COMS30020 - Computer Graphics

Week 4 Briefing

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And now the moment we've all been waiting for...

Time to start working in 3D !!!

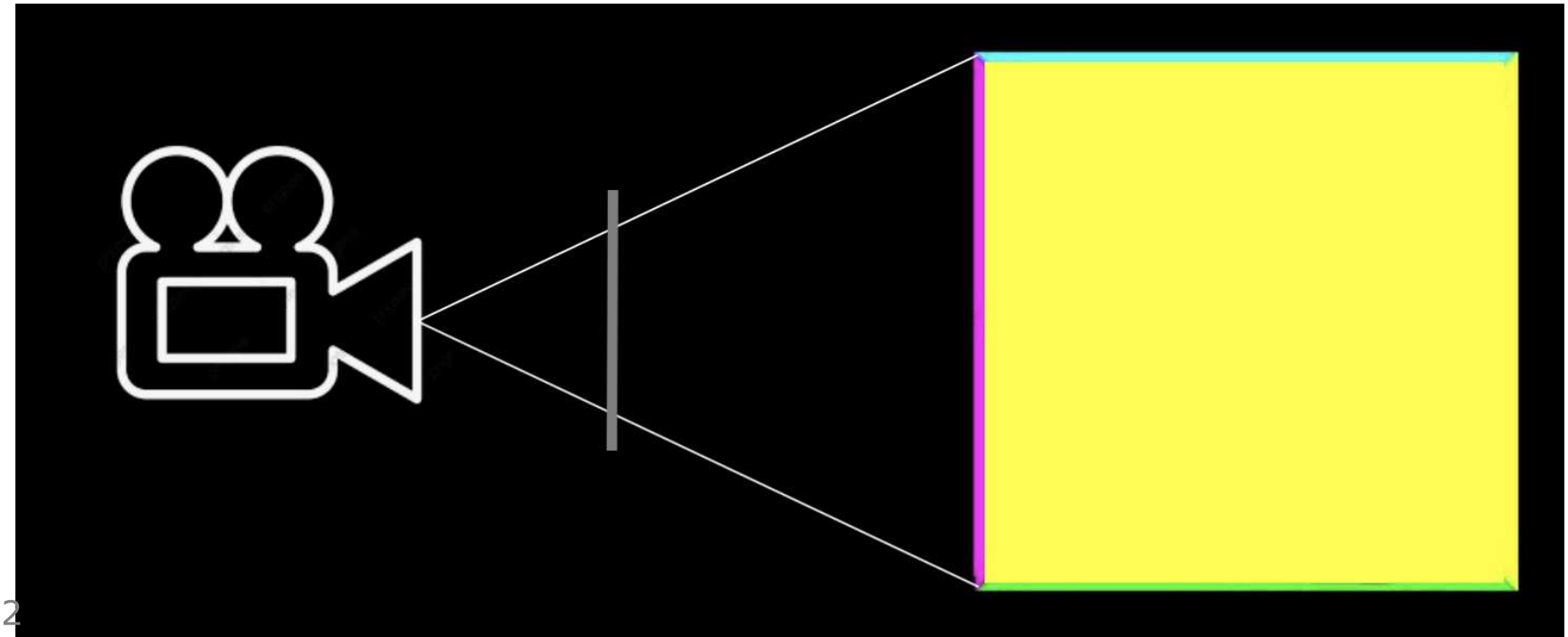
- the 2D functions you have written will be useful -

The general setup for the rest of the unit

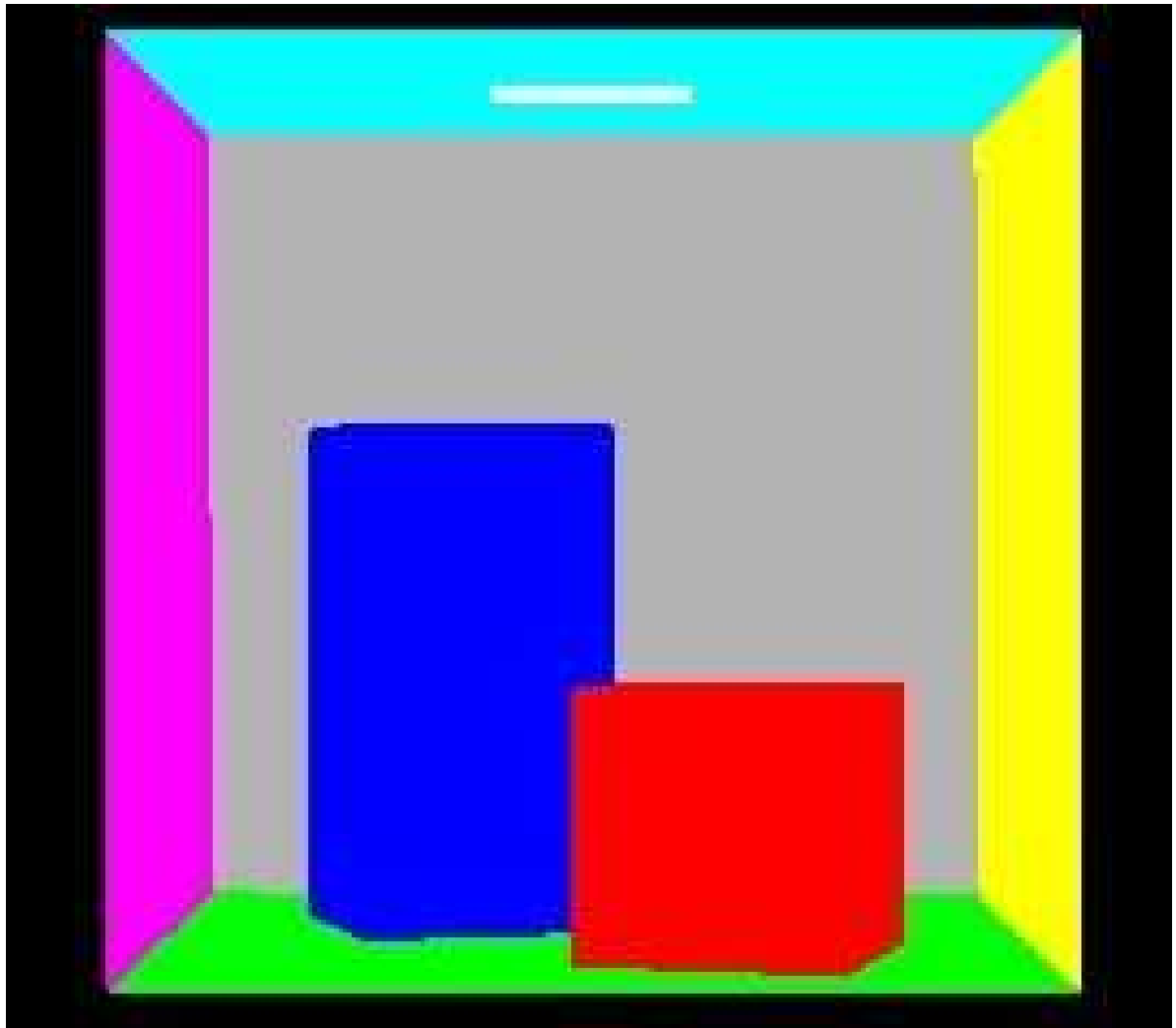
model (a scene in three dimensional space)

camera (our viewpoint on the scene)

image plane (canvas onto which we draw scene)



Your model for the next 4 weeks



In order to render this you'll need to...

- Load in some geometry (points in 3D space)
- Load in some colours ("materials")
- Take a "point of view" on the model
- Do a bit of maths (to "project" model into 2D)
- Draw the model on the canvas ("image plane")

Let's take a look at the workbook for more details:

https://github.com/COMS30020/CG2023

Identical Rendering

From this point on, achieving results identical to samples shown in workbooks becomes much harder

This is because the render you produce of a scene Depends on the viewpoint you take on the model

Let's consider this is more detail...

View

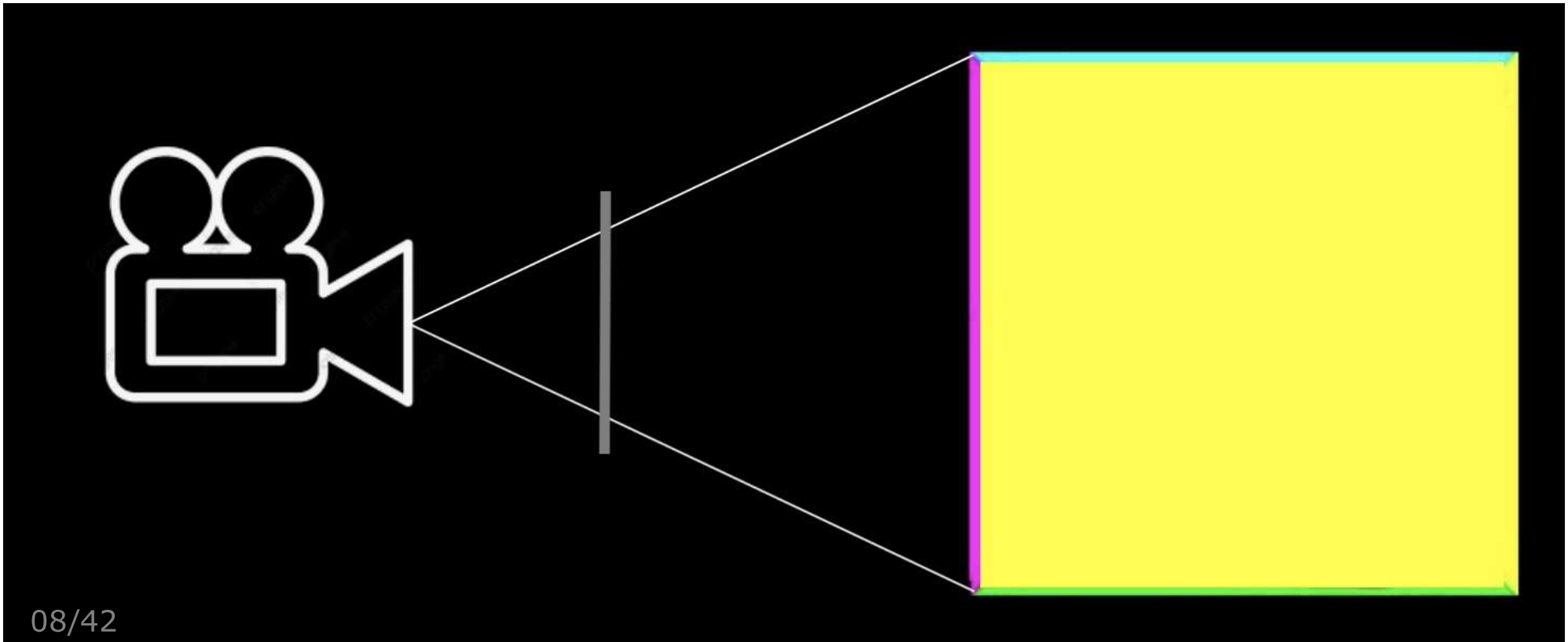
The view you get on a scene will vary

Depending on parameters you use in your render:

- Model scaling (when you load in vertices)
- Camera position (relative to world origin)
- Image plane position ("Focal length")
- Image plane scaling (used to fill the window)

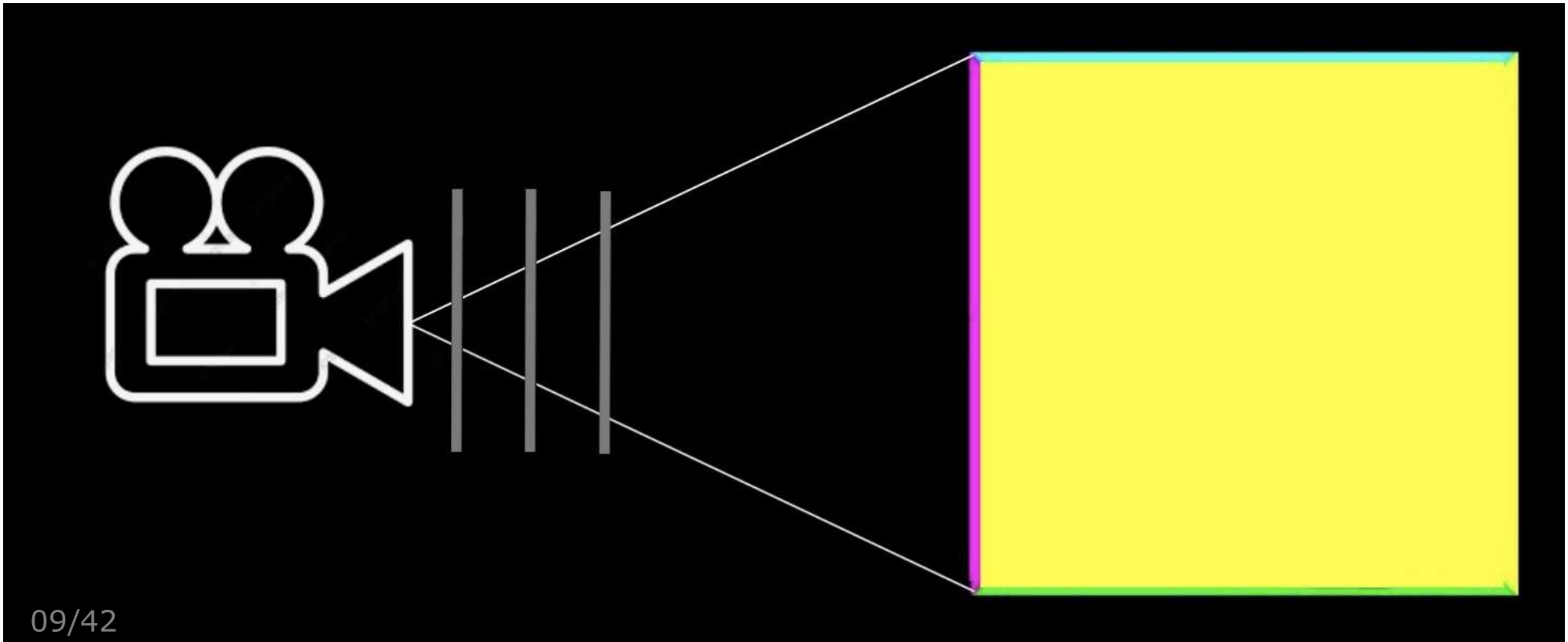
Let's take a look at some of the variations...

What happens if we move the image plane ?

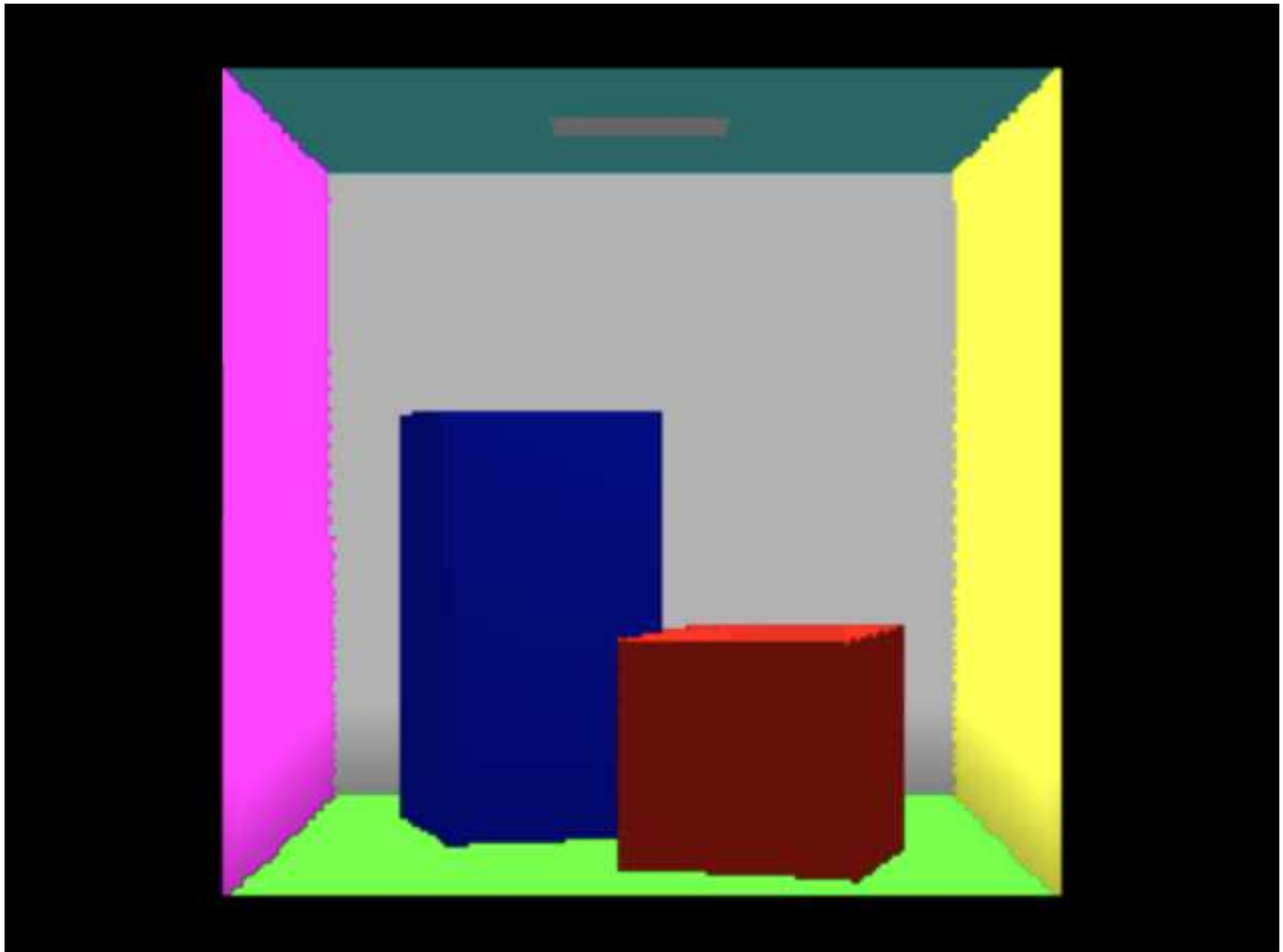


Our perspective on the scene stays the same

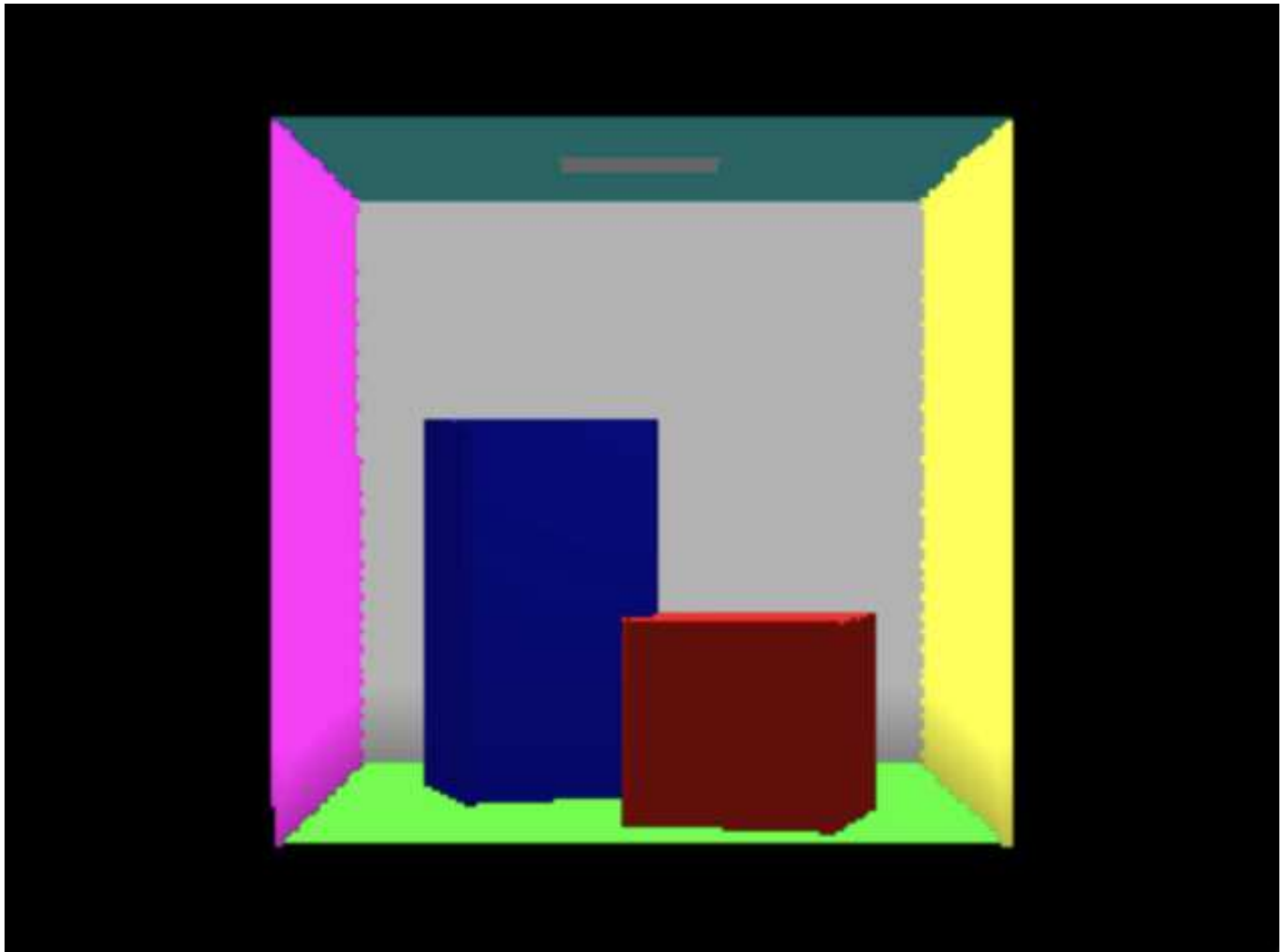
But the size of the image on the image plane changes



