

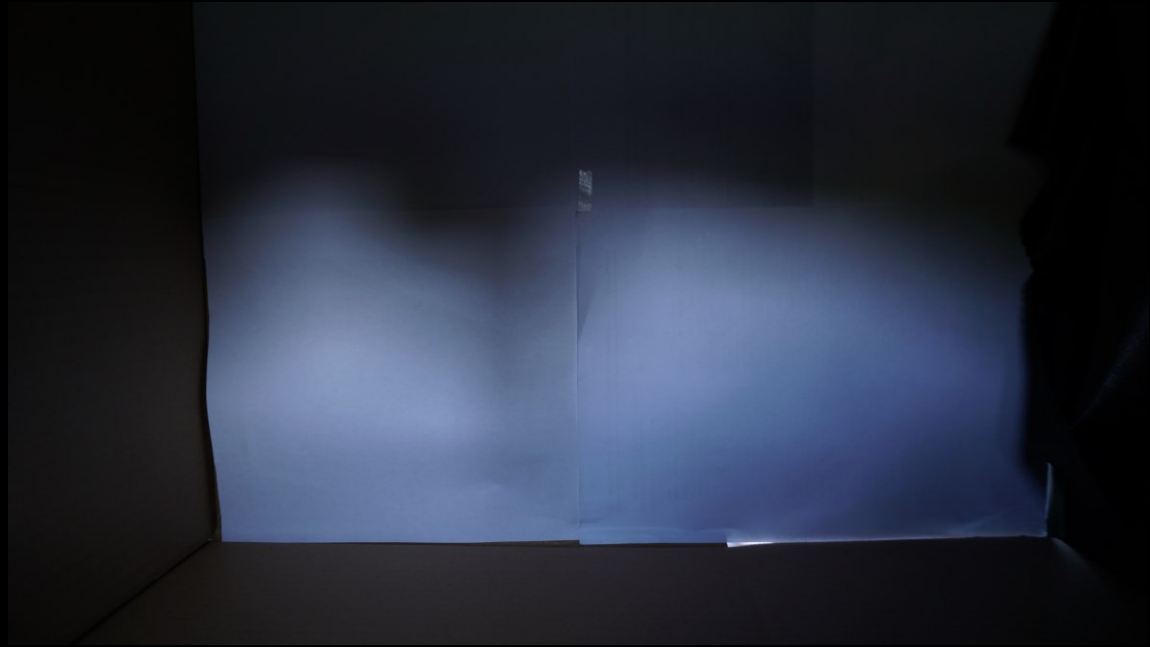
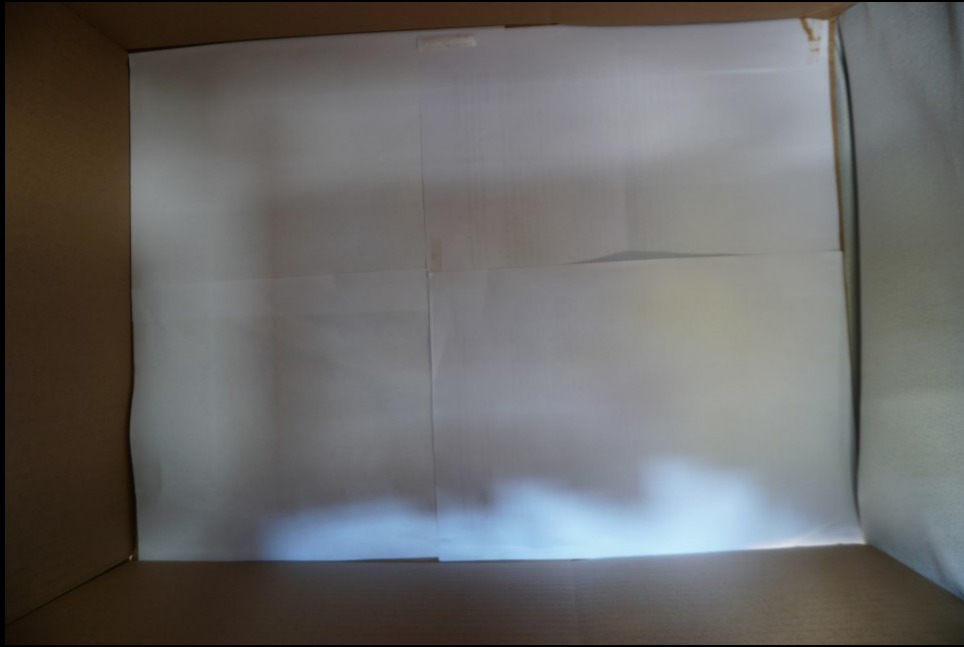
# Pinholes and Pinspecks

