

# How to build a homemade visualiser using IP Webcam (for owners of good specification Android phones)

This short guide aims to take you through the steps for how to build a table-top visualiser at home using a mobile phone app for Android called **IP Webcam**. You do not need to be particularly technical to use the software, but a willingness to experiment and try things out will go a long way.

## Requirements

- **Android phone** which has a reasonably **good** specification<sup>1</sup>, and its power charger.
- Laptop connected to a power source, or a desktop machine.
- A means to secure your phone with its rear camera pointing over your drawing surface.
- You may need a power extension cable to your work area and additional lighting.
- **[Recommended]** The Chrome web browser installed on your laptop/desktop machine.
- **[Recommended]** High-contrast pens, such as felt-tip or very black "uni-ball" pens.

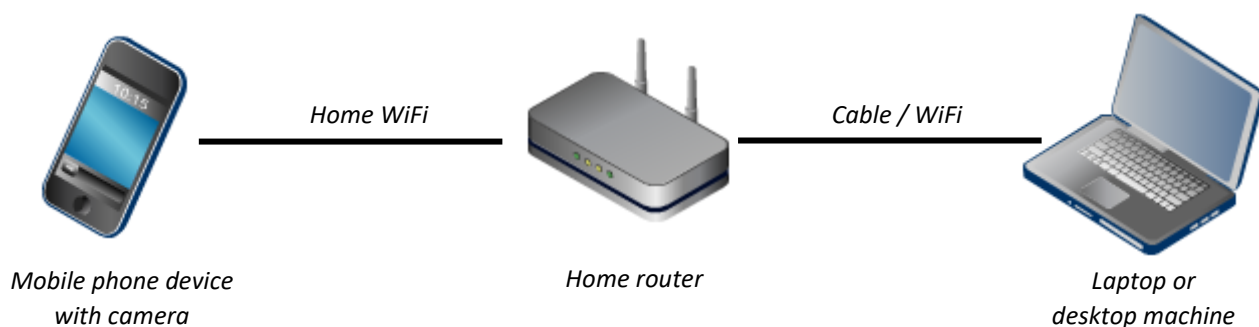
## How does it work?

Your mobile phone will act as the visualiser camera. This will need to be securely positioned above your drawing surface. Your phone will broadcast a live video feed from your phone's camera to your local home network over WiFi. A reasonably good specification phone is required (see footnote).

The video feed will be viewable on any web browser within your home network such as the browser on your work laptop/desktop computer. A set of controls to remotely control your camera is also provided from your mobile phone and can be accessed through your laptop/desktop web browser.

To share this with your students during an online tutorial or lecture, you can use the Blackboard Collaborate sharing tools to share a web browser window or (even better) just the browser tab displaying the video feed.

## Your local home network

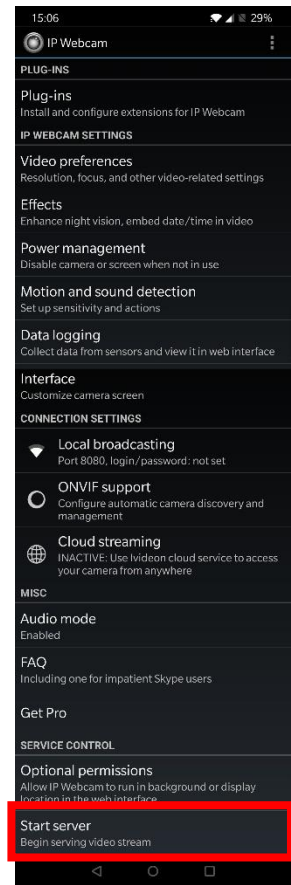


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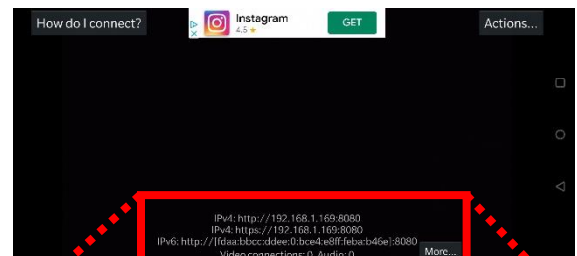
<sup>1</sup> It is difficult to say how powerful your phone needs to be. This setup was trialled on a higher spec OnePlus 7T phone and very low spec £45 Alcatel One phone. The high spec phone performed very well, albeit with a faster draining battery. The low spec phone shut down due to overheating after 15 minutes.

