

Cropping

For Better 3D Pictures



By George Themelis
August 2025

Digital cropping is, IMO, one of the most powerful tools that digital photography has to offer

STEREOGRAM 28.05 - January 2024

Digital 3D Cropping Why & How

A Tutorial by George Themelis

Digital 3D Cropping

Back in the “good old film days” using slide film, what you shot is what you got. Cropping was achieved by masking (using mounts with smaller openings or overlapping masks or using aluminum tape). Masking eliminated parts of the image, making it smaller.

With digital photography we are able to quickly crop images in all 4 directions (up, down, right, left). Digital cropping removes pixels, but the image is rescaled to fit the screen, so it doesn't get smaller. On the contrary, cropping is a way to make the main subject look larger.

How to Crop Using SPM

To crop using SPM, follow the instructions in Fig. 1. As I study a picture, I turn the scroll wheel to make the image larger (or smaller) and press & hold the left mouse button to move around, looking for a better composition. Once I have found the picture I want to keep, I use the crop tool to crop the image to my liking.

Why Crop?

There are many good reasons to crop:

- Remove unwanted distractions
- Improve composition
- Focus on the main subject
- Change the aspect ratio
- Reduce (or increase) the stereoscopic deviation

Cropping & Composition

Consider Fig. 2. The original composition is not ideal: The main subject (black swan) is centered in the frame. Also, there is distraction (bright rock) in the upper left corner. Anything bright in a picture tends to attract our attention. In this case, the bright rock is near the edge, leading our eyes out of the picture. Also, in general, the main subject should not be centered. In this case, the swan is moving, so a better composition would be for the swan to be off-center, moving towards the center. Cropping the image to keep the area in red has achieved both goals.

(Continued on page 3)

Slide Film Masking



Film masking = using mounts with smaller openings or overlapping masks or using aluminum tape we eliminated parts of the image, making it smaller.

Digital Cropping = we are able to quickly crop images in all 4 directions (up, down, right, left). Digital cropping removes pixels, but the image is rescaled to fit the screen, so it doesn't get smaller. On the contrary, cropping is a way to make the main subject look larger.

Cropping

- **Remove distractions**
- **Focus on your subject**
- **Improve composition**

- **How is cropping done?**
- **Limitations / Pitfalls of cropping**

- **Change Aspect Ratio**
- **Increase Magnification / Focal Length**
- **Change Stereoscopic Deviation**

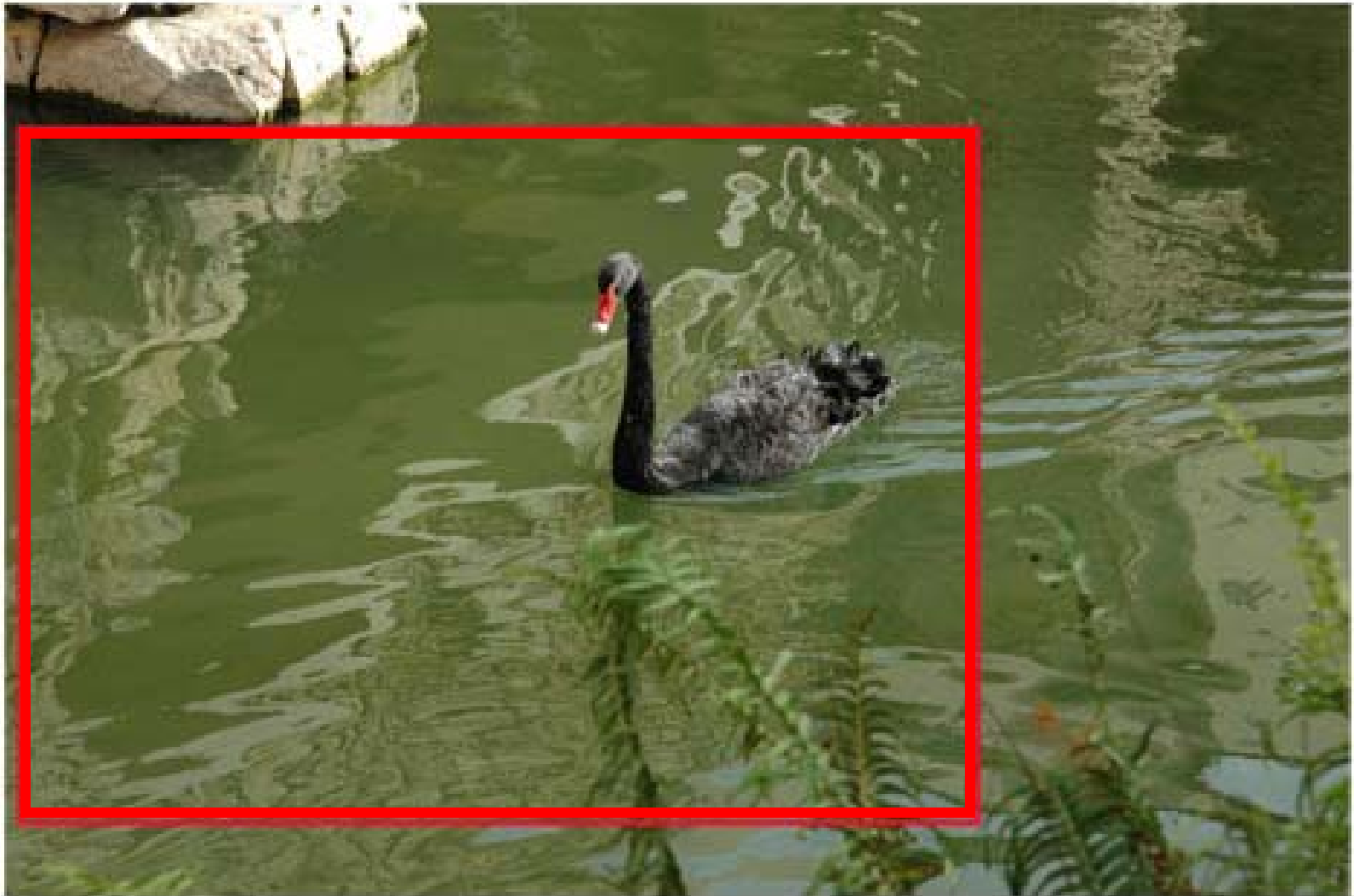
The concept of cropping applies equally to both 2D and 3D photography. This is the only unique topic for 3D photography