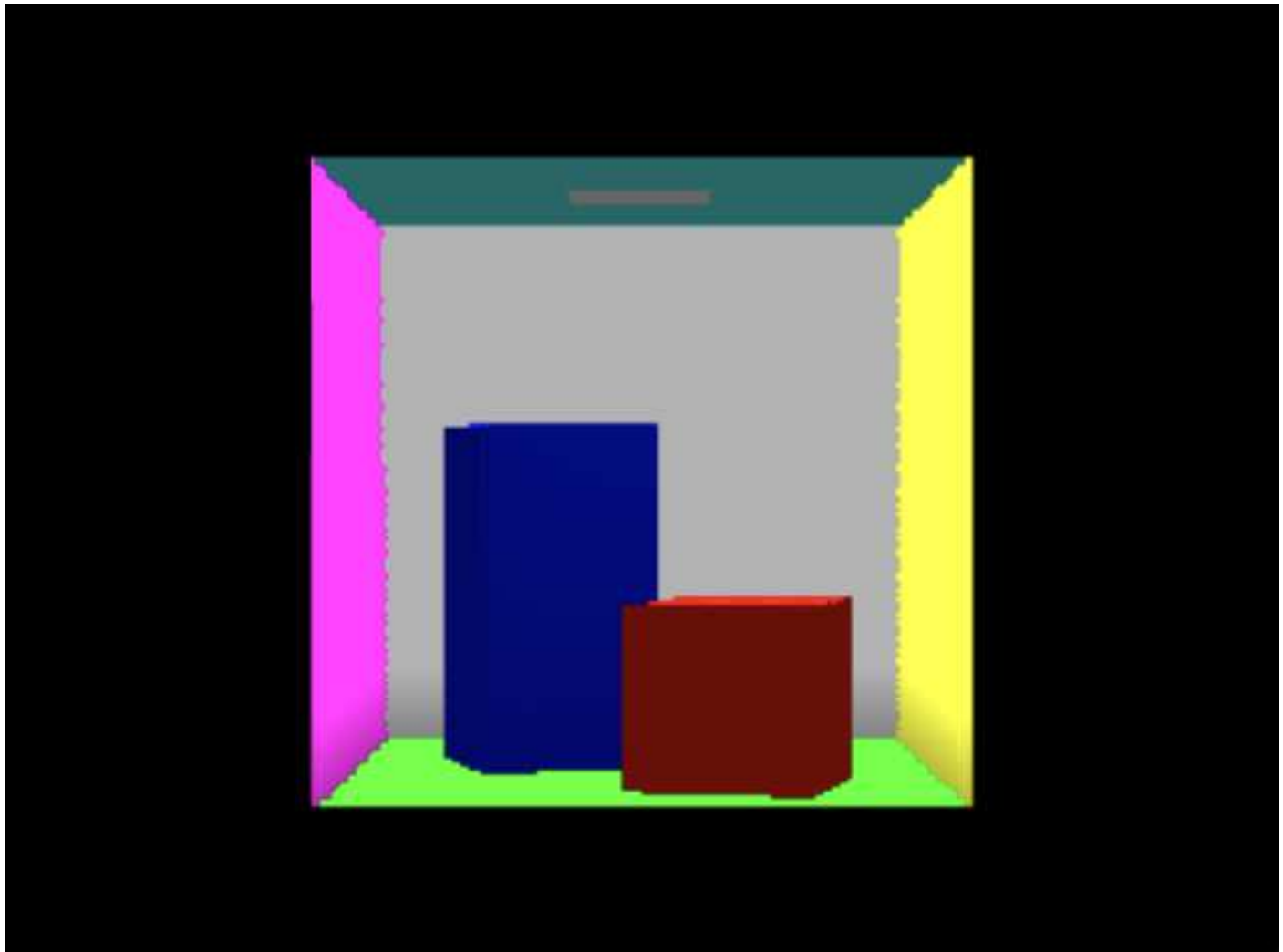
Focal Length of 4



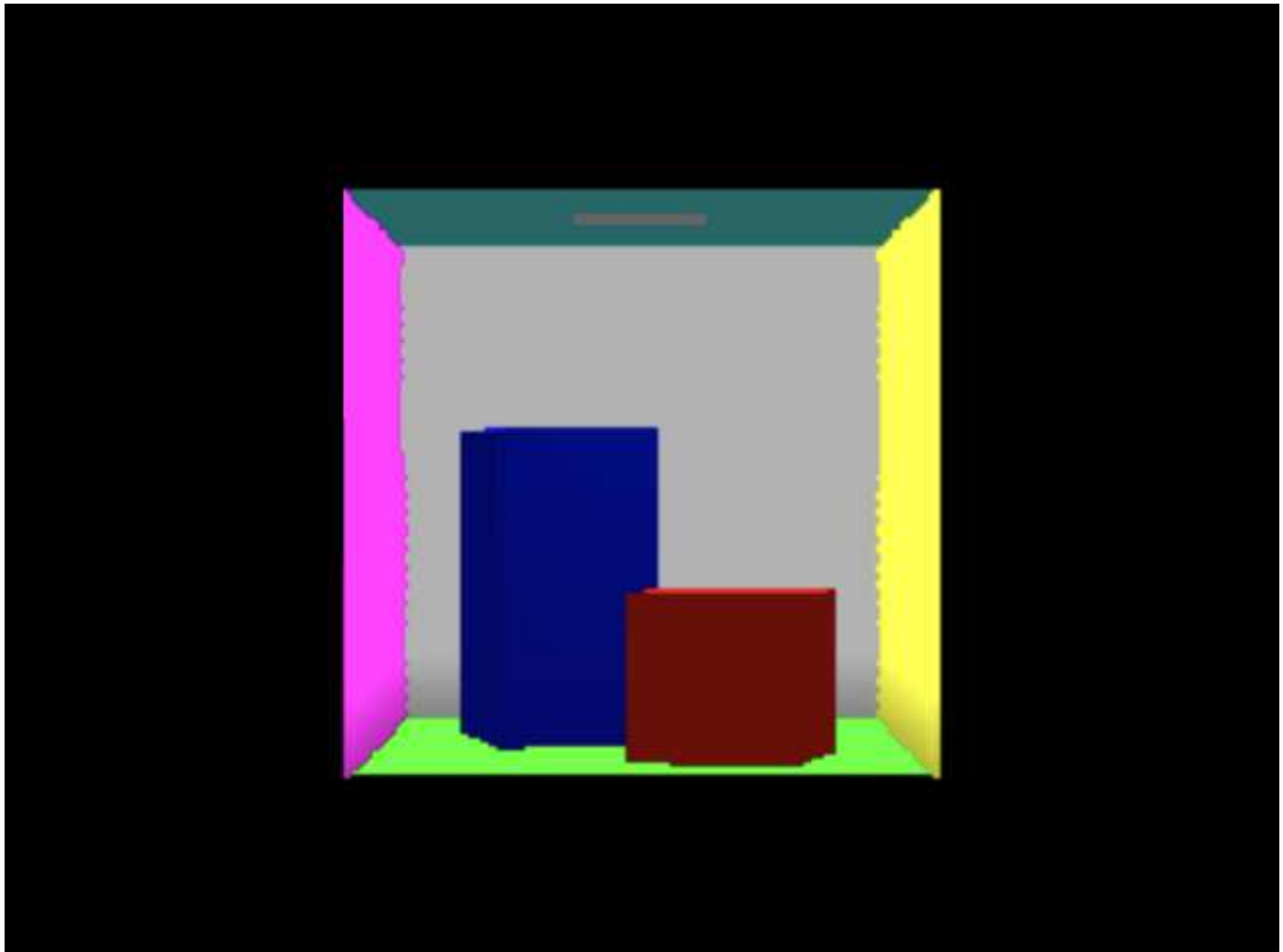
Focal Length of 3



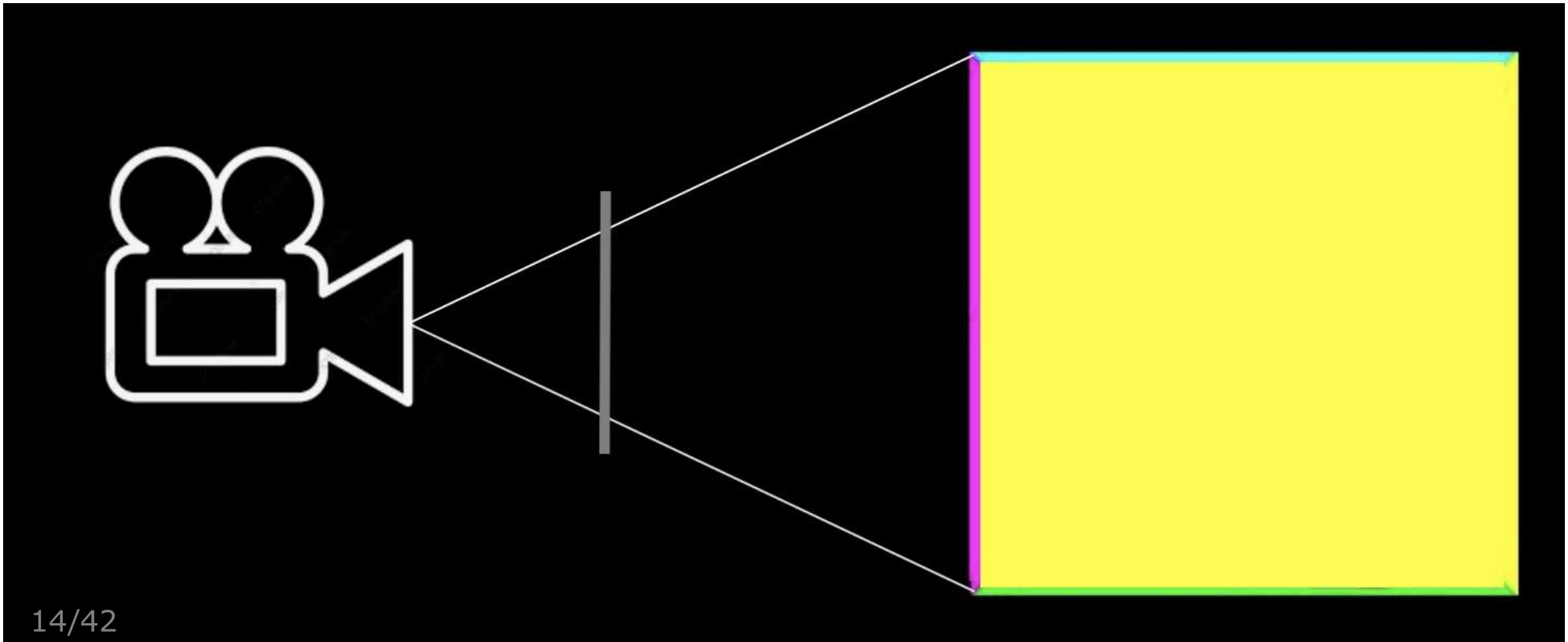
Focal Length of 2



Focal Length of 1

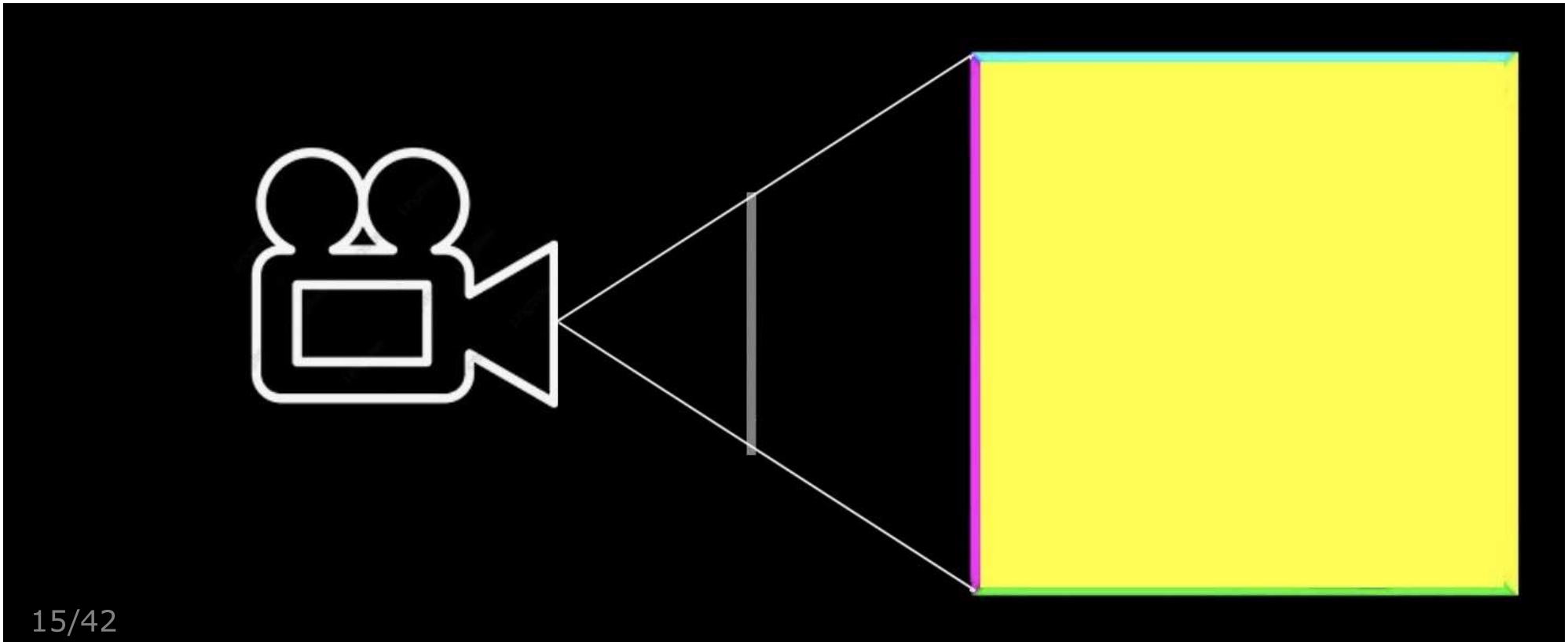


What happens if we move the camera ?