## Home visualiser setup

1. Download and install the [IP Webcam](#) app (by Pavel Khlebovich) from the Google Play store. Only the **free version** is required, therefore you can ignore the paid-for Pro version. The free version is ad-supported, but these are not too intrusive and won't be seen on your video feed.
2. Open the IP Webcam app on your phone.
3. The app consists only of a series of options to configure how your mobile phone webcam will behave. You can ignore most the options and just scroll down to the last option to select **"Start server"**. This will switch on your phone's camera and begin broadcasting the video stream. However, the first time you select this option you will need to accept a set of phone app permissions to grant IP Webcam the correct access. Select **"Allow"** to the permission requests outlined below – you need to allow all of these, or else the IP Webcam server won't start up:
  - **Take pictures and record video**  
(required to use your phone's camera as a visualiser)
  - **Access photos, media and files on your device**  
(required should you wish to grab a photo of your workings from the visualiser camera)
  - **Record audio**  
(required for the app to broadcast audio when used as a security camera. While this feature won't be required for basic visualiser use, you need to allow it anyway)



4. Your phone's camera should now start up. Place your phone flat on to a surface so the rear camera is obscured and the broadcast feed goes black. Note the text which is overlaid onto the (black) camera feed. Type the top URL<sup>2</sup> (i.e. everything on the top line except IPv4: so you begin with http) into the web browser on your laptop/desktop. Make sure you include all the colons, slashes and dots as per the URL given in the app.



```
IPv4: http://192.168.1.169:8080
IPv4: https://192.168.1.169:8080
IPv6: http://[fdaa:bbcc:ddee:0:bce4:e8ff:feba:b46e]:8080
Video connections: 0, Audio: 0
```

In this example, we must enter the following into our web browser:  
`http://192.168.1.169:8080`

For reasons that will become clear later, we recommend you use the **Chrome** web browser.

<sup>2</sup> For the curious, this URL consists of three elements (1) the **scheme** (e.g. http); (2) the **host** as an IP address (e.g. 192.168.1.169); and (3) the **port** subcomponent (e.g. 8080). All are required to navigate to the IP Webcam home page.

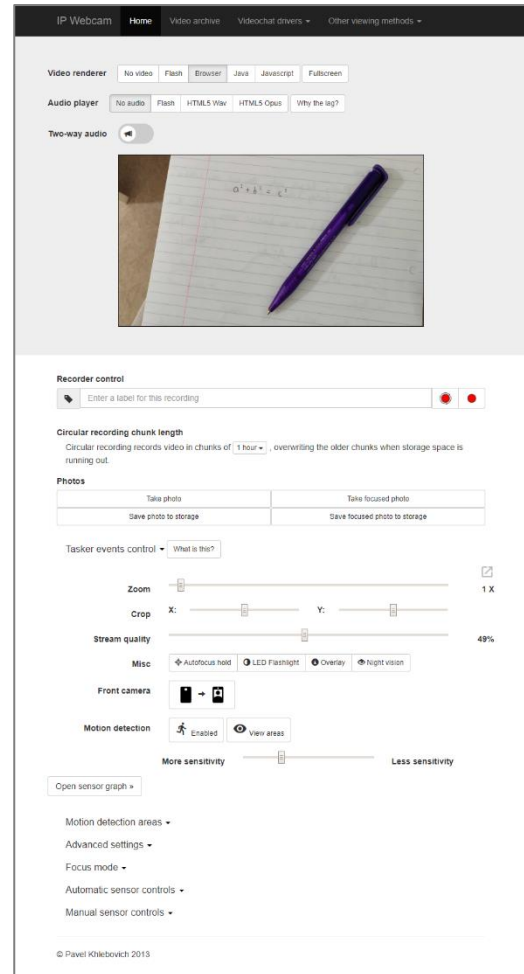
5. If everything is working correctly, your web browser should display the IP Webcam home page featuring all the options to control the video feed.
6. At the top of the home page controls, set the “**Video renderer**” to “**Browser**”. You should now see the video feed from your phone displayed in your web browser. You can leave the “**Audio player**” setting as “**No audio**” as we don’t require it for our visualiser.
7. Now **build a support frame** for your camera to be positioned above your drawing surface. At this stage, don’t worry about the image orientation or zoom. This can be refined later on, once you have your camera in approximately the position.