- **“Extreme Cropping”**
Find a subject within a subject

Distraction

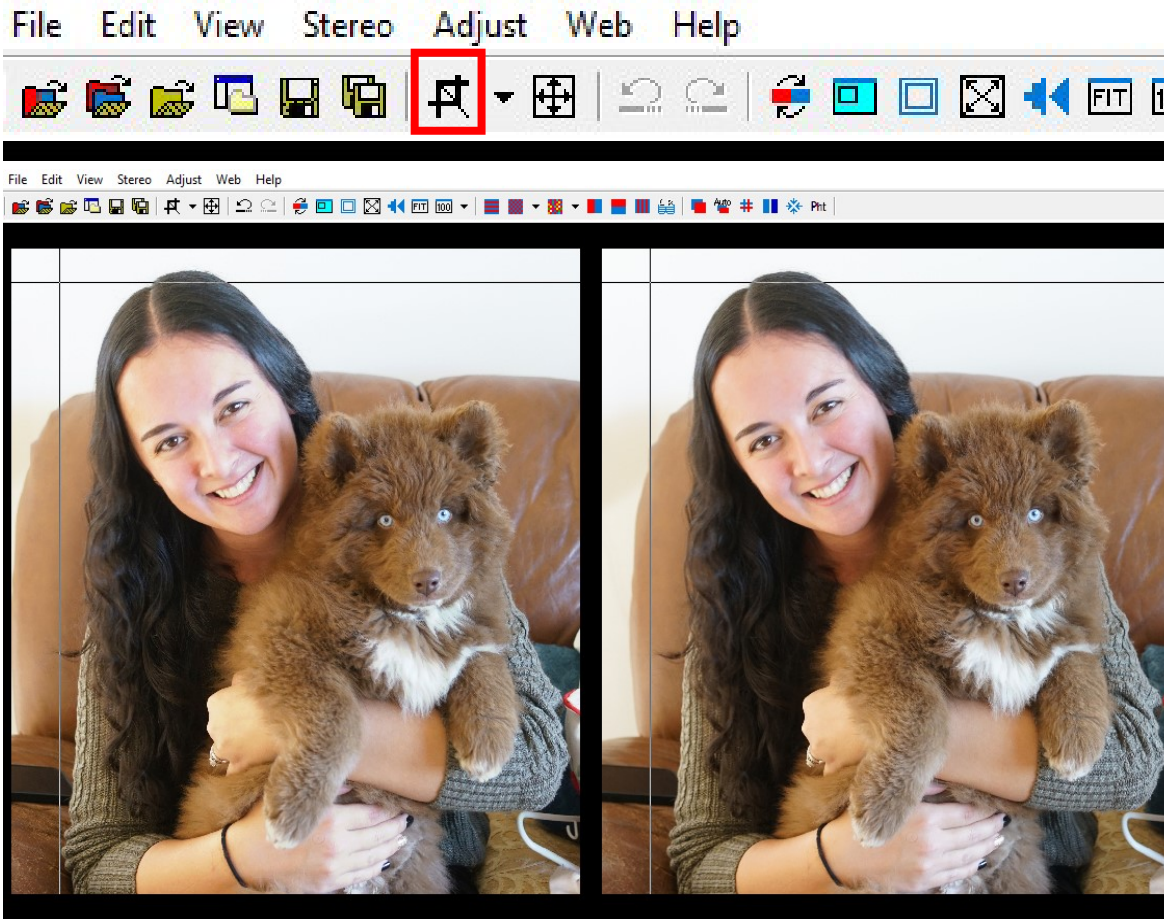


Main subject is centered





How to crop using SPM



- Select the **crop sign** or press ****
This creates a pair of cross hair lines that move around as you move the mouse.
- **Select one corner** of the cropping area, say top left. **Press and hold the left mouse button and move to the opposite corner** (bottom right).
- **Release the button.** You now have the cropping area outlined. At this point **you can still move the cropping area around by pressing and holding the left mouse button.**
- **The instant you release this button, the image will be cropped.** It takes a few tries to master this.
- If you make a mistake, hit the **UNDO button** (or press **<Ctrl><Z>**) and try again.

Useful SPM Shortcuts For Cropping

Key	Function
	Activates cropping
<ESC>	Cancels cropping
<F>	Adjusts image to fit the screen
<J>	Blows up image to 100%
<Ctrl><Z>	Cancels the last action (cropping)

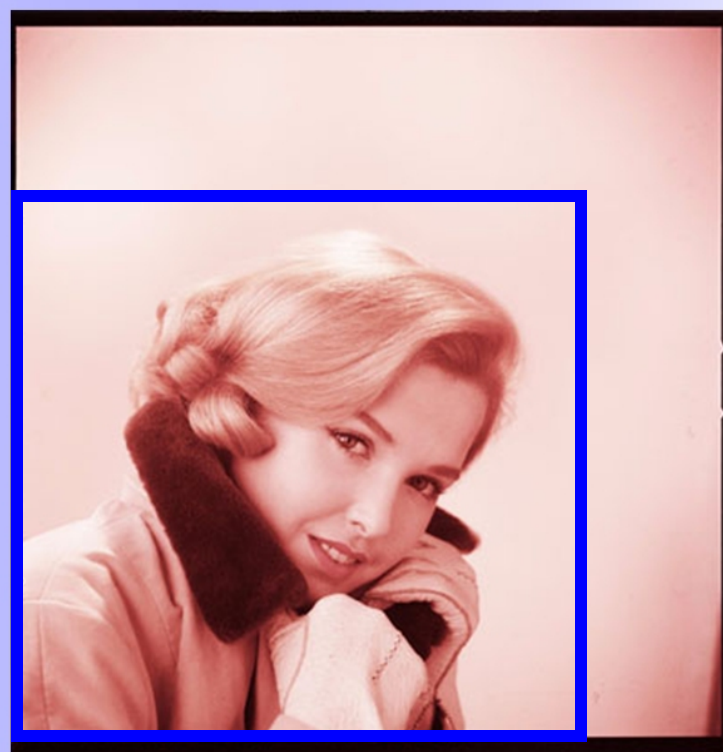
Use the Mouse: Press & hold the Left Mouse Button to move the image around. Turn mouse scroll wheel to increase/decrease image size

