

# Spatioangular Resolution Tradeoffs in Integral Photography

*T. Georgiev, C. Zheng, B. Curless,  
D. Salesin, S. Nayar, C. Intwala*

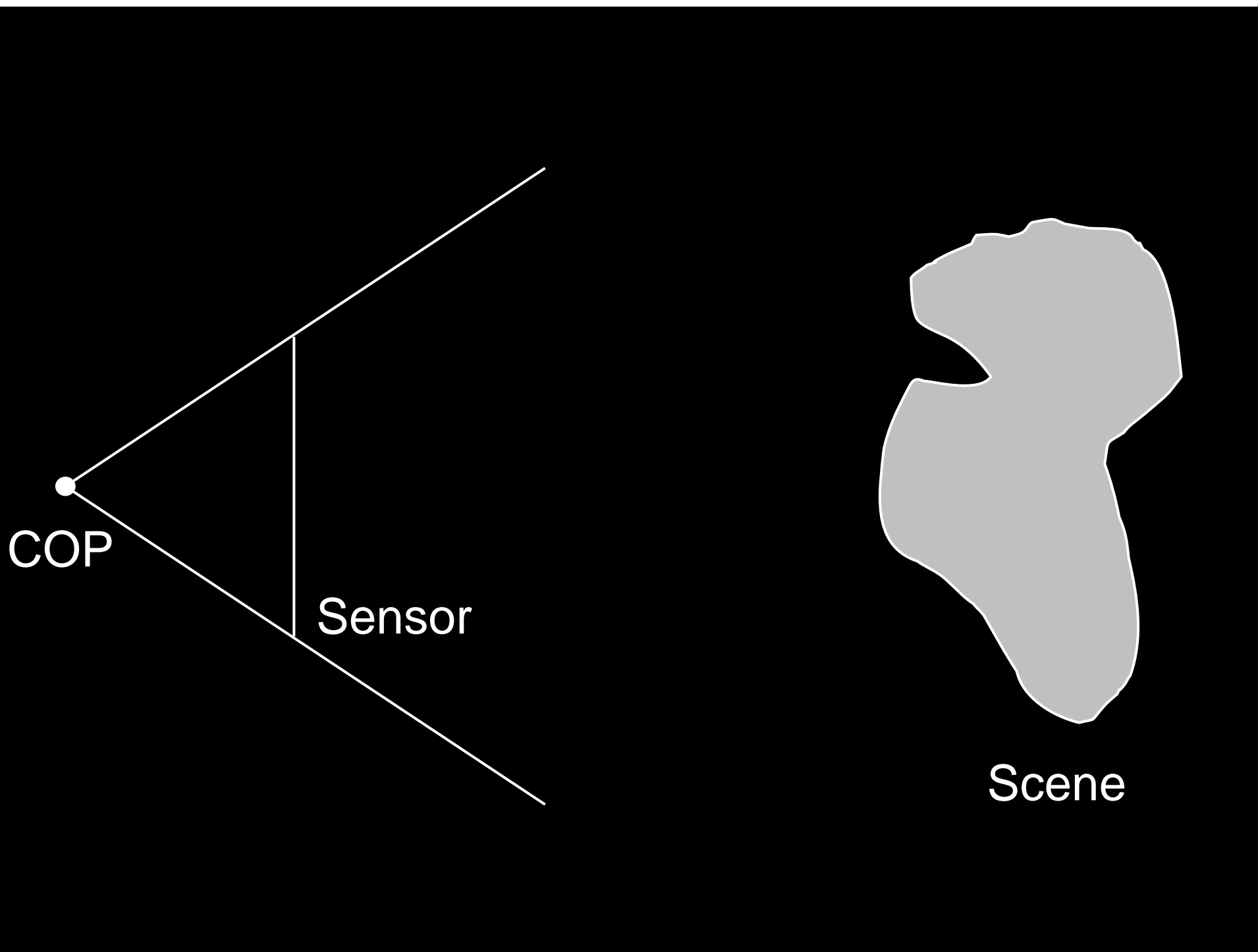
**EGSR 2006**

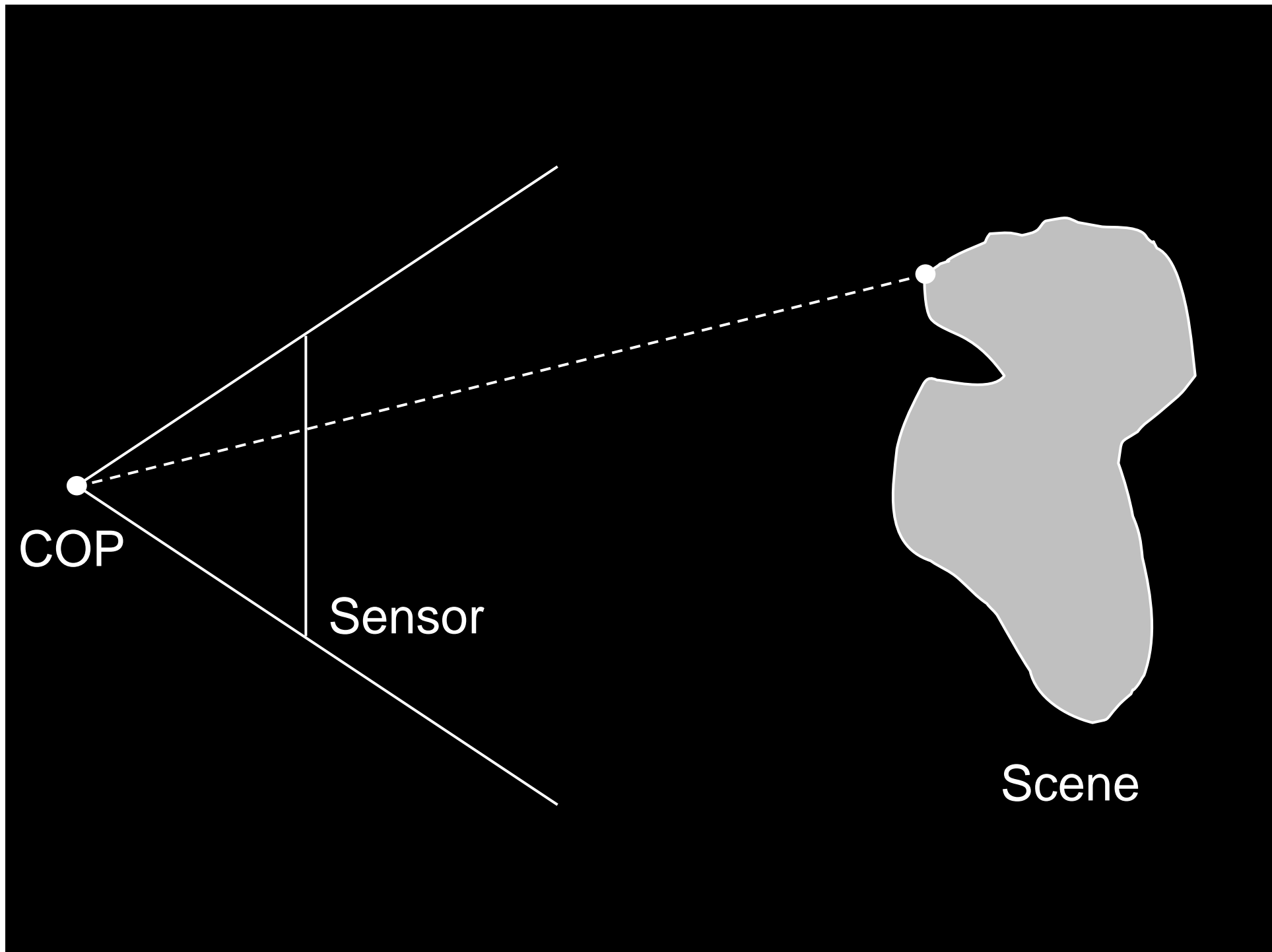
# Capturing parallax

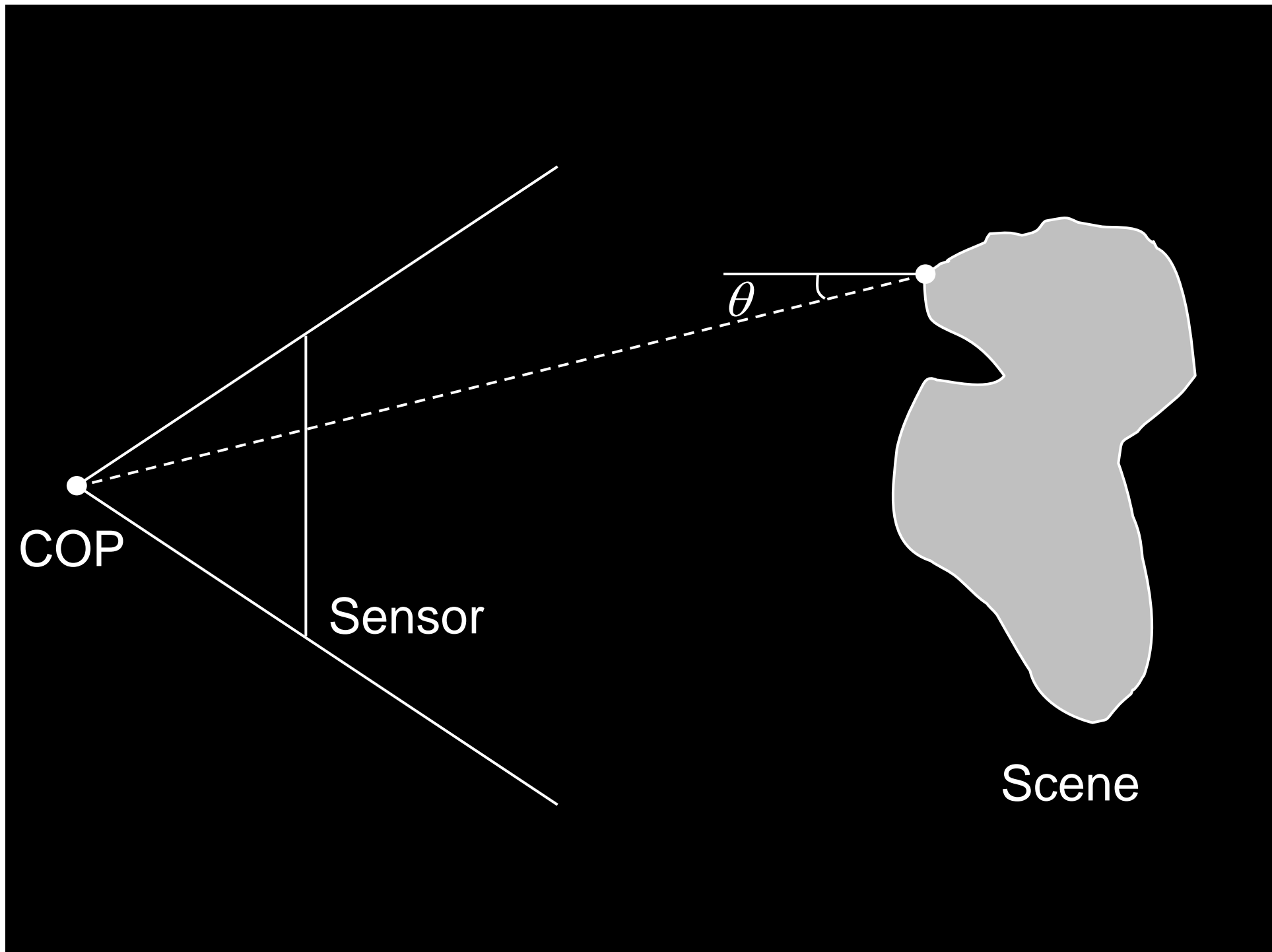
## Approaches:

