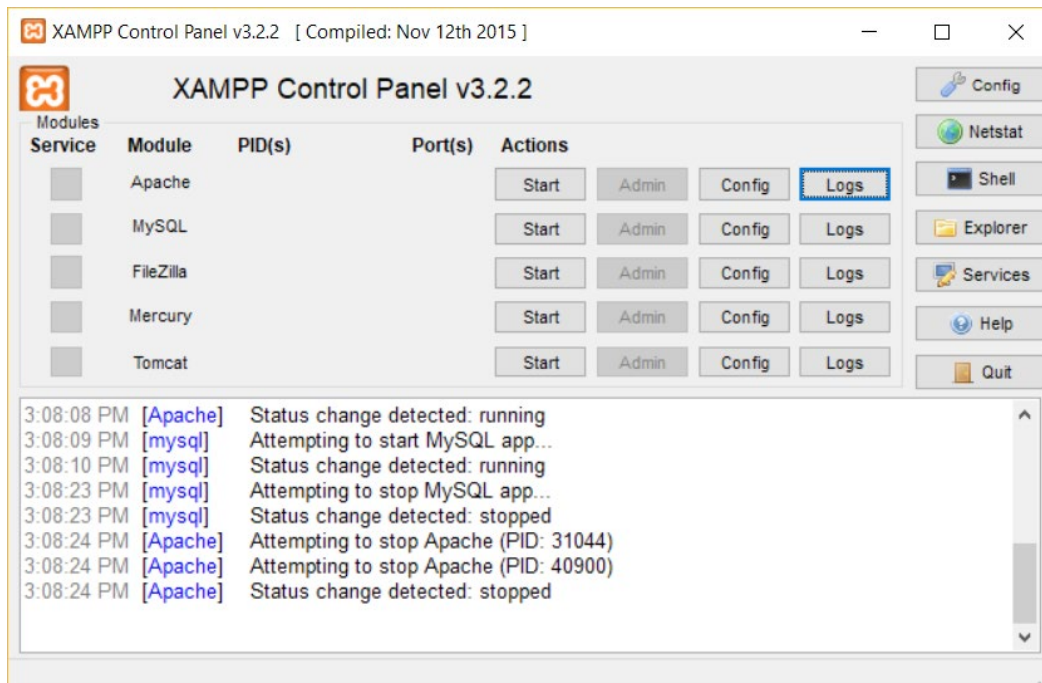


Figure 6 XAMPP Control Panel

18. Click the top “Start” (in “Apache” line) to start the HTTP server. Visit <http://localhost/dashboard/> to make sure it works correctly.

## Step 3: Writing webpage for camera video

The webpage is written using HTML and PHP language. HTML is used to build static content of the webpage, while PHP is used to handle requests, and to generate dynamic content. To make web page writing easier, a few libraries are used to help with our goal.

1. Copy the folder’s content to the folder C:\xampp\htdocs.
2. To include the video captured from the camera, use `<iframe>` tag to embed YouTube video streaming to our page. Use the following code:

```
<div style="overflow: hidden;">
<iframe height="100%" width="100%"
src="https://www.youtube.com/embed/hBJtIuUifnk?controls=0&autoplay=1"
style="border: 0px none; margin-left: -650px; height: 95%; width: 2000px;"
frameborder="0" allow="autoplay; encrypted-media" allowfullscreen>
</iframe>
</div>
```

3. Replace the red font part with the ID of your own video live stream, from the URL in step 1.14. For example, if the URL is <https://www.youtube.com/watch?v=1b5ug5WDU6Q>, then the ID will be 1b5ug5WDU6Q.

4. Replace all lines above to the file `video_youtube.php` in the same folder.
5. Open [http://localhost/video\\_youtube.php](http://localhost/video_youtube.php) to check if you can see the video.

#### Step 4: Combine the video page together with the virtual pendant

1. To show the video monitoring together with the virtual pendant on the same page, use `<iframe>` tags again to combine two pages together, side by side:

```
<iframe src="video_youtube.php" height="100%" width="40%"></iframe>
<iframe src="pendant2.php" frameborder="0" height="100%" width="59%"
align="right"></iframe>
```

2. Copy all the lines above and save it to the file `stream.php` in counter folder.
3. Visit <http://localhost/stream.php> and see if you can see the camera video.

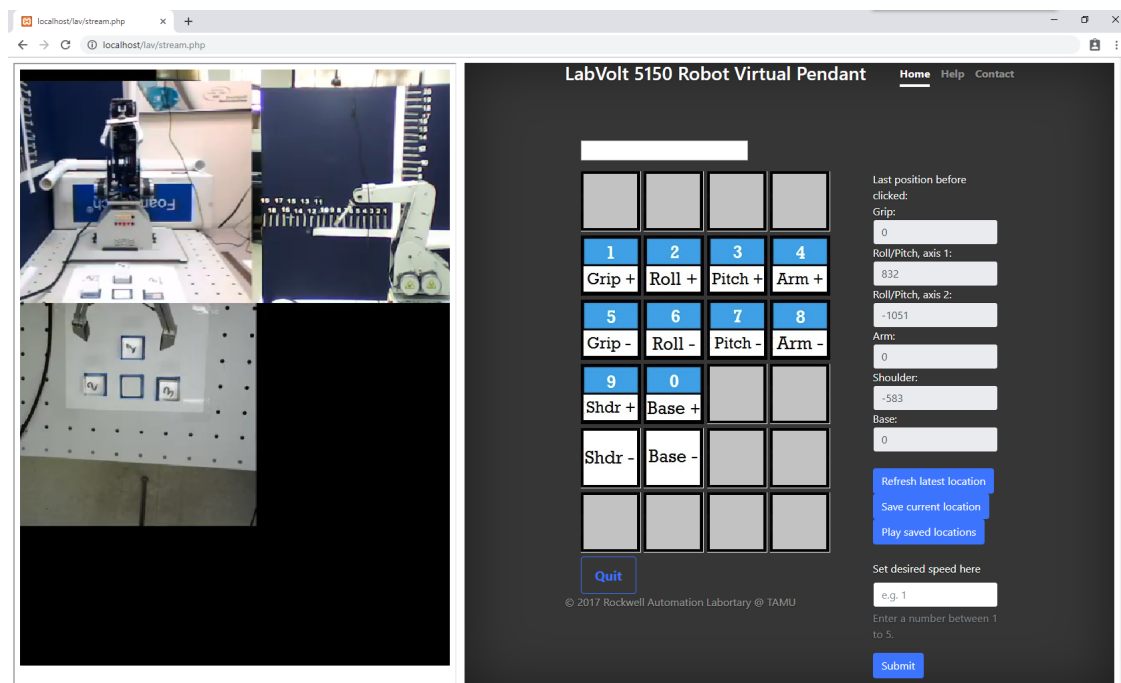


Figure 7 Video webpage result

- [1] <https://cdn-fastly.obsproject.com/downloads/OBS-Studio-22.0.2-Full-Installer-x64.exe>
- [2] <https://www.apachefriends.org/xampp-files/7.2.6/xampp-win32-7.2.6-0-VC15-installer.exe>