Composing / Cropping Portraits



- There is natural tendency to frame a face by putting the eyes at the center.
- A better composition is **having the eyes in the upper 1/3 of the frame, looking into the picture**



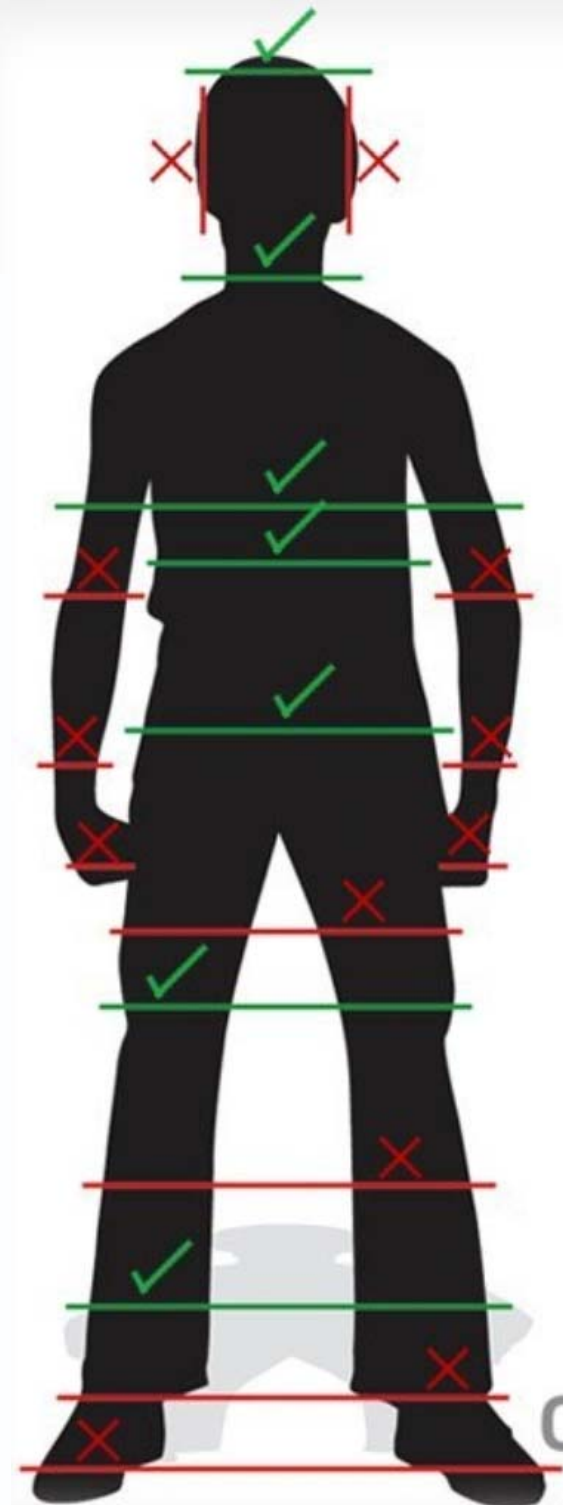
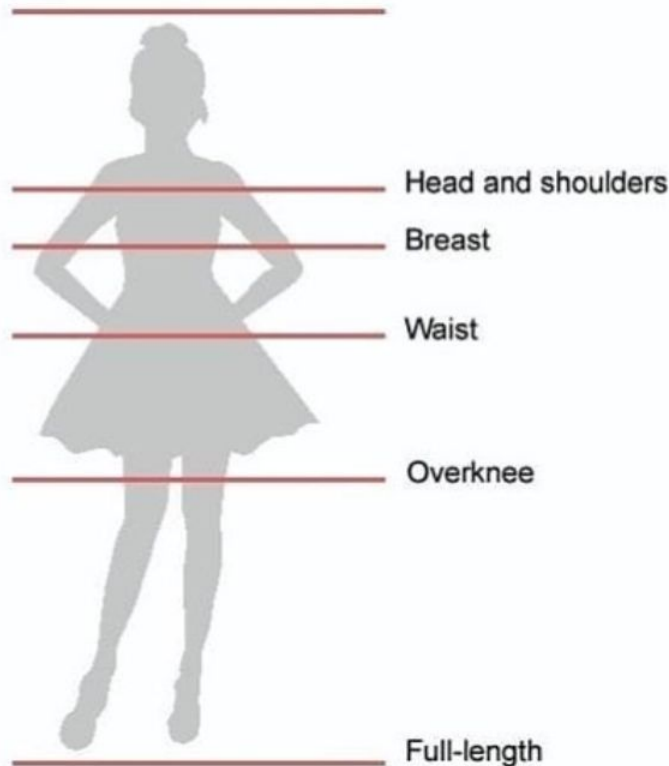


Cropping Rules

PHOTOGRAPHY TIPS

Framing portraits

- Don't crop off the joints.
- When framing the head crop the top off almost to the brows.
- Waist up portraits are better to be shot from the waist level.
- Head and shoulders - from the breast level.
- Close up - from the eyes level.



Digital
Camera
World.com

modified by: christopherartell.com

Limitations / Pitfalls of cropping

- Cropping **reduces image resolution**
- Cropping can only remove elements and shift the picture as a total. **It cannot change the relationship between objects.**

Focus on getting the composition right to start and use cropping later for fine-tuning.