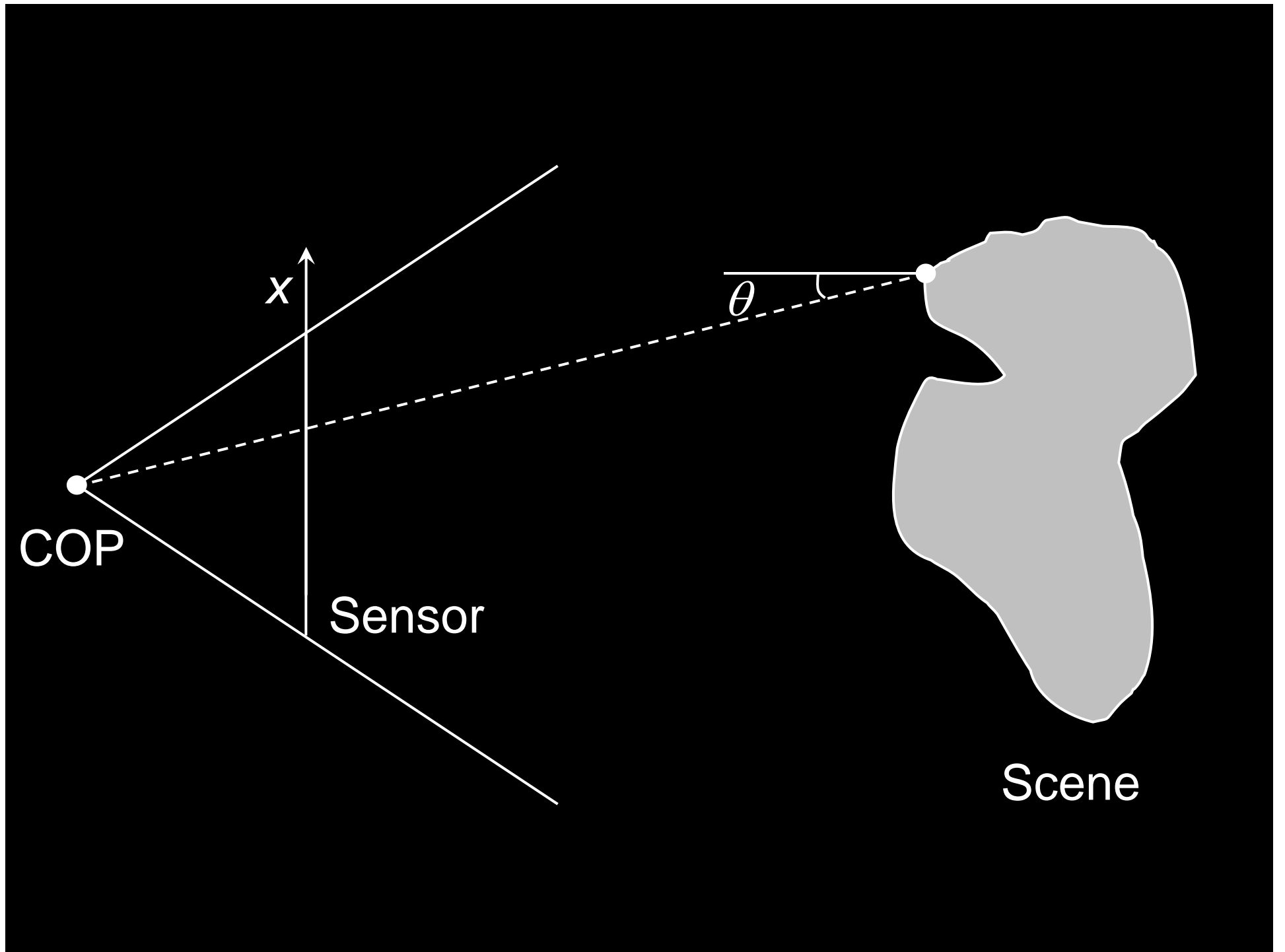
- Multiple photographs
- Multiple cameras
- Spatially multiplexed viewpoints on one sensor
  - Admits to compact design
  - Can handle moving scenes

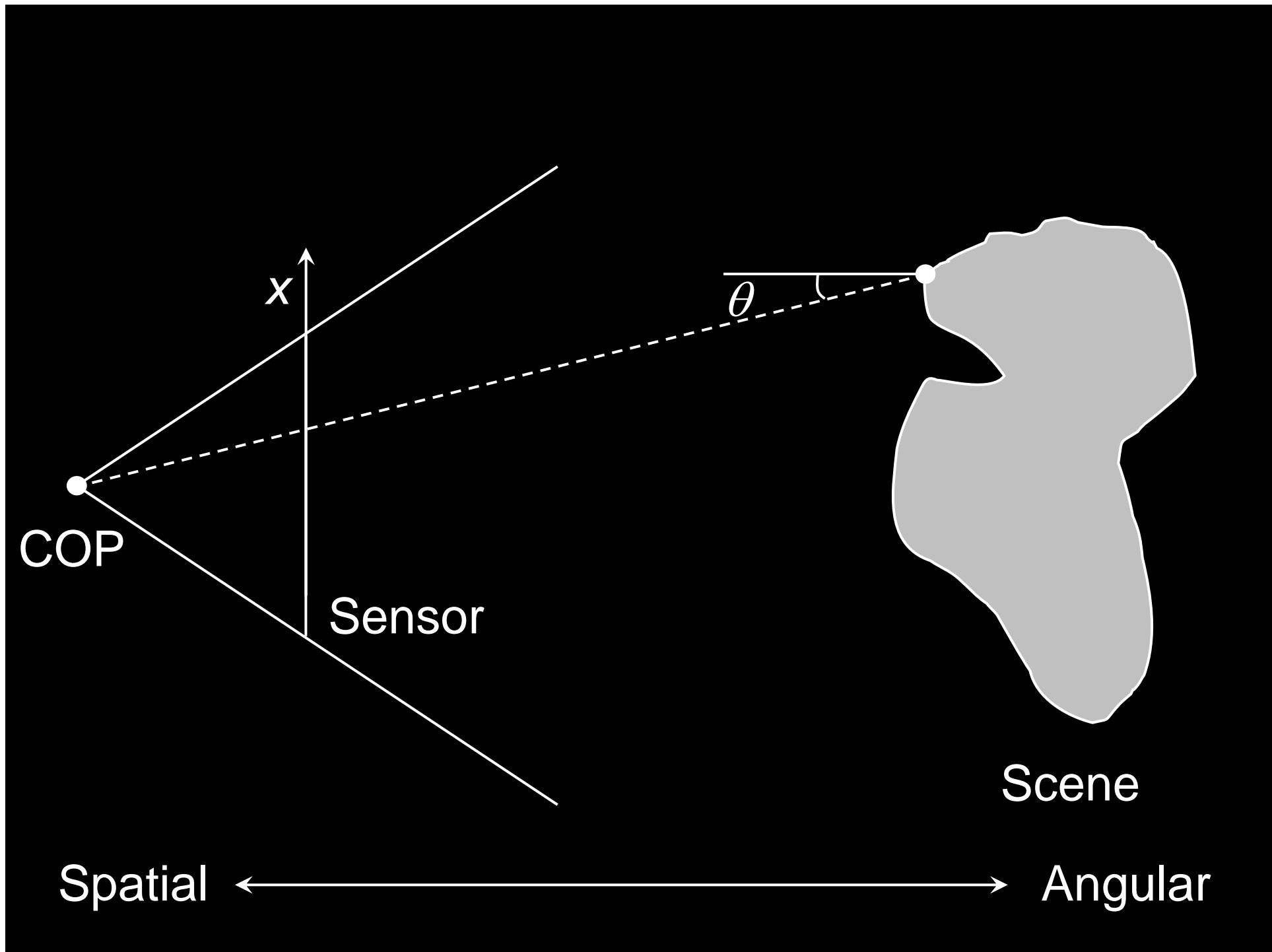
What are the multiplexing tradeoffs?