You will need to be creative – use small tables, kitchen equipment, Lego, anything to secure your phone above your writing surface (A4 paper). The exact distance will depend on the camera in your phone, but between 20-30cm is typically a good distance. Take care not to clamp your phone so tightly that it scratches or breaks it, or so loosely that it can easily fall out if the setup is knocked.

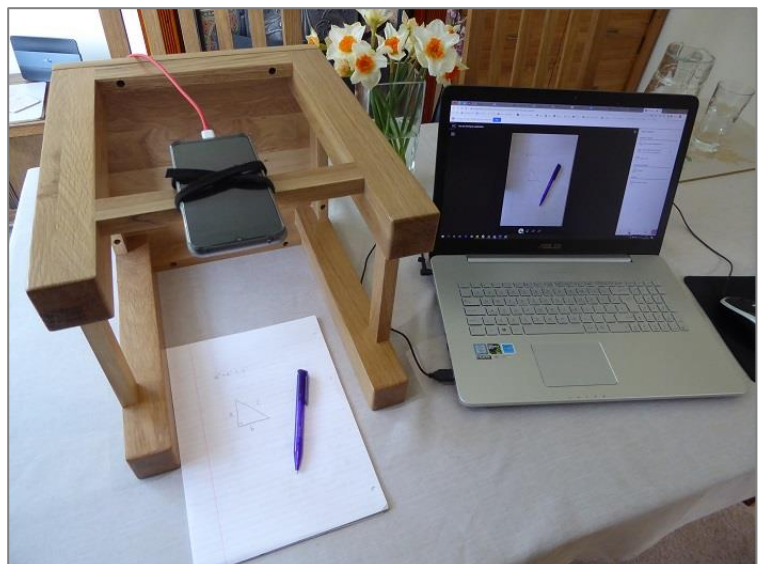
You will also need to ensure the **phone charger** is plugged in to your phone as the video broadcast will quickly drain your phone’s battery.

Your phone support will also need to be placed **next to your laptop/desktop machine** so you can communicate with your students at the same time as driving the web conferencing software.


In this example setup, a small occasional table has been used to place the phone at the correct height and the phone is secured with soft Velcro straps which allows it to be easily moved to fine tune the camera position. Some users may find a *landscape* orientation works better than this *portrait* one with regards to best use of on-screen space.

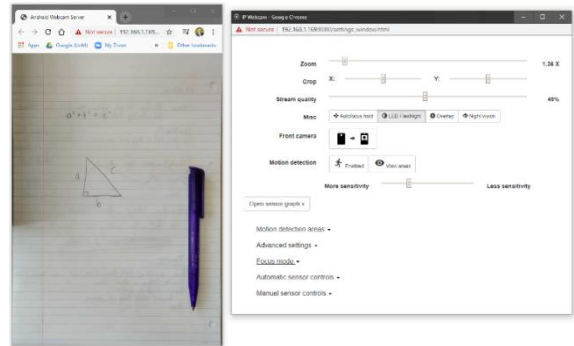


The IP Webcam home page with video feed



- Now return to the IP Webcam controls in your browser to complete the setup.

Pop the controls out to a separate window so you can see the video feed and controls more easily together. Select the “**pop-out**” icon  to the right of the Zoom control option. Once you have done that, you should also select the “**Fullscreen**” option next to the “Video renderer” options to pop the video feed into its own browser tab/window. Resize this window to fit the size of the video feed. Finally, close the original IP Webcam page to avoid on-screen clutter and confusion.