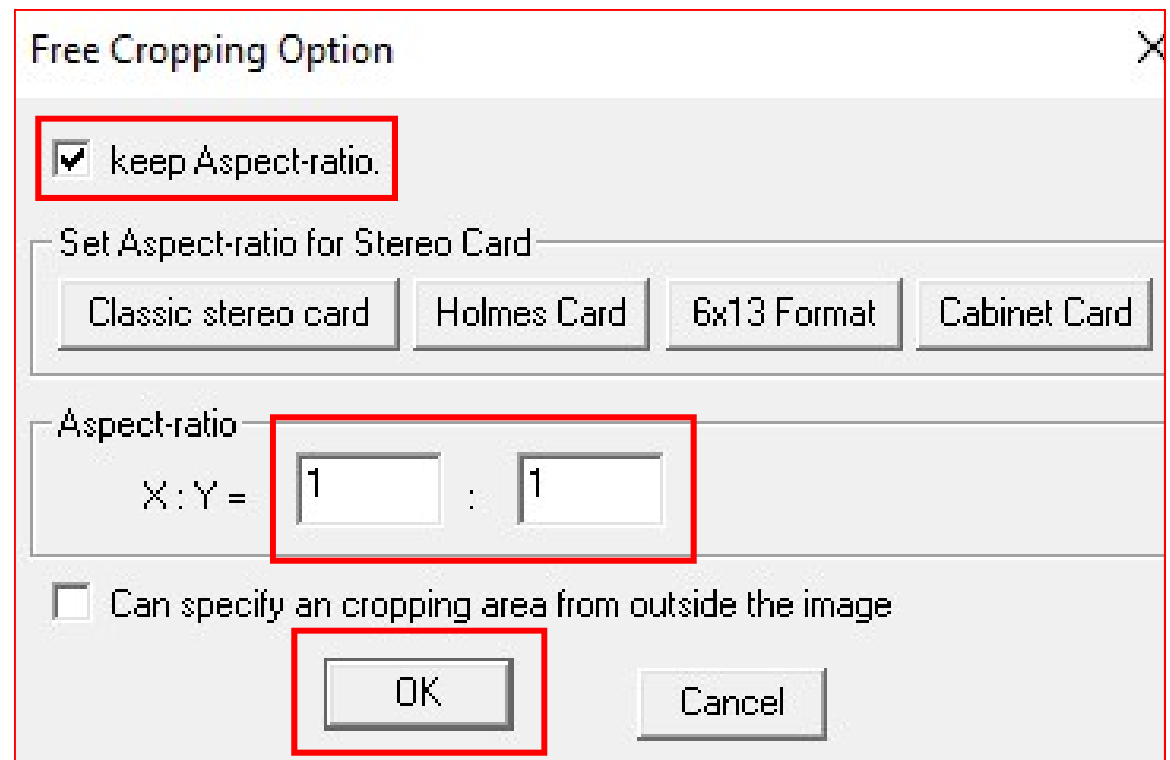
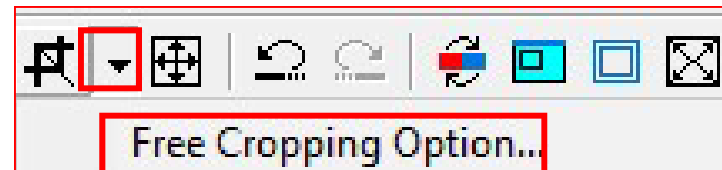
- Cropping is subjective. **Danger of over-cropping**
- **Cropping is tied to the viewing method**

Cropping to Change Aspect Ratio

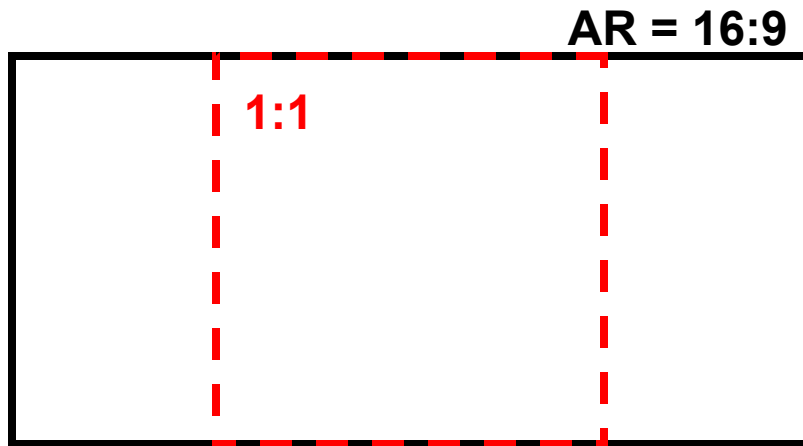
Sometimes it is useful to crop an image to a **specific aspect ratio**

I often crop to an **aspect ratio of 16:9**, which is the ratio used on most computer screens, TVs and 3D projection setups. An image cropped at this aspect ratio will occupy the largest possible screen area in stereo projection.

Those who make **stereoviews** like to crop to **1:1** aspect ratio.



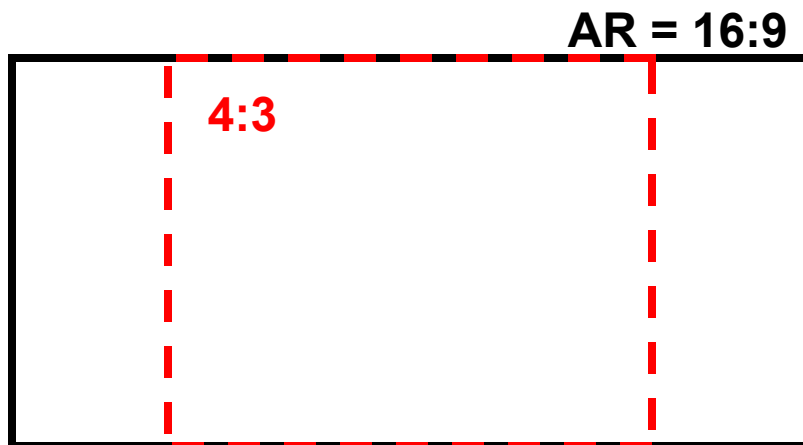
Cropping Increases Magnification and the effective Focal Length