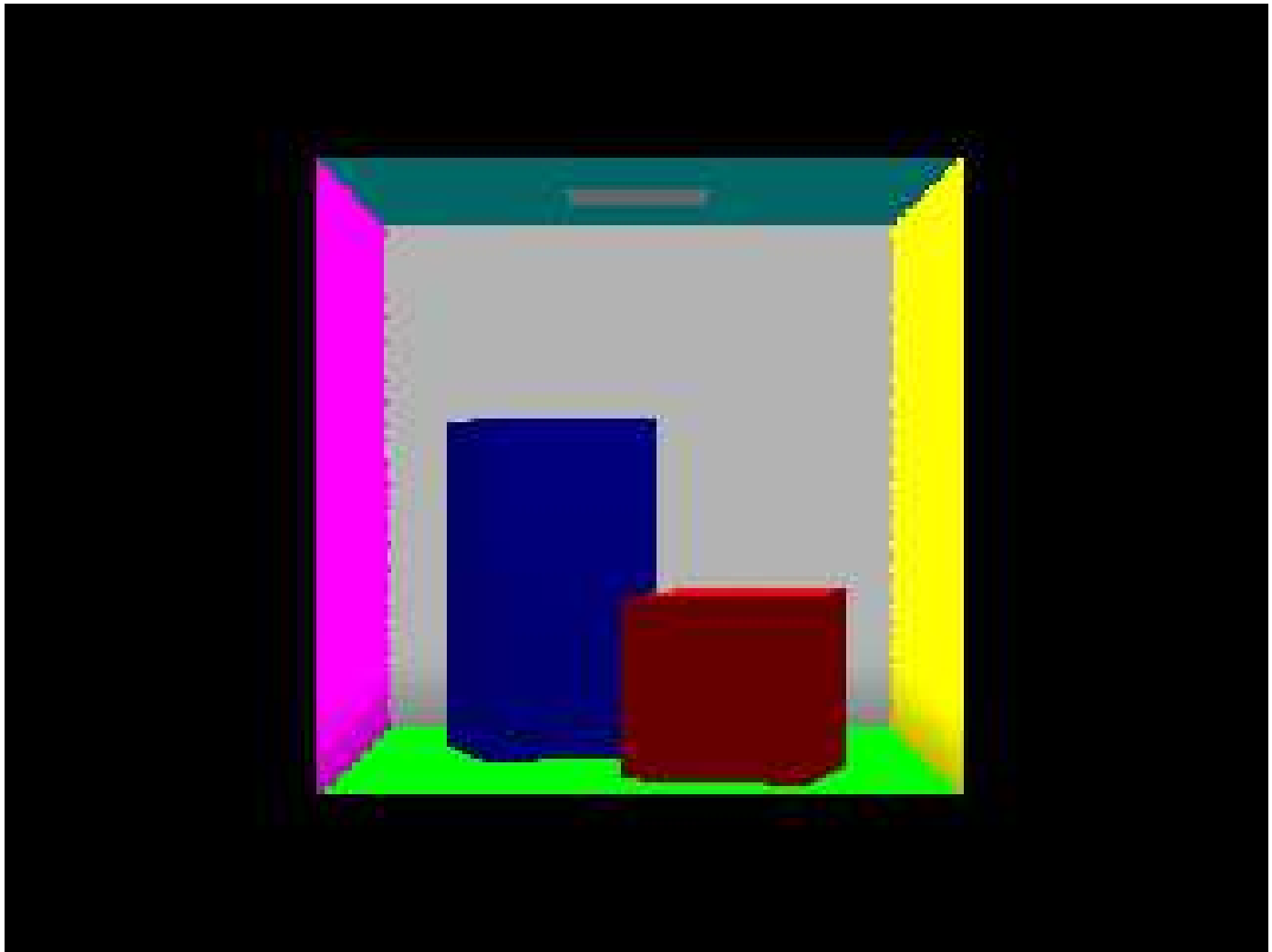


Again, the size of image on image plane will change

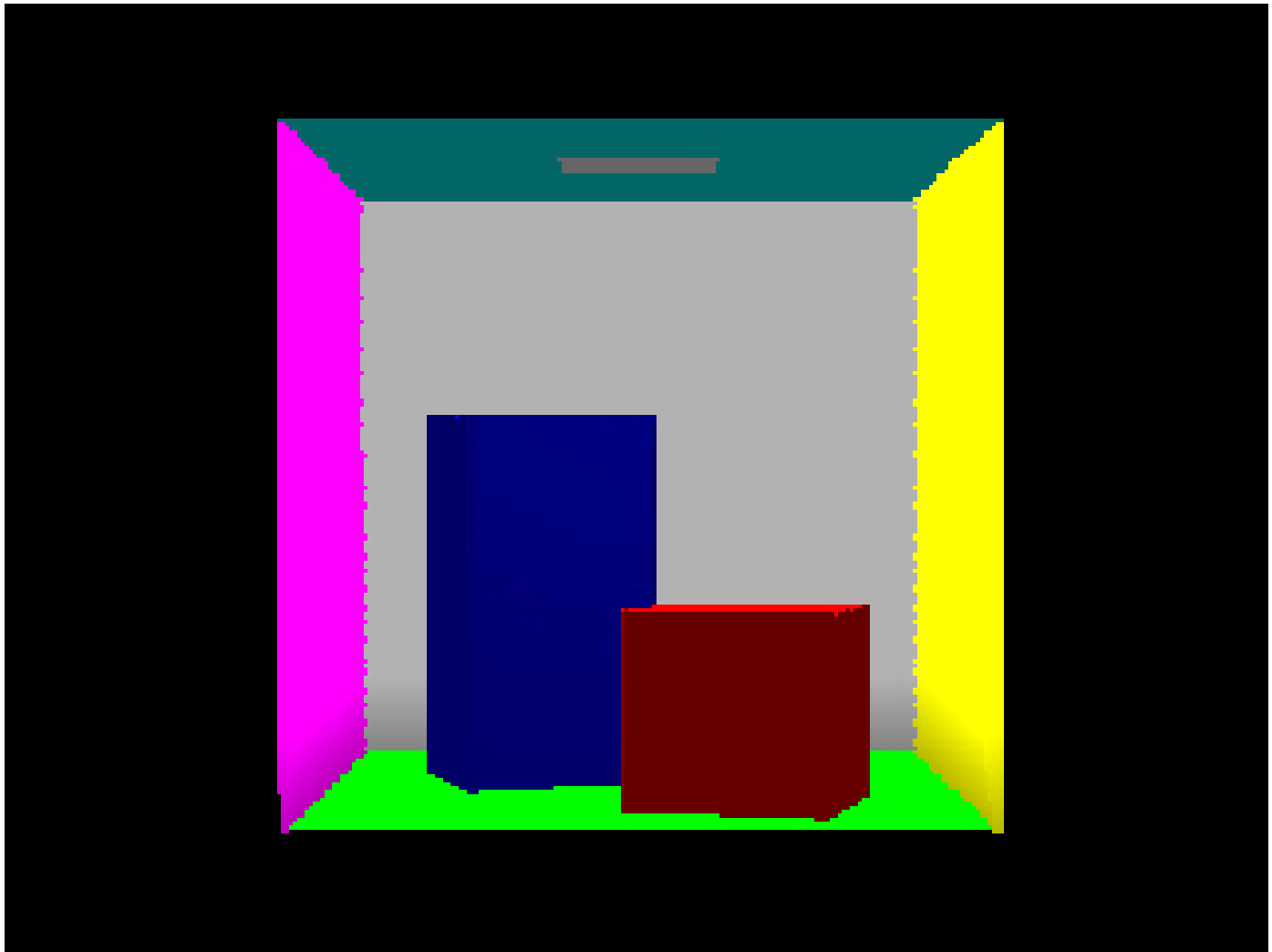
But ALSO so will our *perspective* on the scene !



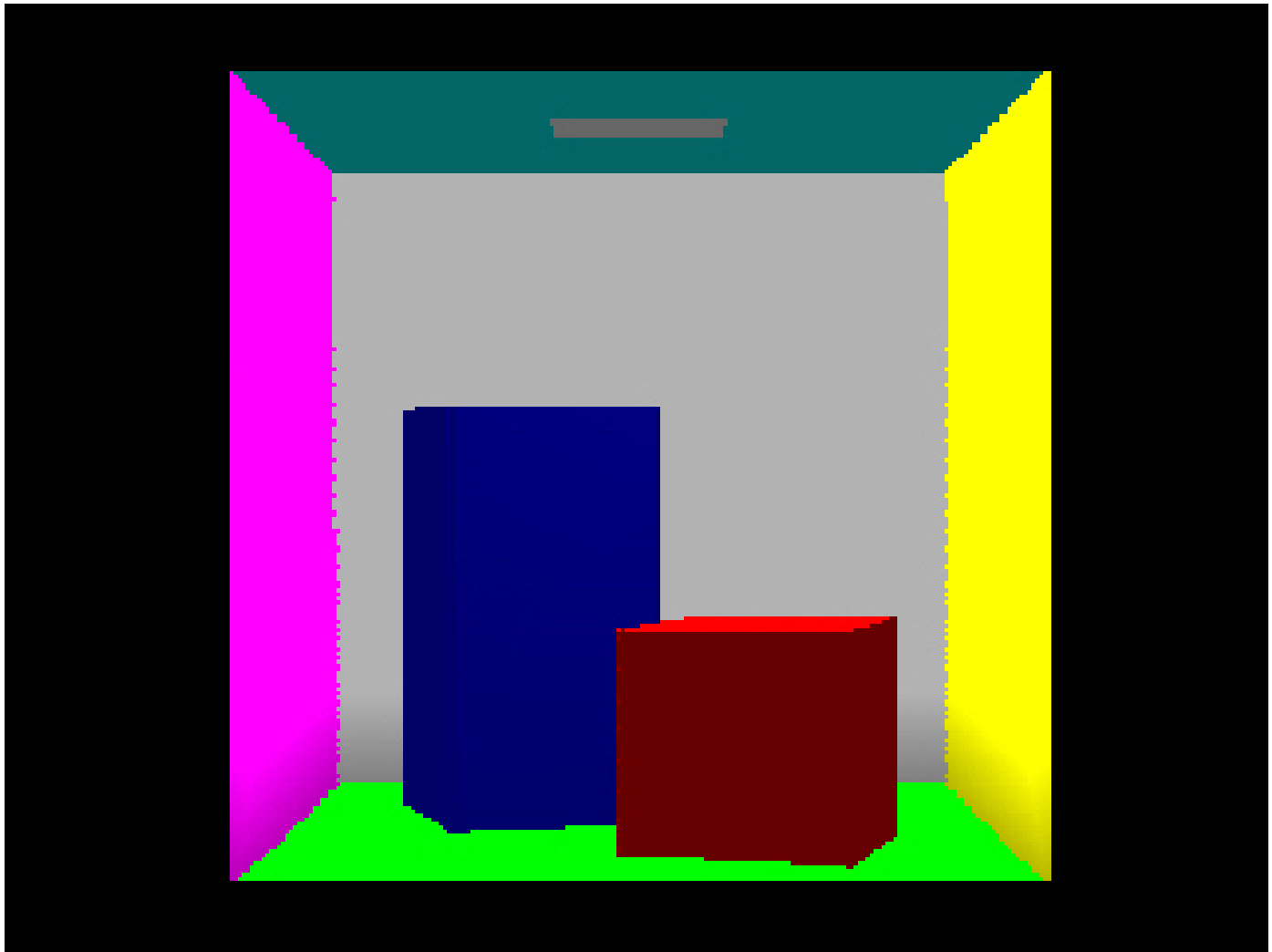
Camera Position #1



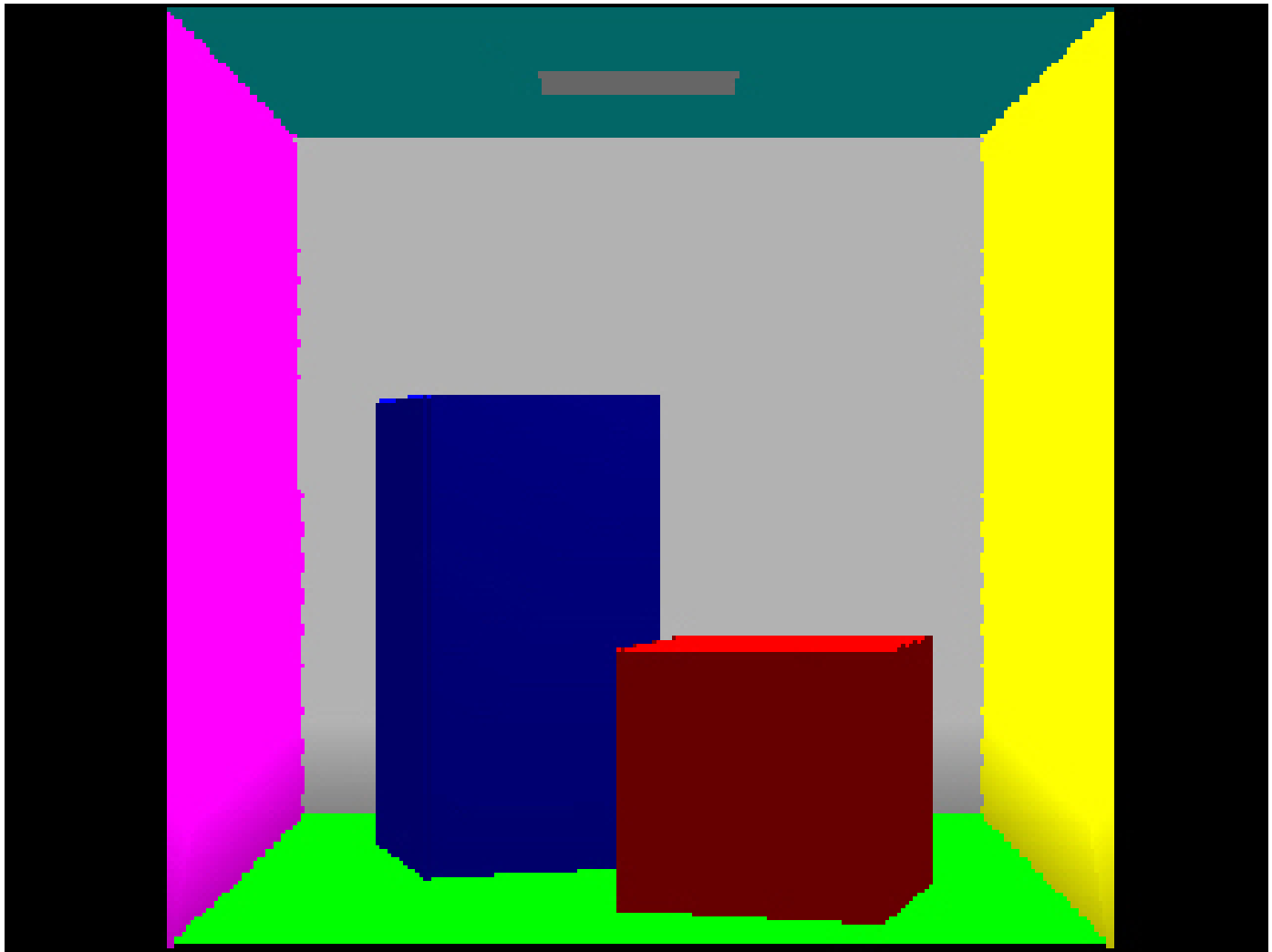
Camera Position #2



Camera Position #3



Camera Position #4



The change in perspective is however hard to see !