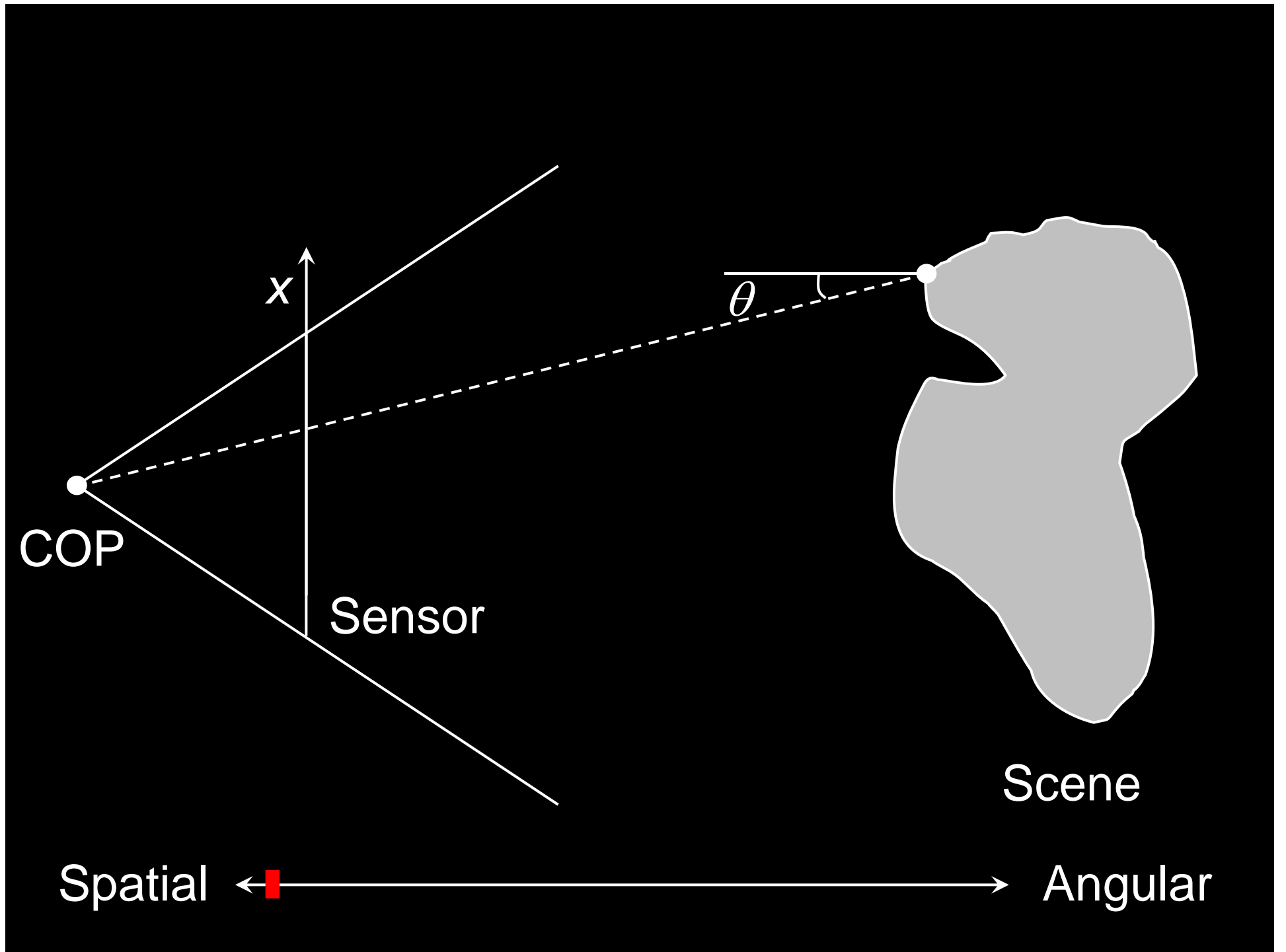




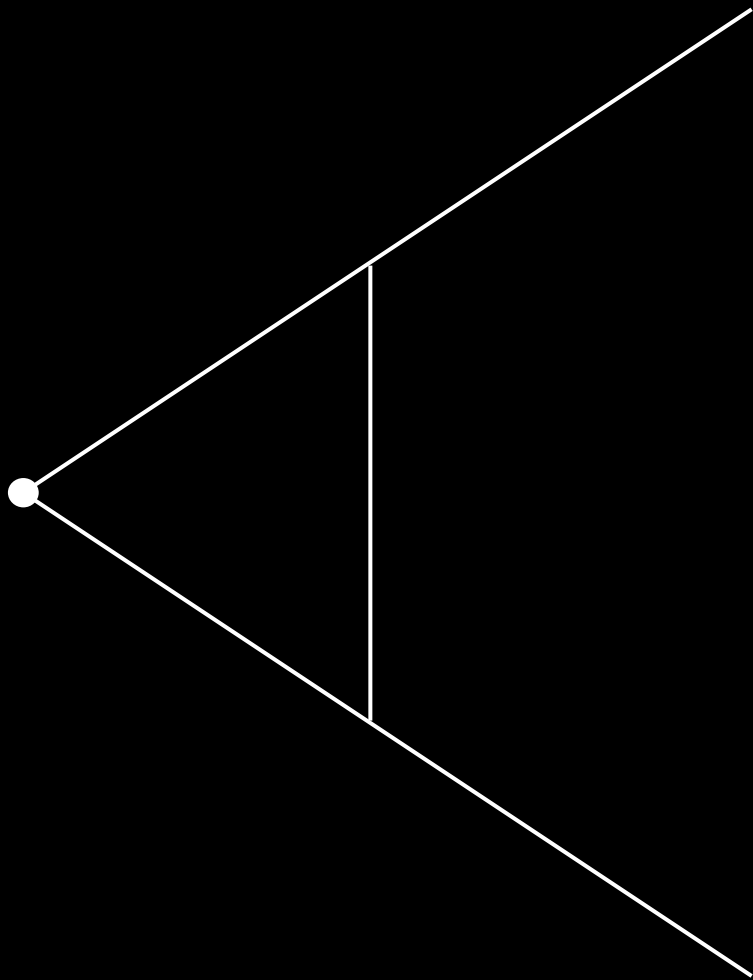








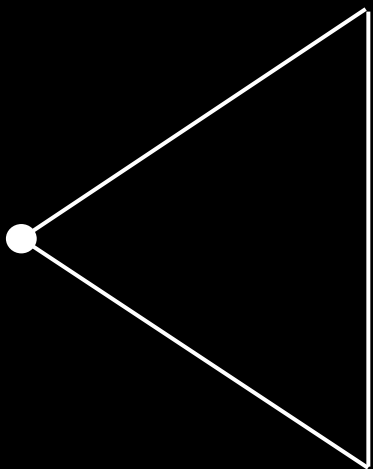