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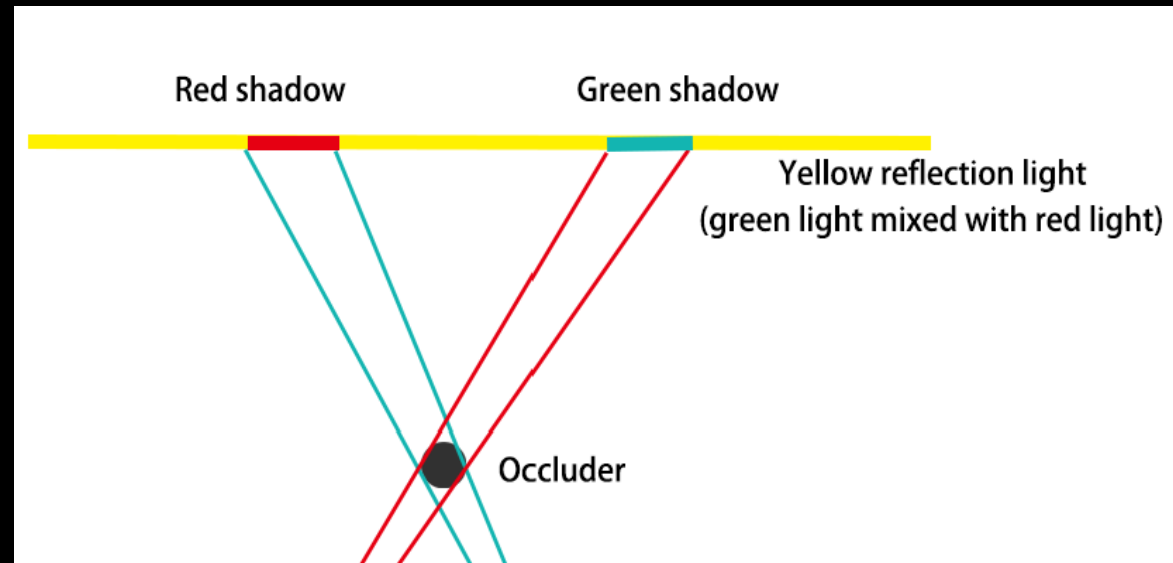
# Accidental pinholes and pinspecks in life...

- windows acting as 'pinholes' revealing scene outside on the wall



# Accidental pinholes and pinspecks in life...

- shadows carry color and light information



# the math

$$I_{occluder}(x, y) = I_{background}(x, y) - I_{pinhole}(x, y)$$

$$I_{pinhole}(x, y) = I_{background}(x, y) - I_{occluder}(x, y)$$

$$= \rho(x, y)(L(x, y) - L_{occluder}(x, y))$$

illumination image

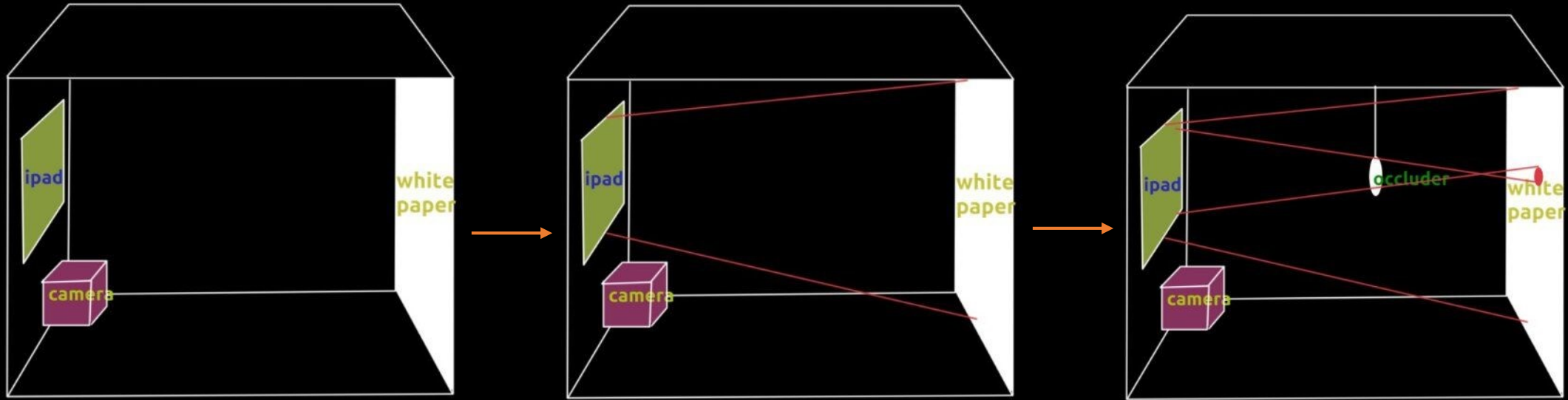
$$= \rho(x, y)(T_{hole}(x, y) * S(x, y))$$