(because the size of the room is also changing)

however...

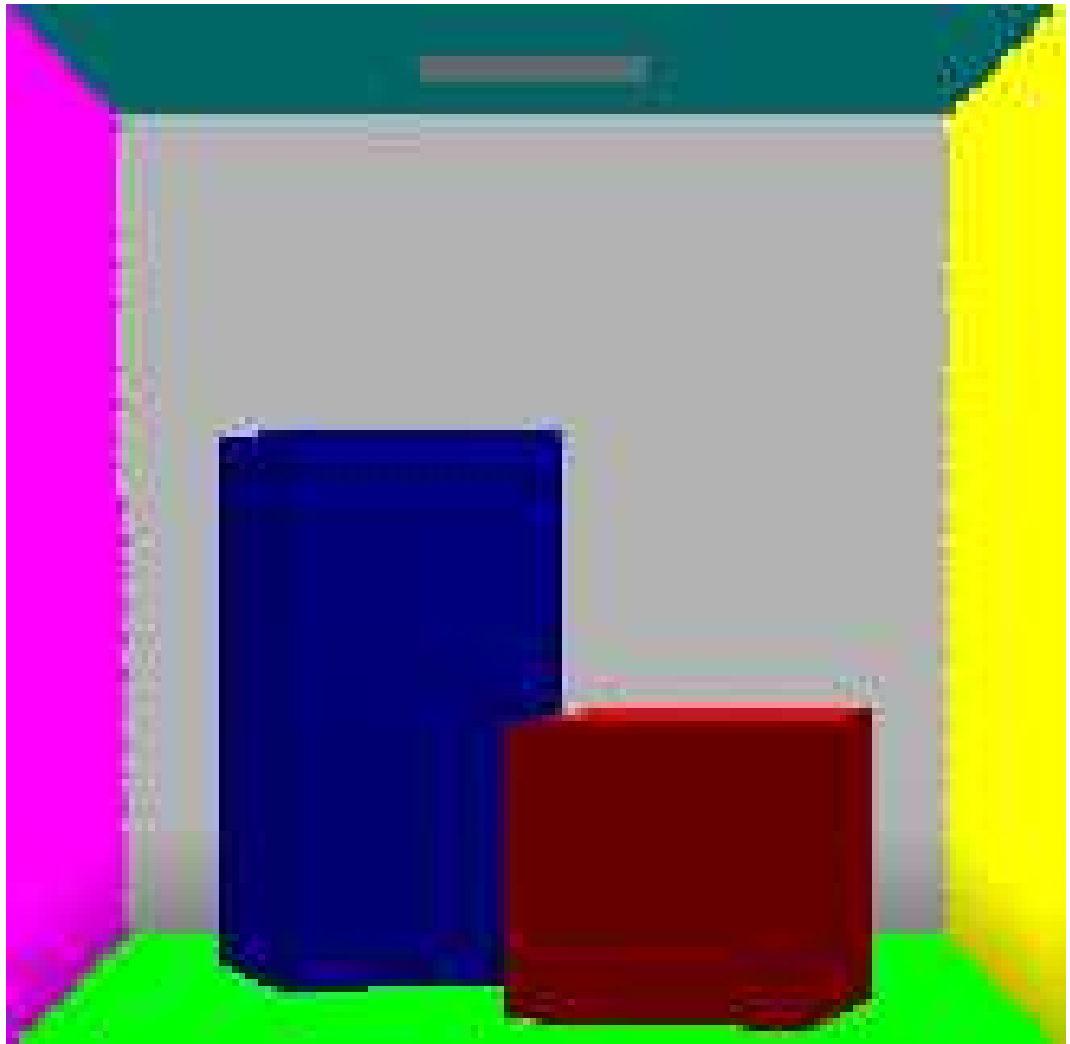
If we do BOTH at the same time

(Move the camera AND shift the image plane)

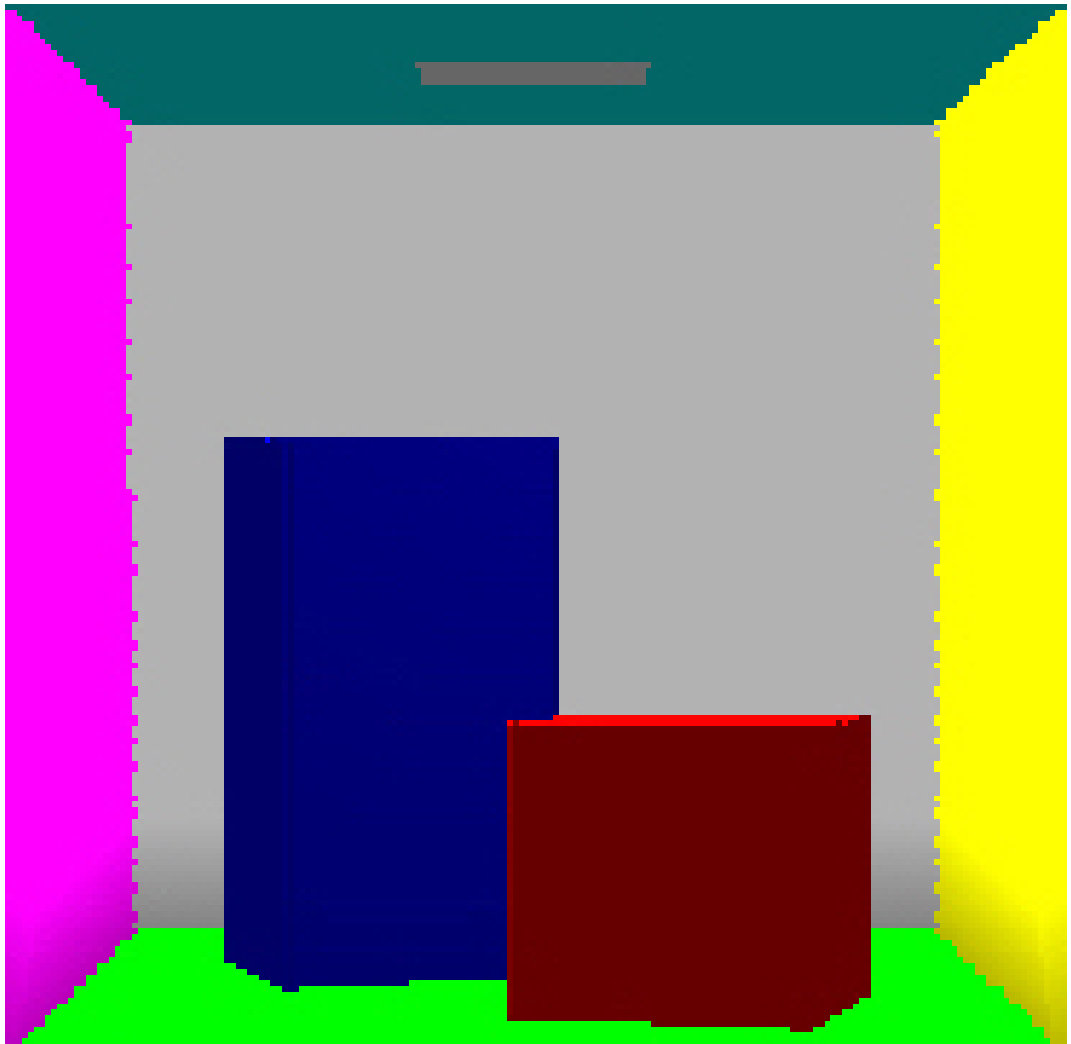
We can cancel out the two zoom effects

And leave just the change in perspective...