Cropping a picture from 1:1 to 16:9

$$M = 16/9 = 1.8x$$

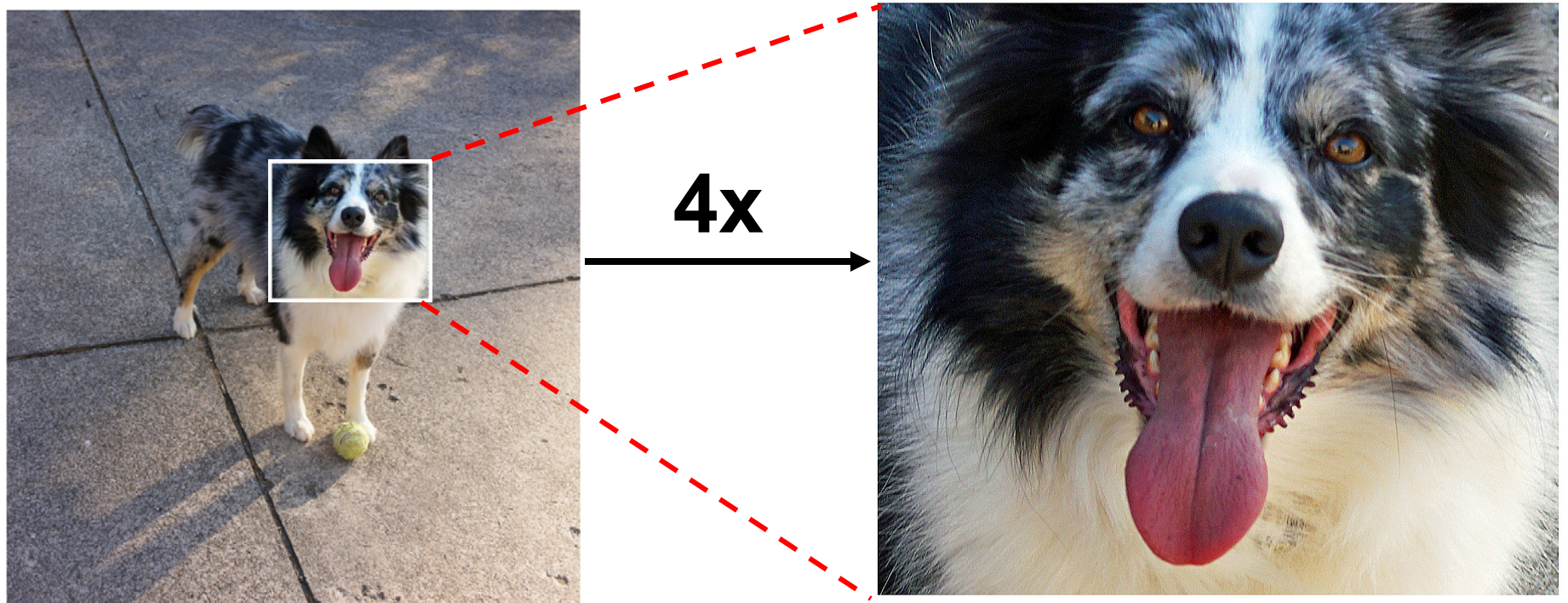
$$24 \text{ mm FL} \rightarrow 24 \times 1.8 = 43 \text{ mm}$$



Cropping a picture from 4:3 to 16:9

$$M = 12/9 = 1.3x$$

$$18 \text{ mm FL} \rightarrow 18 \times 1.3 = 24 \text{ mm}$$



Magnification = 4x

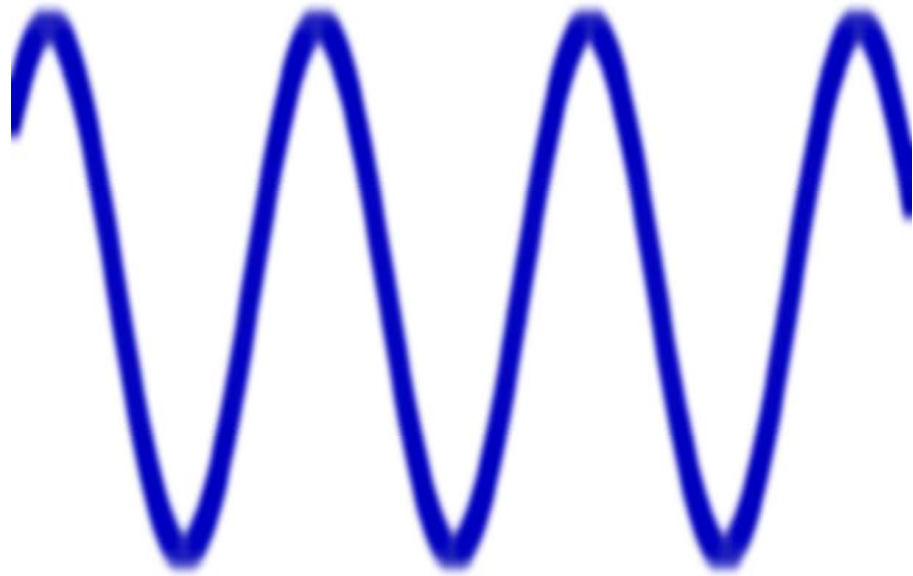
Effective Focal length = 4x FL (4x 35mm ~ 135mm)

"Telephoto Compression"



Wide Angle Lenses:

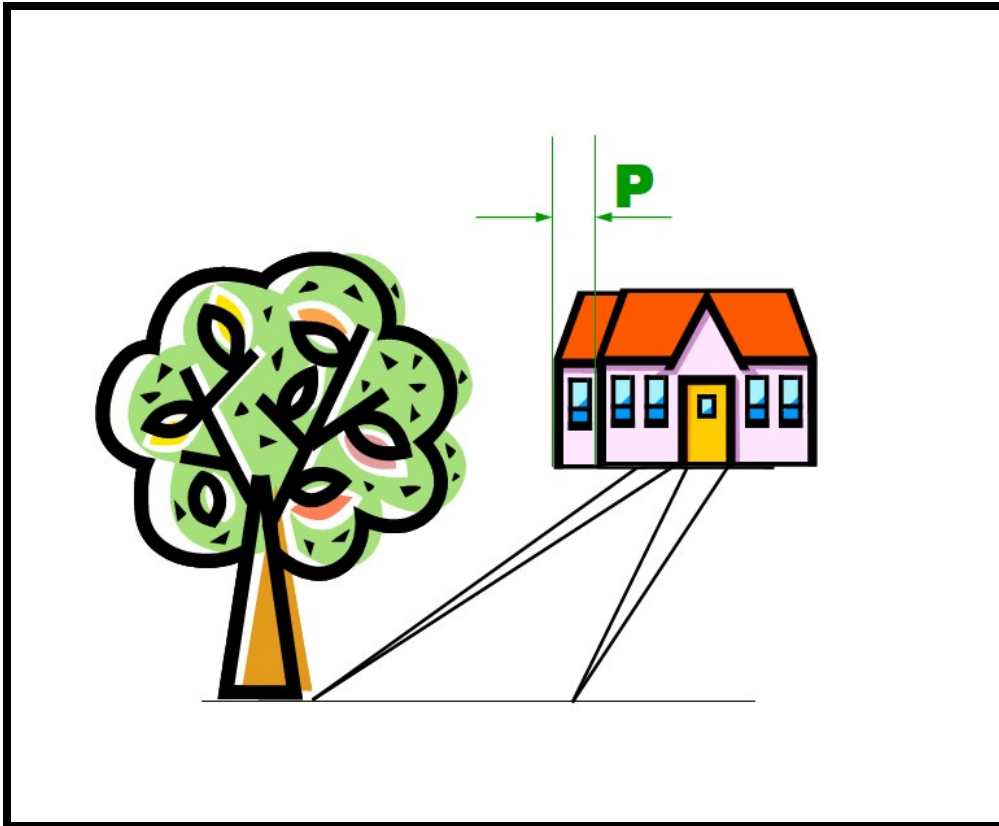
Expand Space



Telephoto Lenses:

Compress Space

Cropping & Stereoscopic Deviation



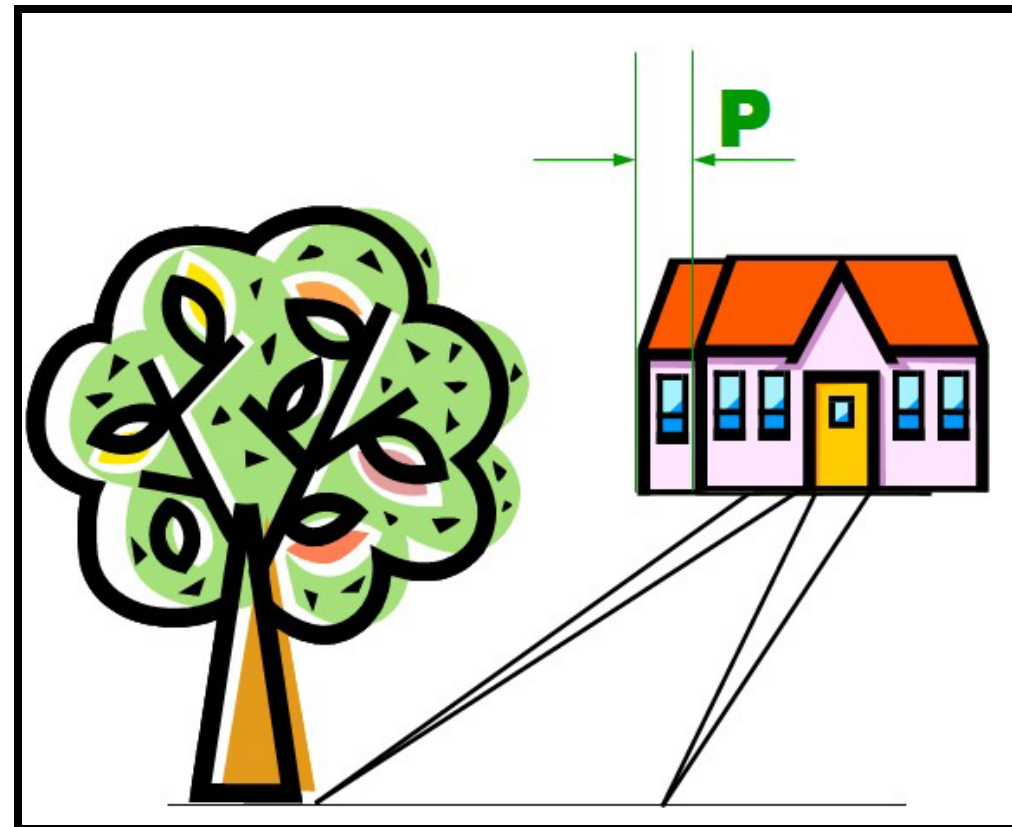
Stereoscopic deviation = displacement of the far object with respect to the near object

One intuitively expects that cropping and enlarging the image will **increase the stereoscopic deviation** by the degree of enlargement

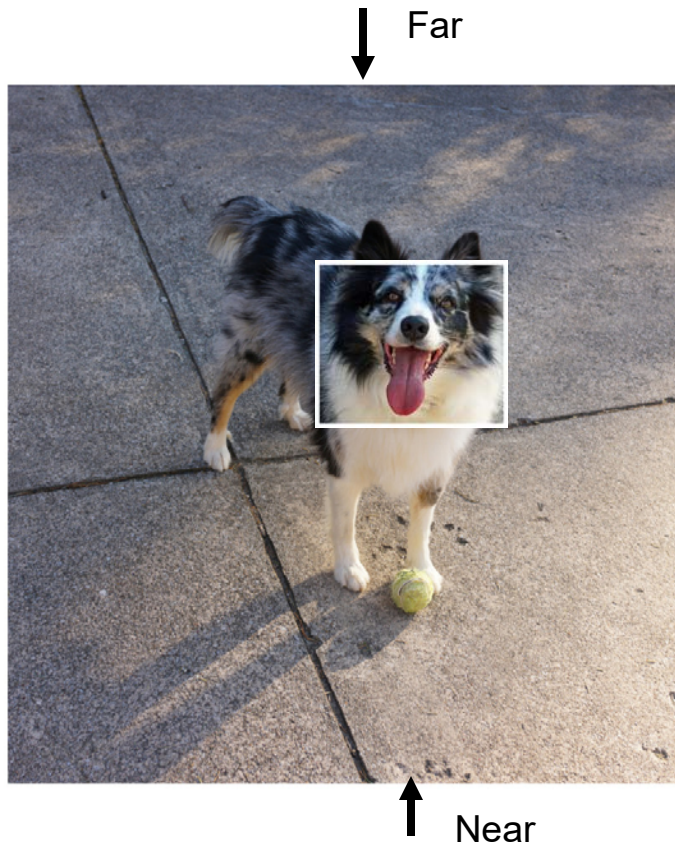
$$SD = FL \times \text{Base} / \text{Distance}$$

