Measuring a Camera's Field of View

Another important camera specification is the *field of view* - how much area is contained in a single image? So far, we've worked with images that have very different fields of views, ranging from a large field of view covering over 4 million square miles and containing 2 hurricanes near Hawaii as well as some smaller fields of view to identify people on top of rooftops.

Let's compare the fields of view of some of our cameras:

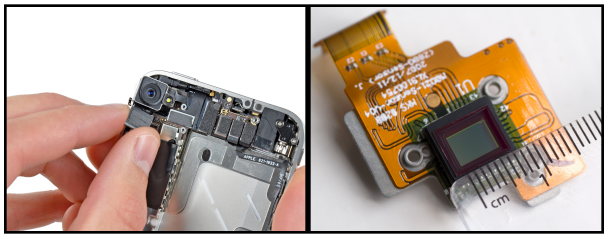
1. Place your camera 1 inch from the provided grid and take an image. (Question: why does it need to be 1 inch?)

2. The grid line spacing is 1 mm, with bold lines every 1 cm. Look at the image you took - what is the physical width and height of it?

3. To find the pixel scale, you also need to know how many pixels are in your camera. You can either try to Google this value, or go to exif.regex.info and upload an image to see the file's pixel size. (I'd personally recommend using the website. Note that if you visit the site on your smartphone and click "Choose File", it may be easier to select your camera app and take a new photo rather than find the image of the grid.)

   Take the physical size of the image and divide it by the relevant number of pixels. What's your camera's pixel scale (cm/pixel)?

4. Another thing that's interesting is the camera's *detector size* - that is, how big is the detector in the camera? If you took apart your phone, you'll see the camera is a small module on the motherboard, and behind that camera a chip called a CCD (charge-coupled device):



That CCD contains all of the pixels in the camera - so if you have a 12 megapixel camera, that small CCD contains 12 million sensors (pixels) that receive light and send that information to the camera.

In addition to the information we already have, we need to know the focal length of the camera, which is the distance between the camera lens and detector. Again, you can either Google this value (note: some websites return the "effective focal length", which is not what we want) or you can use the value returned by exif.regex.info (listed as "lens").

Based on the geometry of the camera setup, we have

$$\frac{detector\ size}{focal\ length} = \frac{grid\ size\ in\ image}{distance\ between\ camera\ and\ grid}$$

Calculate the width and/or height of your detector.

From #3, we know how many pixels are along each dimension of the detector. What is the size of each pixel in the CCD?