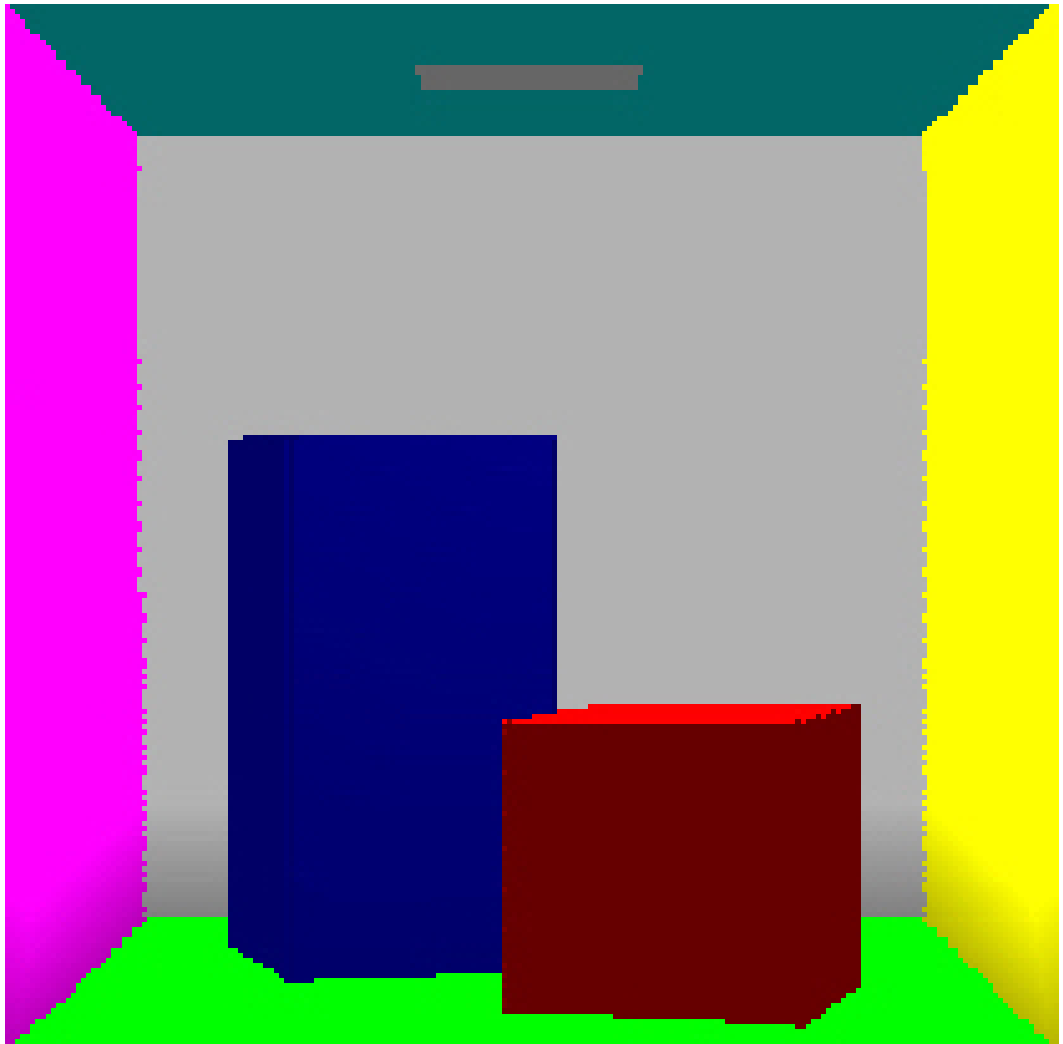
Change in perspective 1



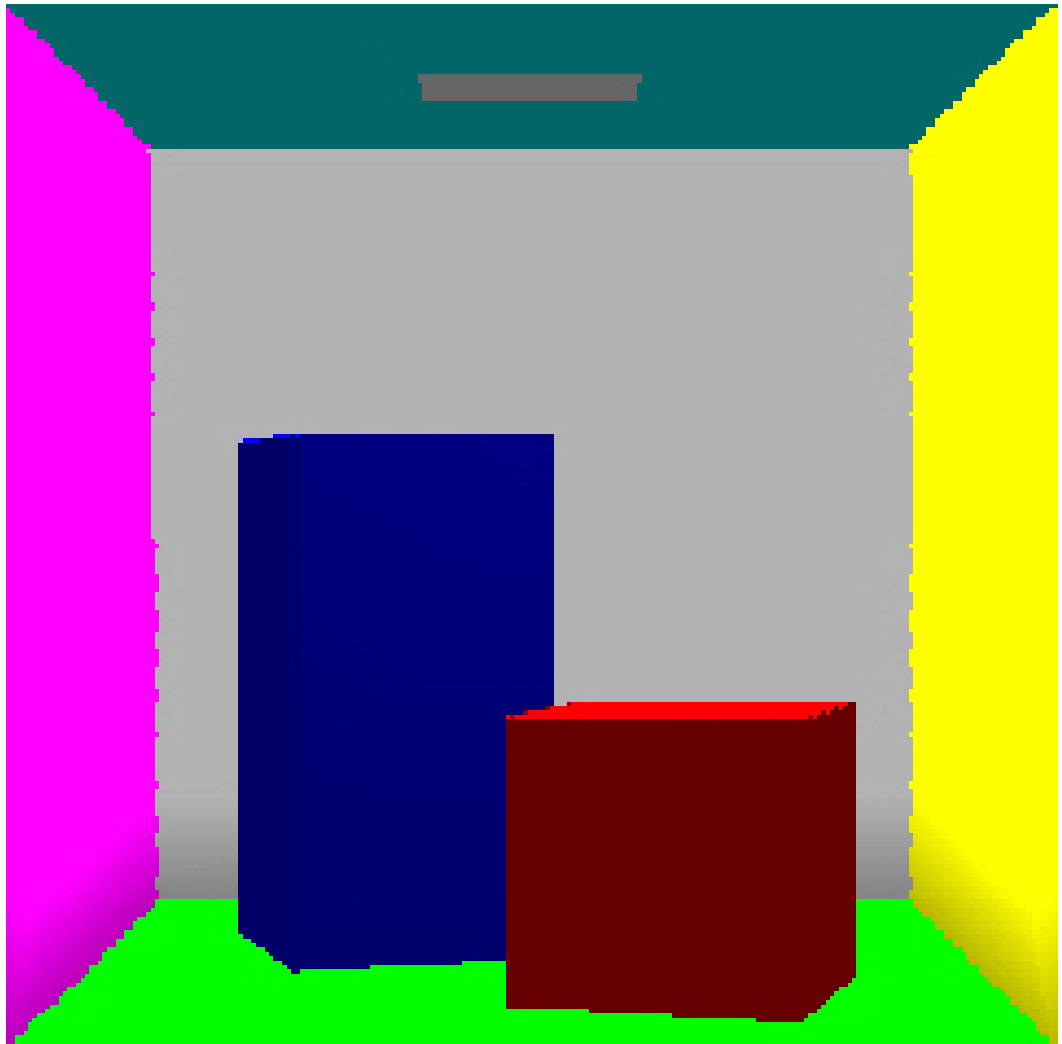
Change in perspective 2



Change in perspective 3



Change in perspective 4



Strangely familiar ?

Does this "deepening" effect look familiar ?

You will have seen it many times in cinema:

jaws

https://www.youtube.com/watch?v=_eO_5q5dR9M

Dolly Zoom 1

Dolly Zoom 2

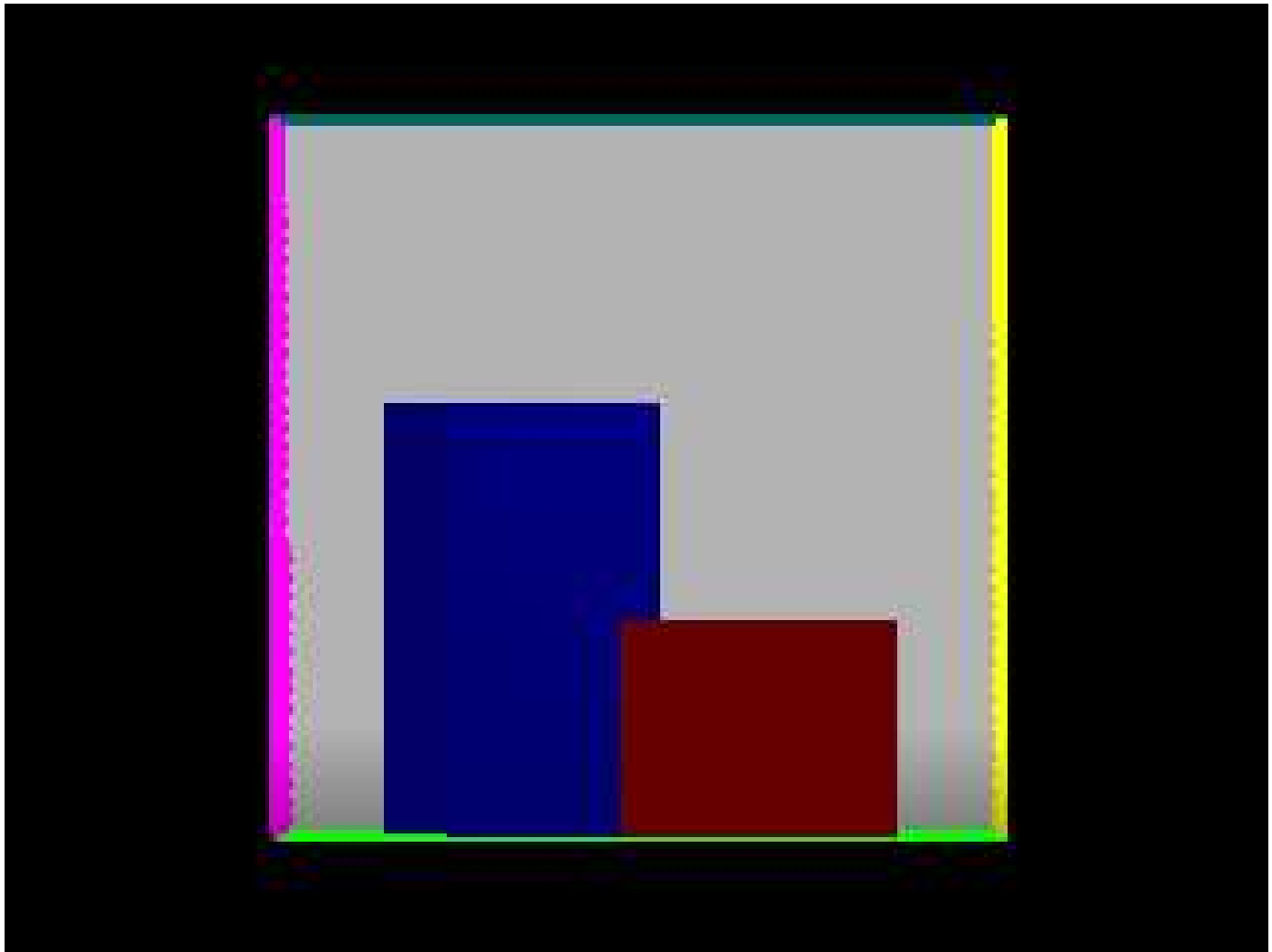
Dolly Zoom 3

Dolly Zoom 4

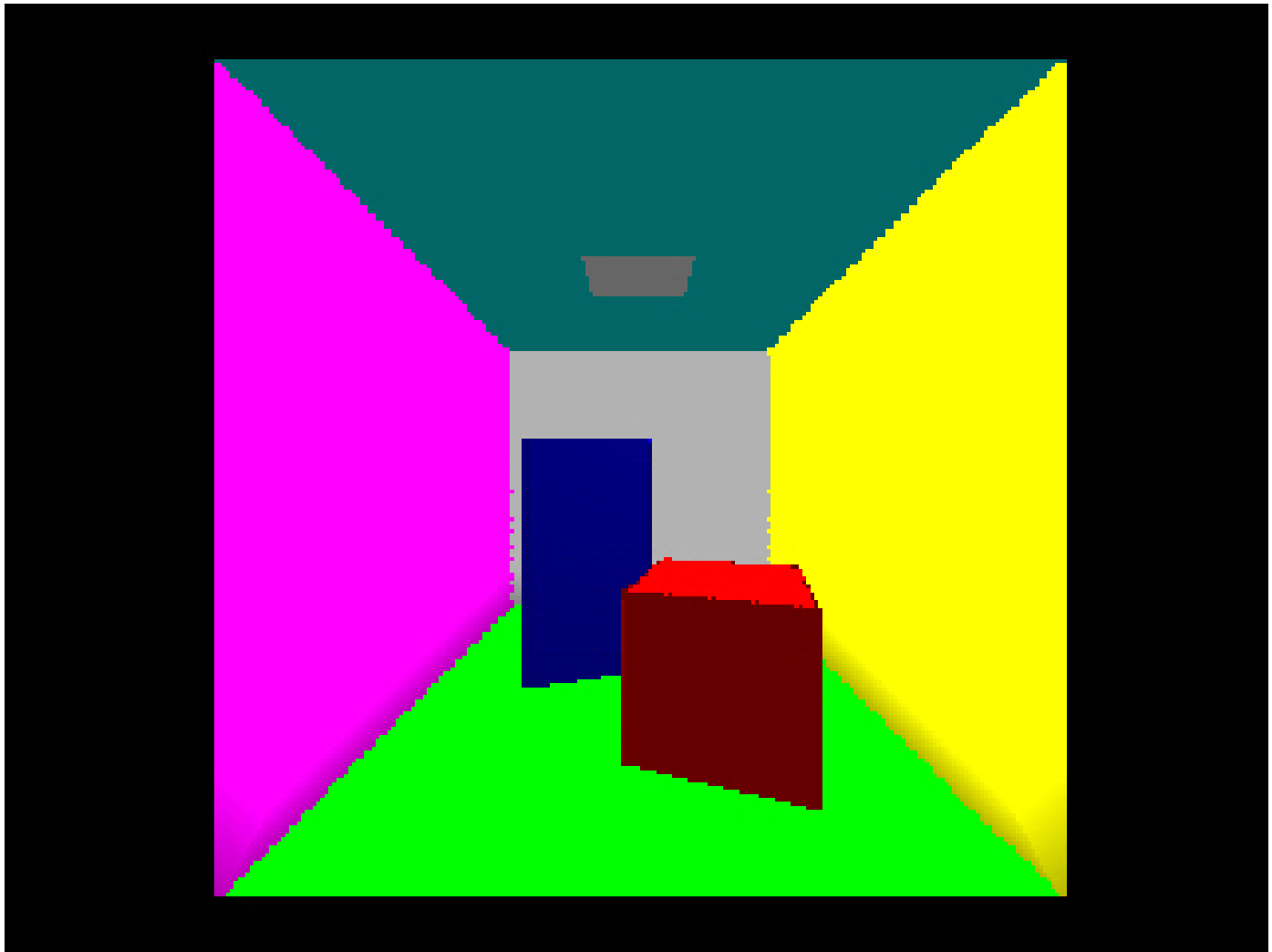
Extremes of Perspective

How wrong can it look (but still be right !)

Extremes of Perspective - Far from Scene

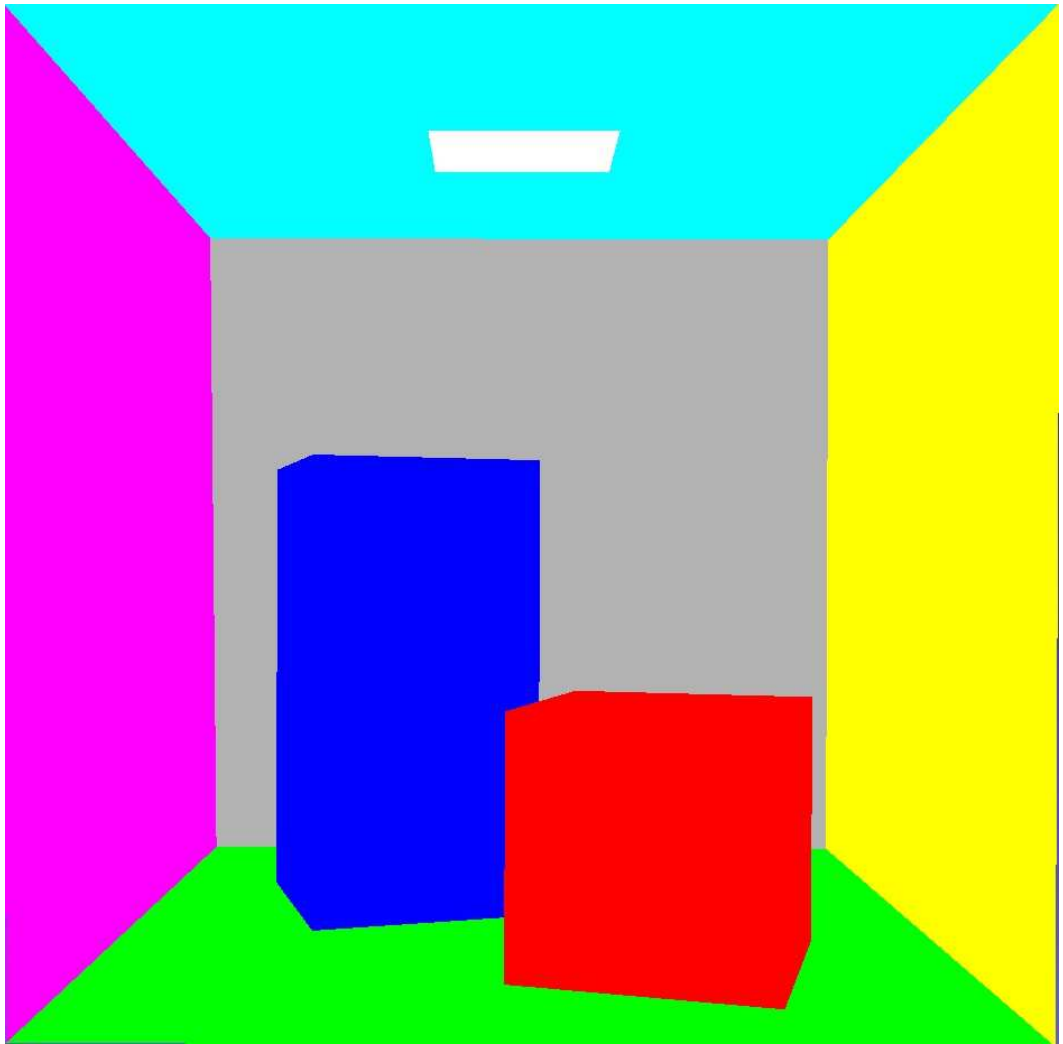


Extremes of Perspective - Close to Scene



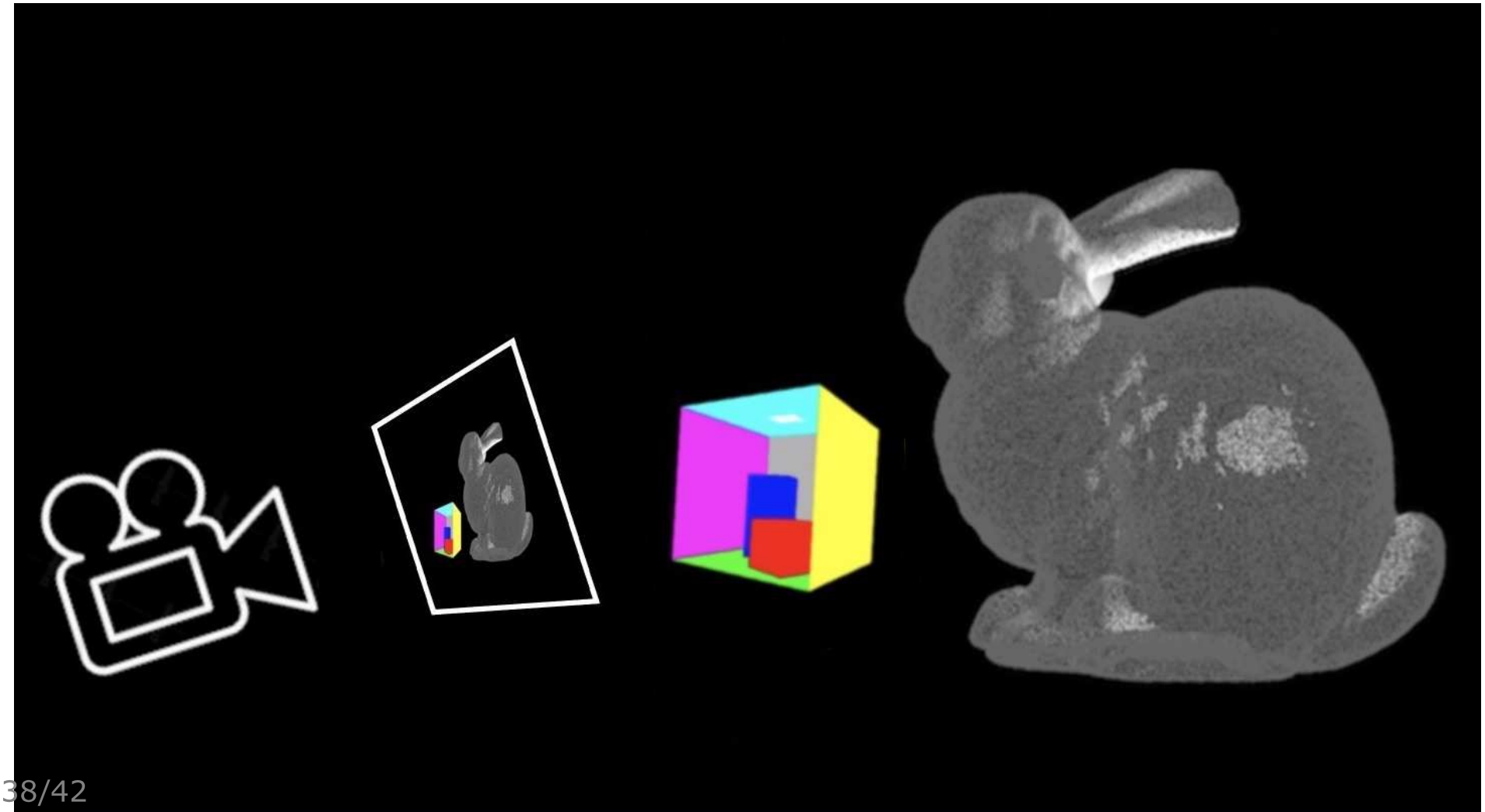
Different students - different perspectives !

Oh noz ! My ceiling is broken !!!



Time for a quick game !

Let's play "spot the origin" !



Transposition

For many rendering features, positions/locations all need to be within the same coordinate space

This will involve a lot of shifting back and forth

But what does this actually mean ?
Here is a really simple example in 1D...

How far to "Dangerous" Dave ?

100 miles 100 miles

X----------X----------X

Simon Lindley Hall Farm Dave

Questions ?

4th Dimension with Carl Segan

4th-dimension