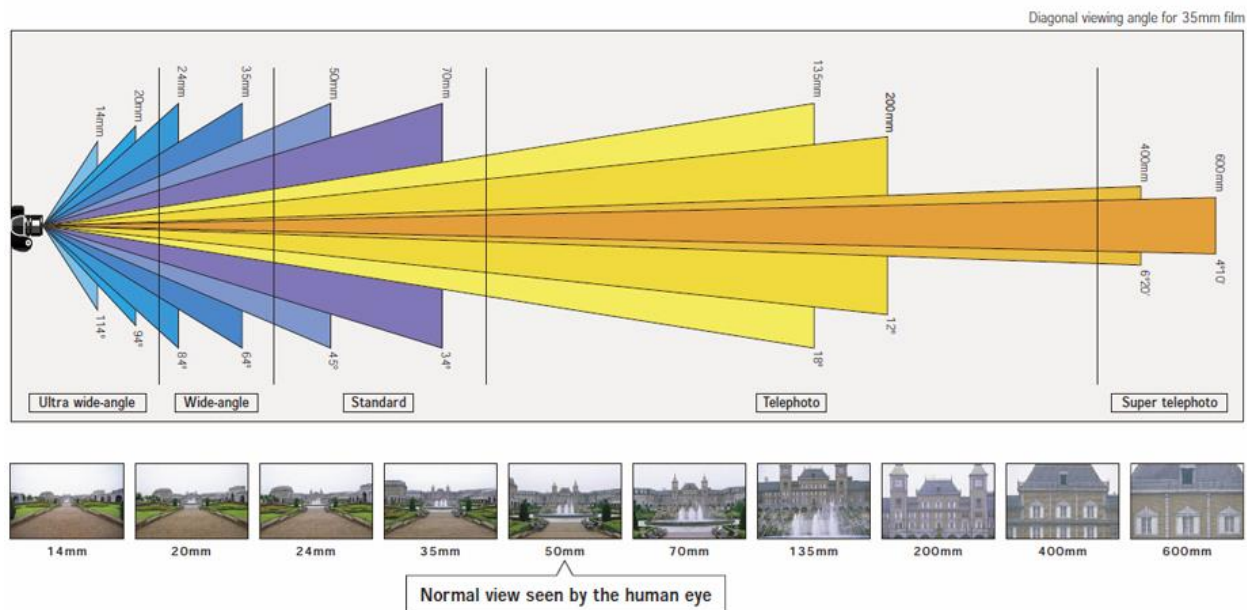


FOCAL LENGTH

Focal length is a calculation of the optical distance from the point where light rays converge to form a sharp image of an object to the digital sensor or 35mm film at the focal plane in the camera. This is usually measured in millimeters (mm).

Focal length is an important indication of the **field of view (FOV)** and the **magnification**. Field of view depicts how much of the scene will be captured and the magnification specifies how large individual elements will be. The FOV and the focal length has an inverse relationship. The higher the focal length is the lower the FOV and higher the magnification. The below figure illustrates the above relationship.



There are two types of lenses as **zoom lens** and **prime lens**. Zoom lens has variable focal length while prime lens has a fixed focal length. Although zoom lens has the advantage of versatility, the prime lens is more suited for our purpose. They are lighter and more compact and tends to be faster, offering wide apertures. Here, the wide apertures allow more light which is beneficial in low light conditions. Wide apertures are also preferred for portraits because of the shallow depth of field (DOF). DOF is the zone of acceptable sharpness within a photo that will appear in focus.

When shooting HD video, prime lenses are ideal to use. They give you the ability to achieve the same shallow depth-of-field at wide open apertures for video footage as we already get with your still photography.

Zero Spy Camera for Raspberry Pi Zero Specifications



The important specifications are as below.

Camera Module Dimensions	8.6mm x 8.6mm x 5.2mm
Lens Diameter	6.9mm
Weight	1.1g
Still Resolution	5 MegaPixels
Video Modes	1080p30, 720p60 and 640 × 480p60/90
Focal length	3.60 mm +/- 0.01
Horizontal field of view	53.50 +/- 0.13 degrees
Vertical field of view	41.41 +/- 0.11 degrees
Focal ratio (F-Stop)	2.9

For further specifications, please refer to the specifications of the original pi camera at <https://www.raspberrypi.org/documentation/hardware/camera/> which gives the same specifications of the above zero spy camera except for the specifically mentioned.

The F-Stop is an indication of aperture. The higher the F-Stop, the lower the aperture for this fixed focal length. Therefore 2.9 F-Stop is normally suitable for our requirement. Considering the focal lengths and field of view, if the camera is held about 2cm away from our eye, we can achieve an image of the eye with width about 2cm, which I assume is suitable.

Moreover, as the framerate at 720p is 60, meaning we could capture 60 frames in 1 second satisfies our requirement of capturing blinking as usually a blink lasts for about 100ms.