albedo variations

aperture

The ideal pinhole image

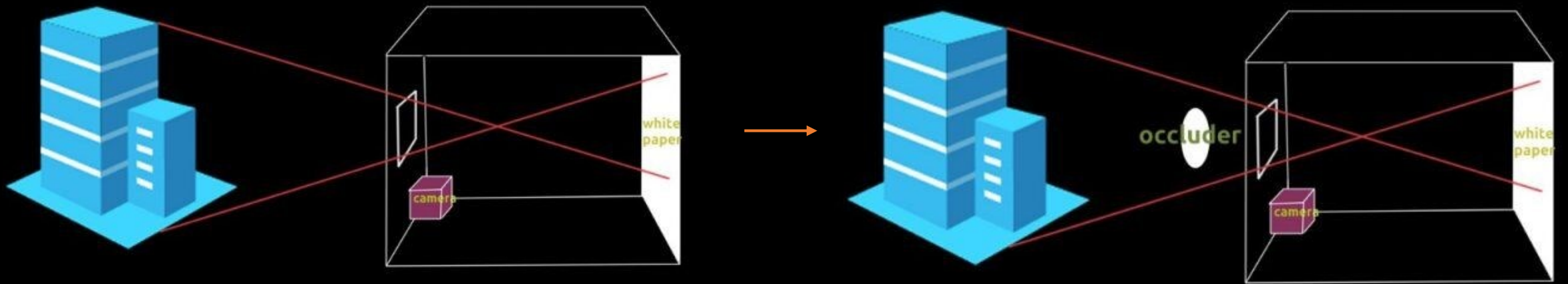
# Our setup - with light from