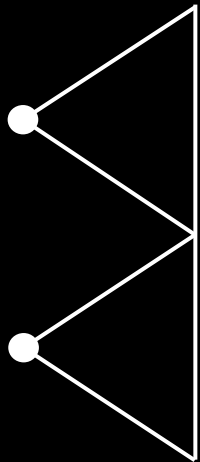


Spatial

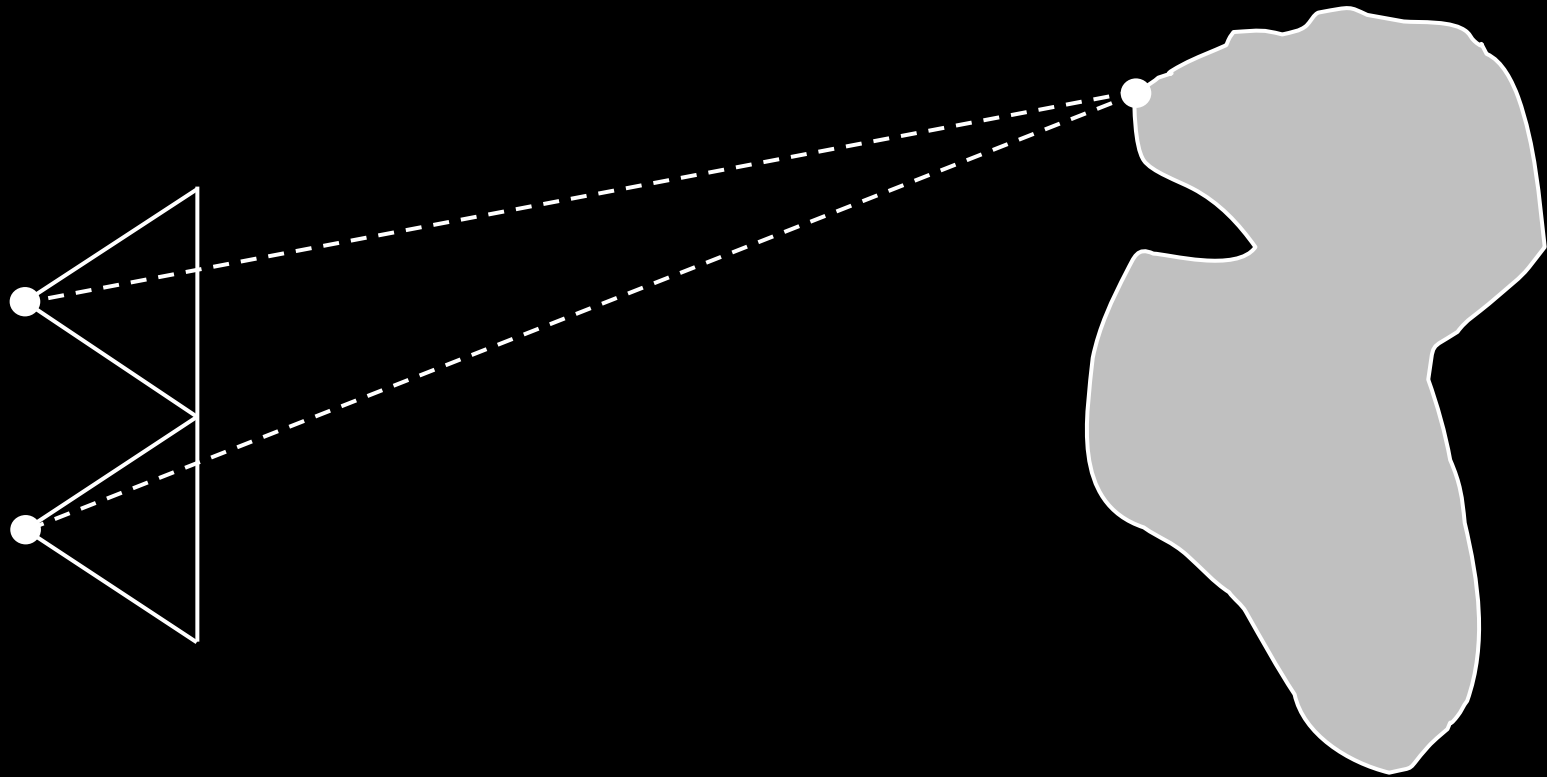


Angular