If the image is magnified, the SD is also magnified, **provided that cropping does not remove near/far objects**

$$1/D = 1/D_{\text{near}} - 1/D_{\text{far}}$$

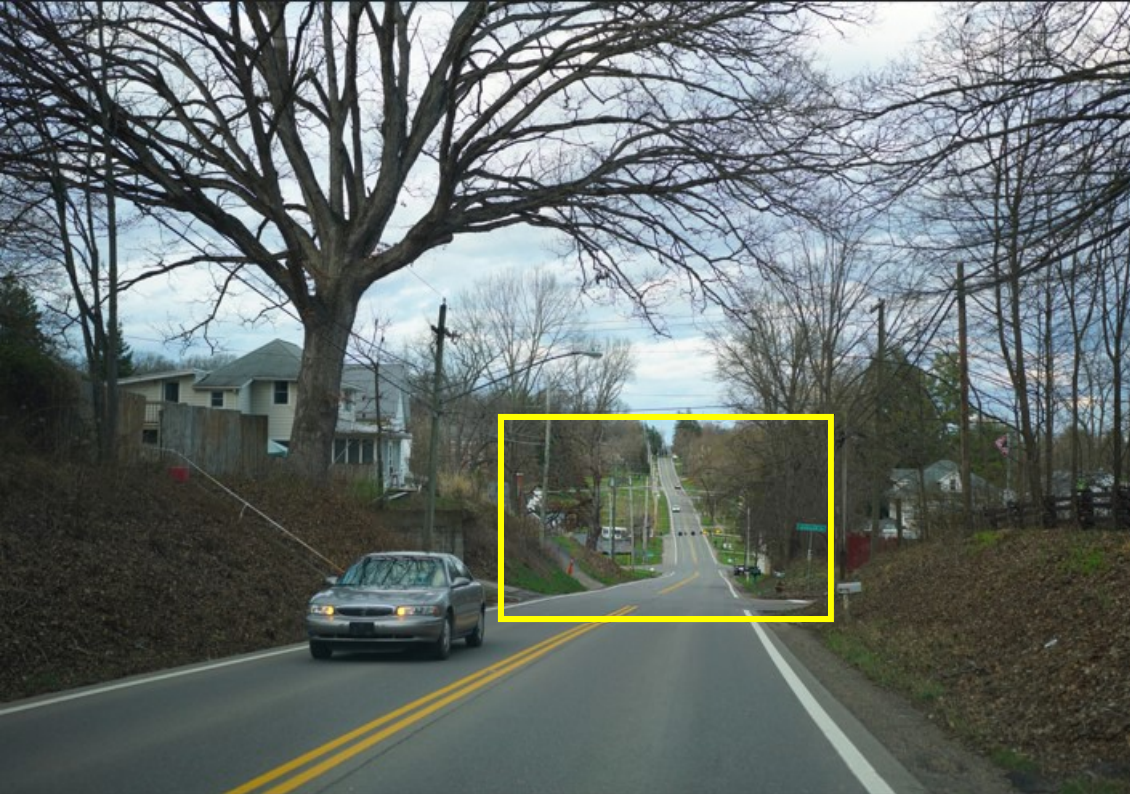


Cropping & Stereoscopic Deviation



In many real-life situations, cropping removes near and far objects. What happens to the stereoscopic deviation is then unclear. All three situations are then possible.

1. Cropping **increases** SD
2. Cropping **decreases** SD
3. Cropping **does not change** SD



Magnification $\sim 4x$

Deviation $2\% \rightarrow 2.5\%$

Near point has been cropped out

In many “normal” pictures cropping and increasing the magnification does not change the stereoscopic deviation.

One can prove mathematically that **the rate at which the near point is removed is equal to the rate at which the image is magnified.**



Infinity Road Problem



3D by DrT

Friday, March 7, 2008

Infinite Road Problem

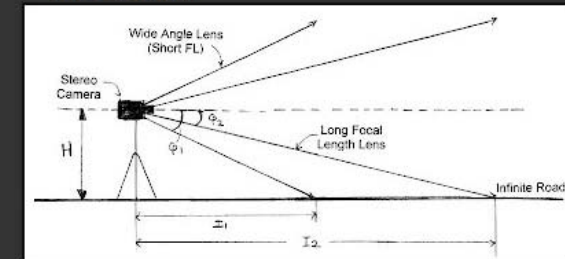
--- Background:

This is something that has been in my mind for a while, since we discussed the effects of changing the stereo base and focal length, and their interaction.

The fundamental stereoscopic formula ($P = FB/I$, P: parallax, or stereoscopic deviation, B: Stereo base, F: Focal length, I: near object distance, assuming far object is at infinity) clearly shows that increasing the focal length increases the stereoscopic deviation "for the same near object distance".

In practice however, the near distance does not stay the same as we "zoom into the scene", but it is pushed back. I have watched Jay in our stereo club, zoom into a scene using digital stereo projection. This zooming is equivalent to increasing the focal length of the recording lens (yes, it is!) and as he zooms into the scene, it appears that the magnified scene is perfectly balanced depth-wise. So, it appears that zooming into a random scene is not a problem and stereoscopic deviation is under control. While it is difficult to analyze a random scene, it is easy to analyze this "Infinite Road" situation.

--- The Problem:



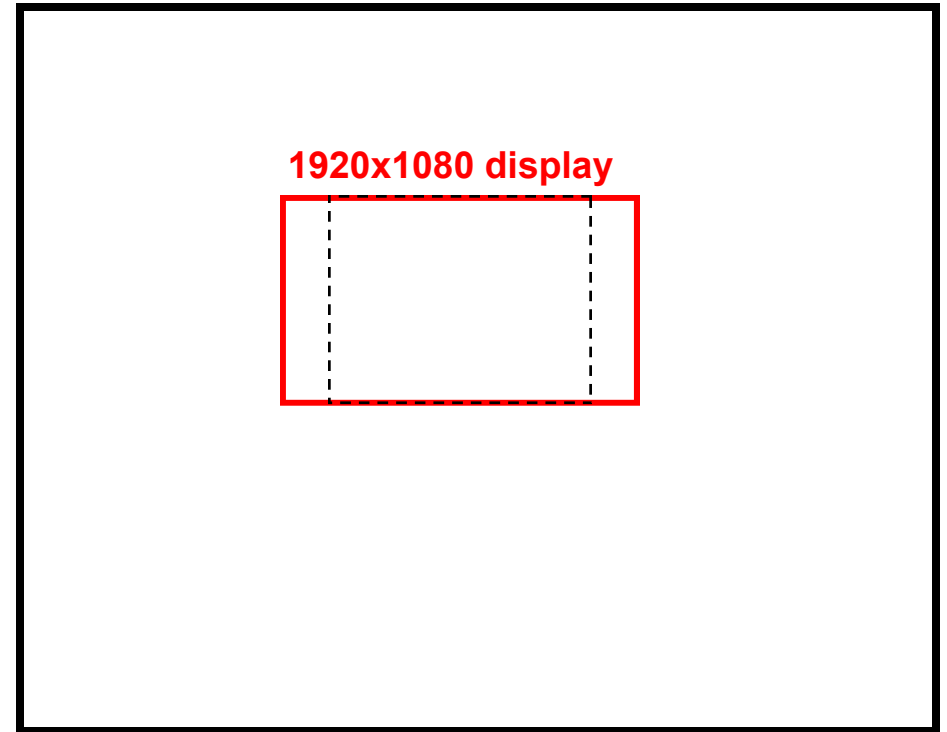
I set my camera on a tripod, at height H from the ground, in front of a road which is flat and extends far away. The only near point to the camera is this road. When I use a wide angle lens the near point is at I1 (see figure at left) If I switch to