iPad



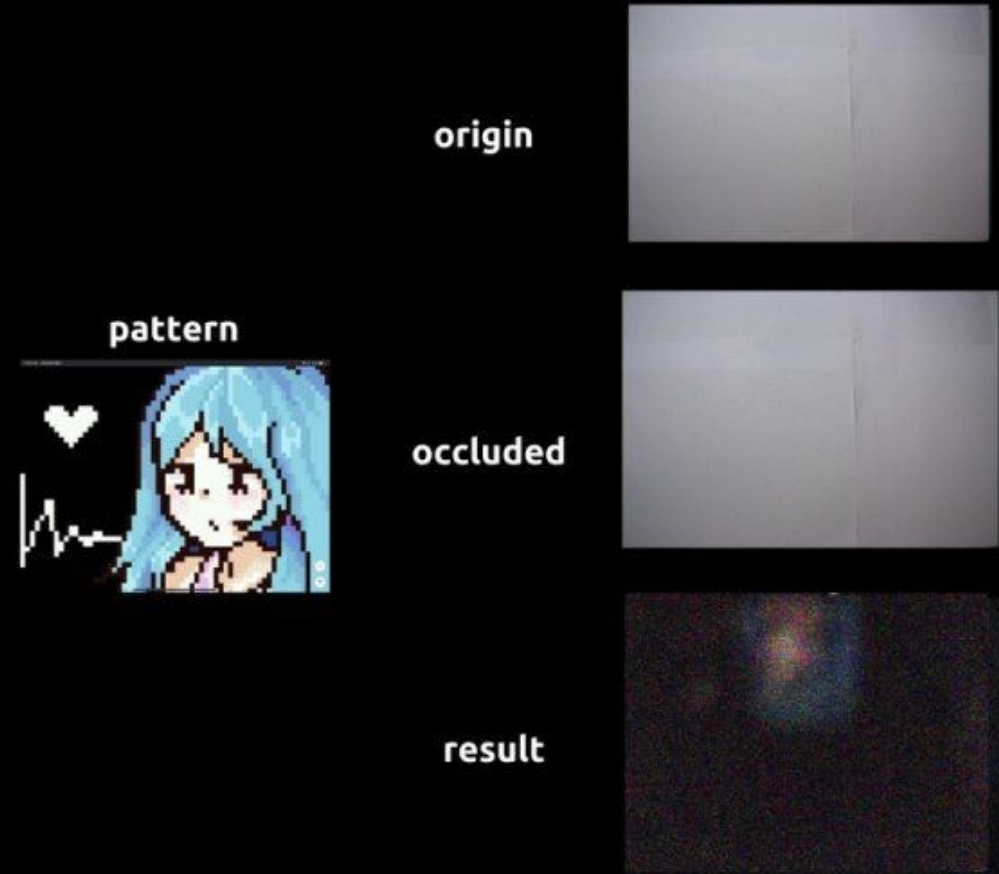
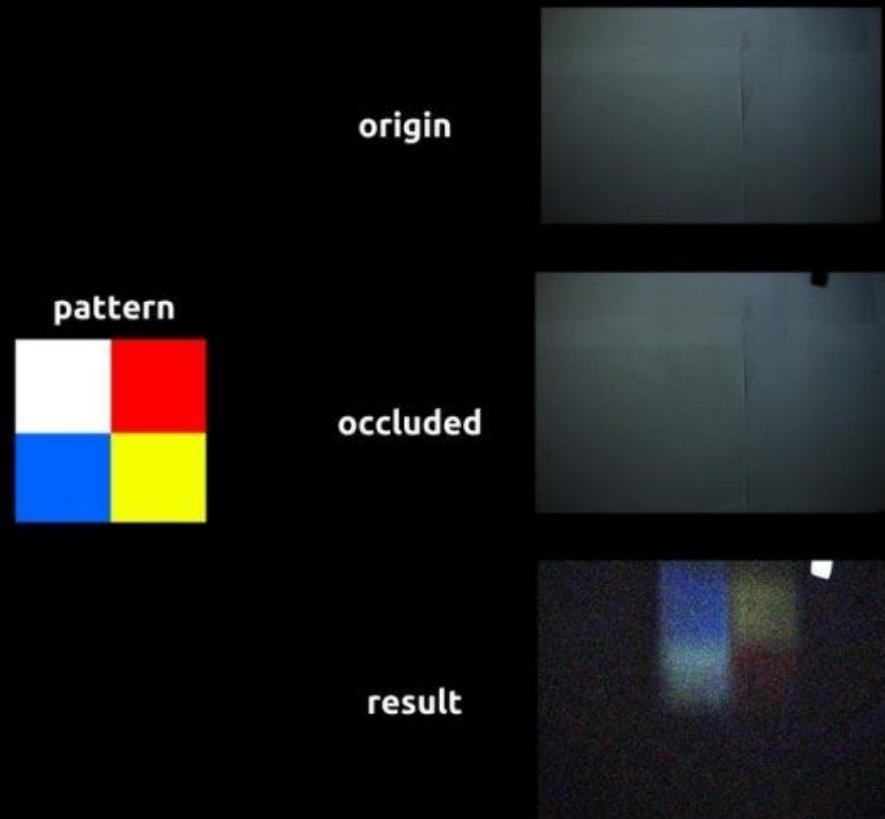
# Our setup - with light from iPad