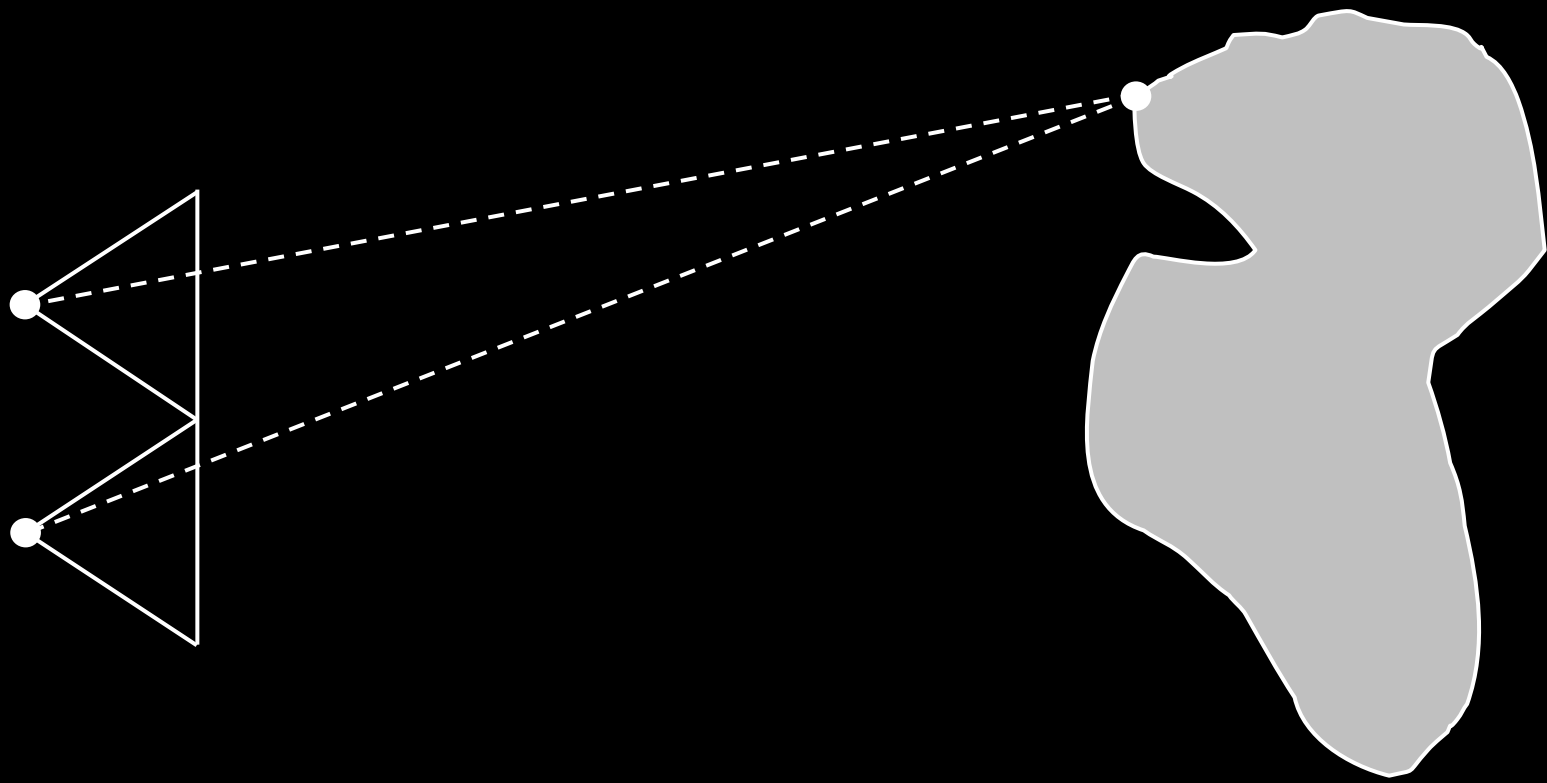




[Nene and Nayar '98]



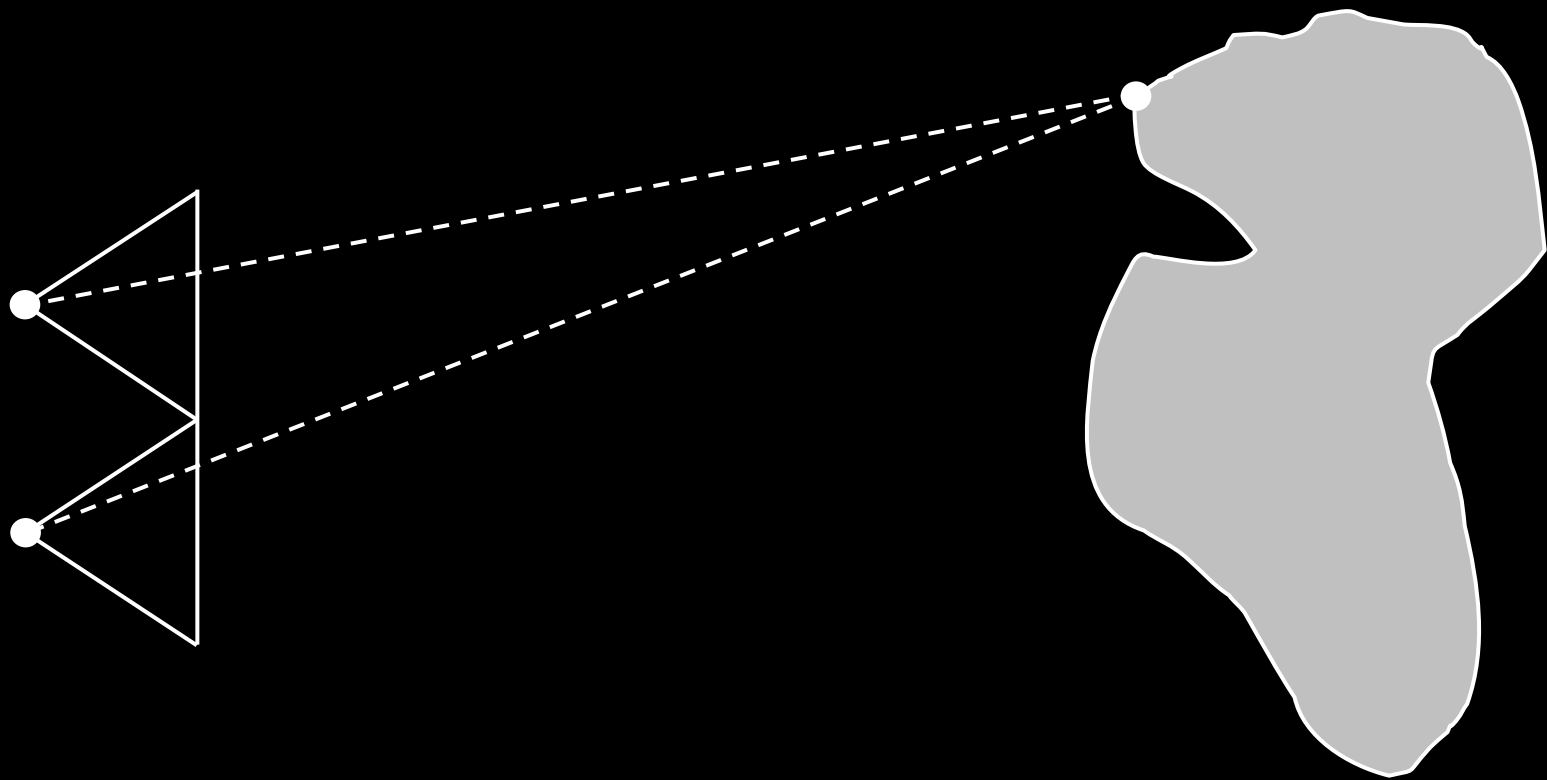
[Nene and Nayar '98]