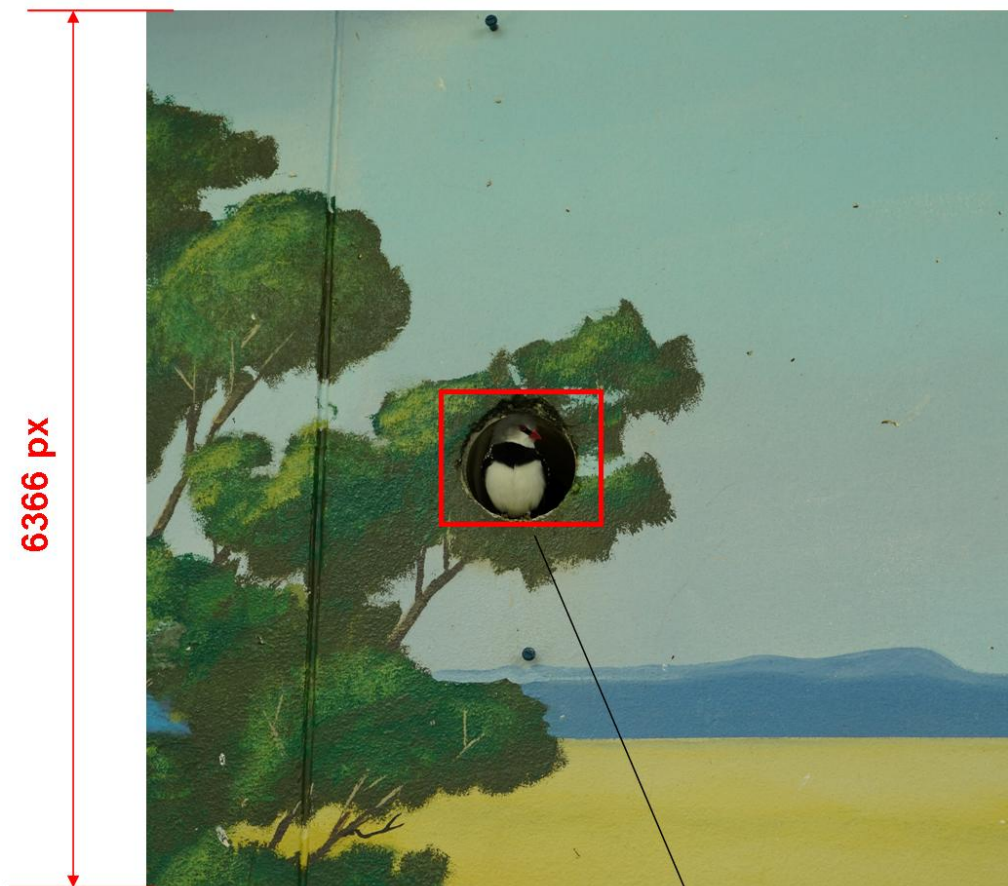
- Set stereo camera with zoom lenses on a tripod at height H in front of a **long straight road**
- Take a series of pictures starting at the wide end and zooming in
- All these pictures have **the same stereoscopic deviation**, which only depends on the height of the camera (it is independent of the focal length)
- So, the rate at which the foreground is removed is equal to the rate that the picture is enlarged
- Even though this is a theoretical situation, **there are a lot of real-life situations that behave the same way**. In these situations, **cropping does not change the stereoscopic deviation substantially**

Extreme Cropping

- **Blow up** the picture
(SPM shortcut: “J”, or just roll the scroll mouse button)
- **Move** picture around
- See something that you like, **crop**.
- You might discover that you **like the heavily cropped picture**. Discover “a picture within a picture”

Image size (blown up)





Enlargement: $6366 / 1060 \sim 6x$
Recording FL = 60mm, equiv. FL = 360mm

Metrics of Cropping

Cropping = same as using a longer FL lens from the same location



Original Height: 5,304 pixels



Cropped Height: 1080 pixels



A few seconds later

Magnification factor: 4.9x

Original Focal Length = 35mm

Cropped Equiv. FL ~ 170mm

Sony A7RIV

6636



1080

$$6636/1080 = \mathbf{6.1}$$

XREAL Beam Pro

2880



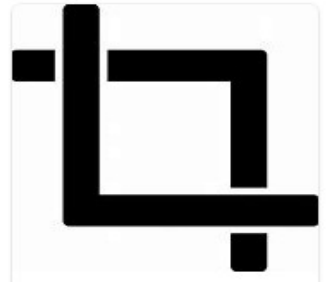
1080

$$2880/1080 = \mathbf{2.6}$$

What helps with “Extreme Cropping”

- **High resolution** camera (sensor)
- **Good quality** lens/sensor
- **Software** (Topaz: Gigapixel, Photo AI)

Cropping is a Powerful Tool



One of the best things about digital photography for me. You can:

- 1) **Remove** unwanted / distracting elements
- 2) **Focus** on your subject
- 3) **Improve** composition
- 4) Change **aspect ratio**
- 5) Increase **magnification / focal length**
- 6) Increase / decrease **stereoscopic deviation**
- 7) **Find a subject within a subject**