The following settings are recommended and should be applied in the order listed:

- Open the “**Advanced settings**” options. Set the “**Video resolution**” to an aspect ratio similar to that for A4 paper (1 : 1.4) and with the larger dimension at around 1024 pixels, e.g. **1024x738**. The options available to you will depend on your phone’s specification. This will fit the image of the A4 paper best without compromising too much on image quality.
- Under the “**Advanced settings**” options, you may wish to change the “**Orientation**” to match your drawing surface setup. Your camera setup and preferred way of working will determine if you need to set this to Portrait or Landscape mode.
- Adjust the camera so that the drawing surface is located in the centre of the image. Now make small adjustments to the “**Zoom**” control so that the whole of the A4 paper is just within the image.
- Open the “**Focus mode**” options. If your phone camera hardware allows it, you might be able to set the “**Focus mode**”. If you are given the option, set this to “**Manually set**” and then adjust the “**Focus distance**” until writing on your drawing surface is as *sharp* as possible. This will ensure your video feed doesn’t jump out of focus as you move your hand in and out of shot.
- Finally, under “**Misc**” options, toggle your phone’s “**LED flashlight**” on to provide additional lighting. If this doesn’t provide enough light, add a desk lamp to your setup.

**Warning 1 of 2:**

Mobile phones vary enormously and you may experience glitches during setup. Persevere, and if the software fails to communicate with your phone, try the following:

- Check the server hasn’t crashed on your phone; restart it if it has. Unfortunately, this will also wipe any settings you have applied so you will have to recreate them.
- Refresh the control page or/and video feed windows in your web browser.
- You may also find it helps if you give the IP Webcam app on your phone additional permissions to “Allow streaming in background”. See the “**Optional permissions**” just above the Start server option.

**Warning 2 of 2:**

Lower spec phones may struggle with the required CPU processing to stream live video through WiFi. Keep an eye on your phone while you are testing your setup and take particular notice of warnings about the phone getting too hot. Stop using the IP Webcam app if this is the case. To help reduce the load on your phone, you could try the following:

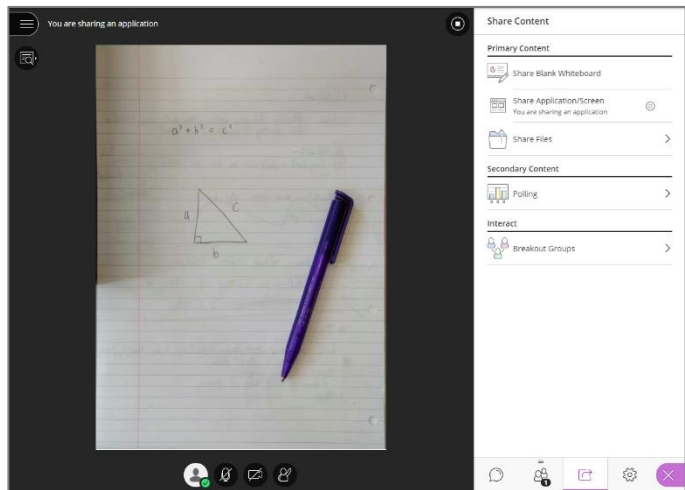
- If possible, move your setup closer to the WiFi router in your home. This will mean your phone has to work less hard to send all the data.
- In the IP Webcam app on your phone, lower the frame rate (FPS) of the video feed. Select this option via **“Video preferences > FPS Limit”**. By default, this is set to **“No limit, maximum CPU/Battery/Network use”**. Reduce this to as low as possible without unreasonably compromising the experience for your participants.

Once you have configured the IP Webcam, it should remain stable and continue to broadcast the mobile phone’s camera without problems. Note down all your settings for next time.

9. Start-up Blackboard Collaborate in a new browser tab and join the session. Select the **“Share Content”** options followed by **“Share Application/Screen”**.
  - If you are using the Chrome web browser, you should select the share **“Chrome Tab”** option and look for the tab entitled **“Android Webcam server”**. This provides the cleanest view of your video feed.
  - Otherwise, select the option to share **“Application Window”** and select the browser video feed window you popped out to fullscreen earlier. Browser controls and options will also appear in the shared view - you could try to hide some of these if you wish.

Resize the fullscreen video feed window until the shared content in Blackboard collaborate is just sharp enough to see the content. If you make it too big, more data will need to be sent to all your students and there may be performance issues for some users.

As you will be working further away from your laptop/desktop, you may be better using a separate microphone (headset and mic) to ensure your voice is picked up clearly.



It is strongly recommended you use high-contrast pens such as felt-tip or very black "uni-ball" pens to help your viewers clearly see what is written or drawn.

10. Finally, when you have completed your tutorial or lecture, select the back button on your phone to close the IP Webcam server.

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The IP Webcam software can do more than is described in this guide. Contact the FSE eLearning team if you have an idea for something you want to do, but can't work out a process.