Spatial



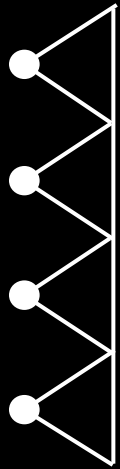
Angular

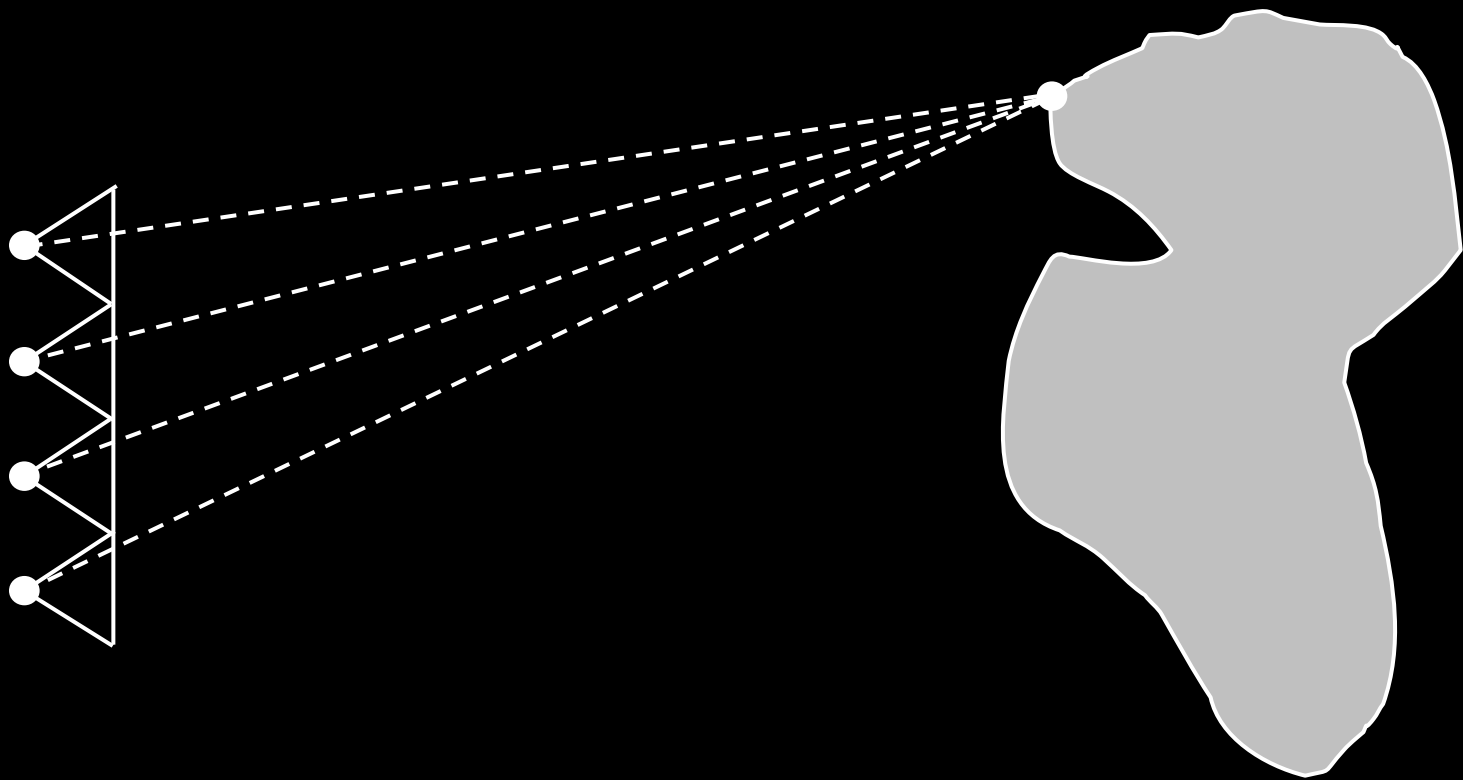


Spatial

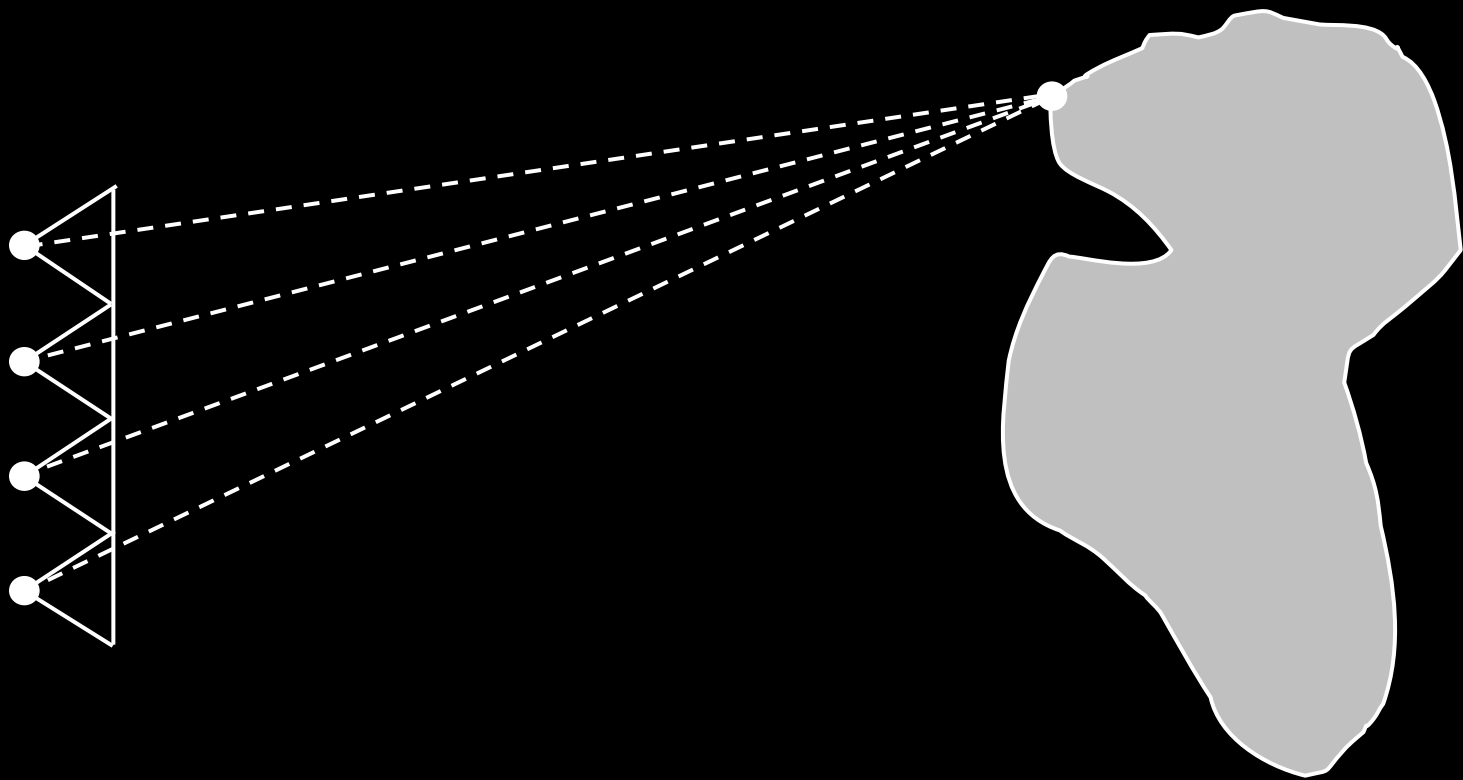