# Our setup - with light from outside

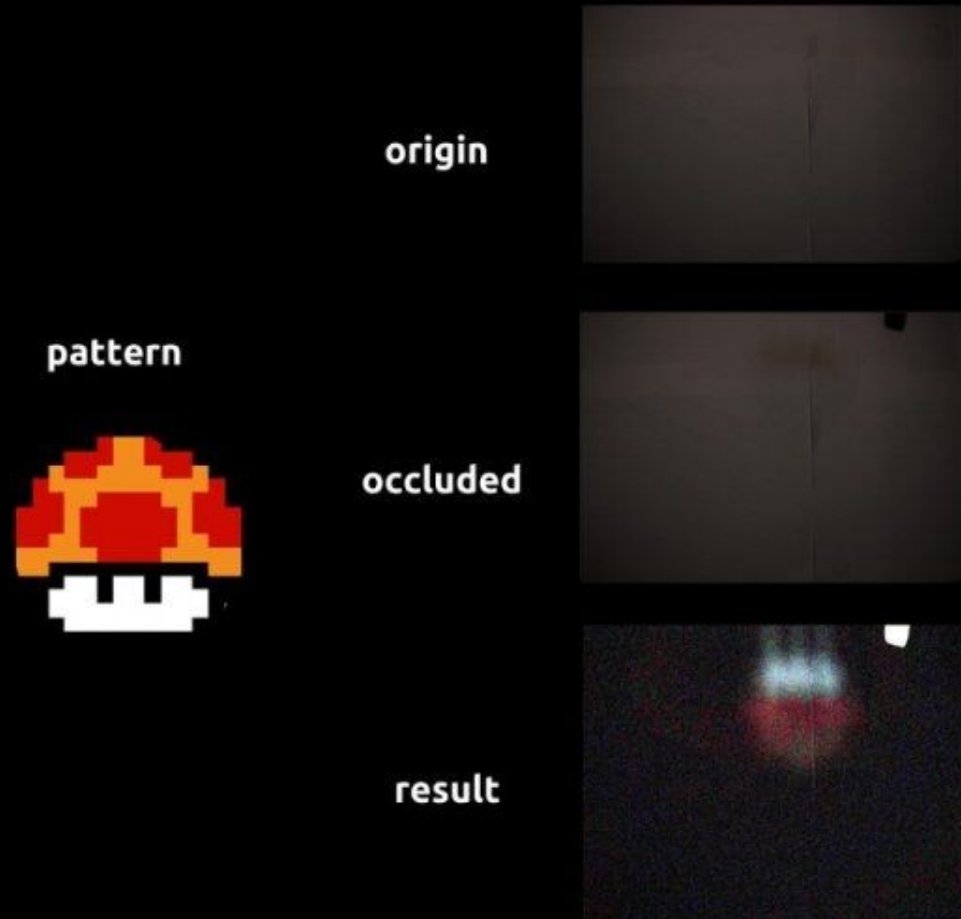


# Results – with light from iPad





# Results - with light from iPad



# Results — sharpening pinhole images with MSRCR deblurring



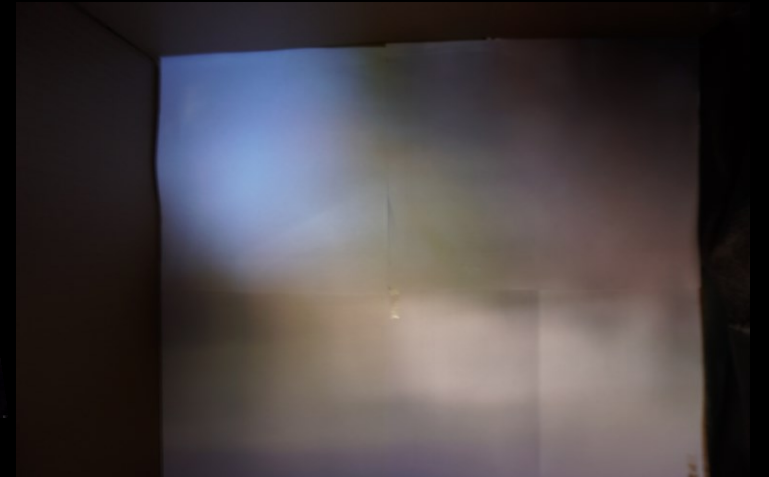
# Results – with light from outside



Original



Combination of pinspeck series



Single pinhole

# Acquiring data...

- Using industrial camera / SLR camera /  
the front camera on phones(with fixed lens)
- Sunlight at noon / late afternoon /  
cloudy / shiny daytime
- Focus on object with large / little diffuse reflectance

# Our further goal

- Use pinholes and pinspecks together

sharper, less loss on colors, and more details

- Denoise on pinspecks



Pinspeck image of a red car

# Reference

- Accidental Pinhole and Pinspeck Cameras, Revealing the Scene Outside the Picture, Antonio Torralba · William T. Freeman, 2014

Thank you !