Angular





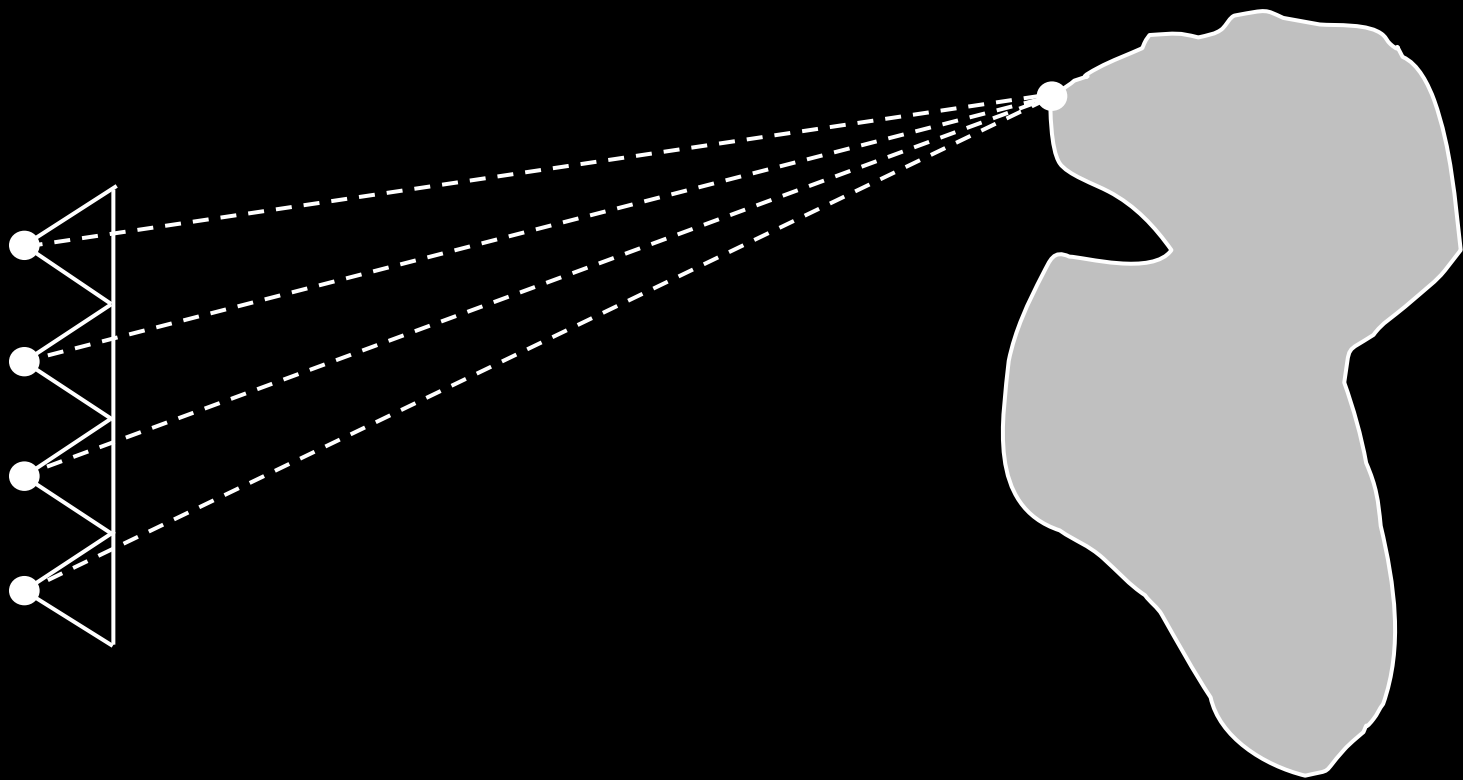




Spatial



Angular

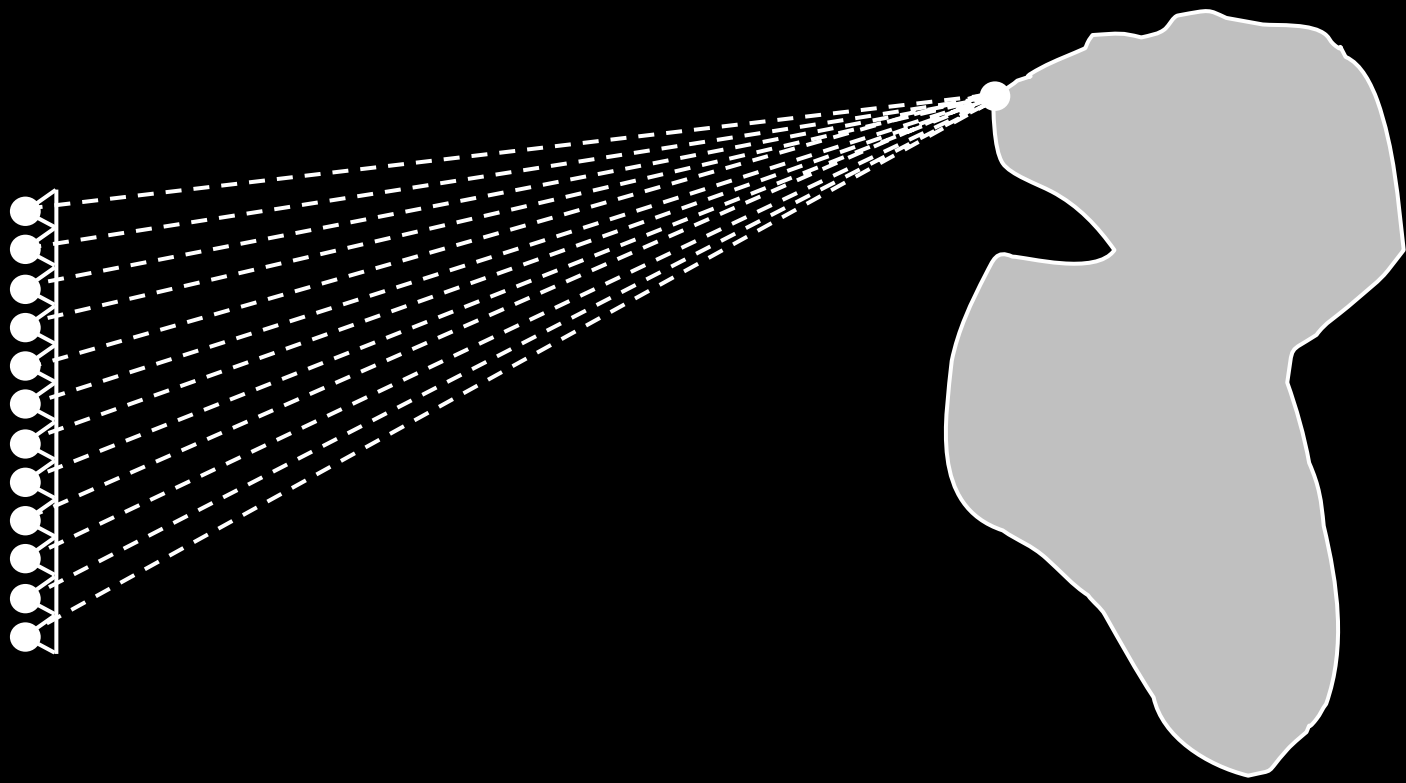


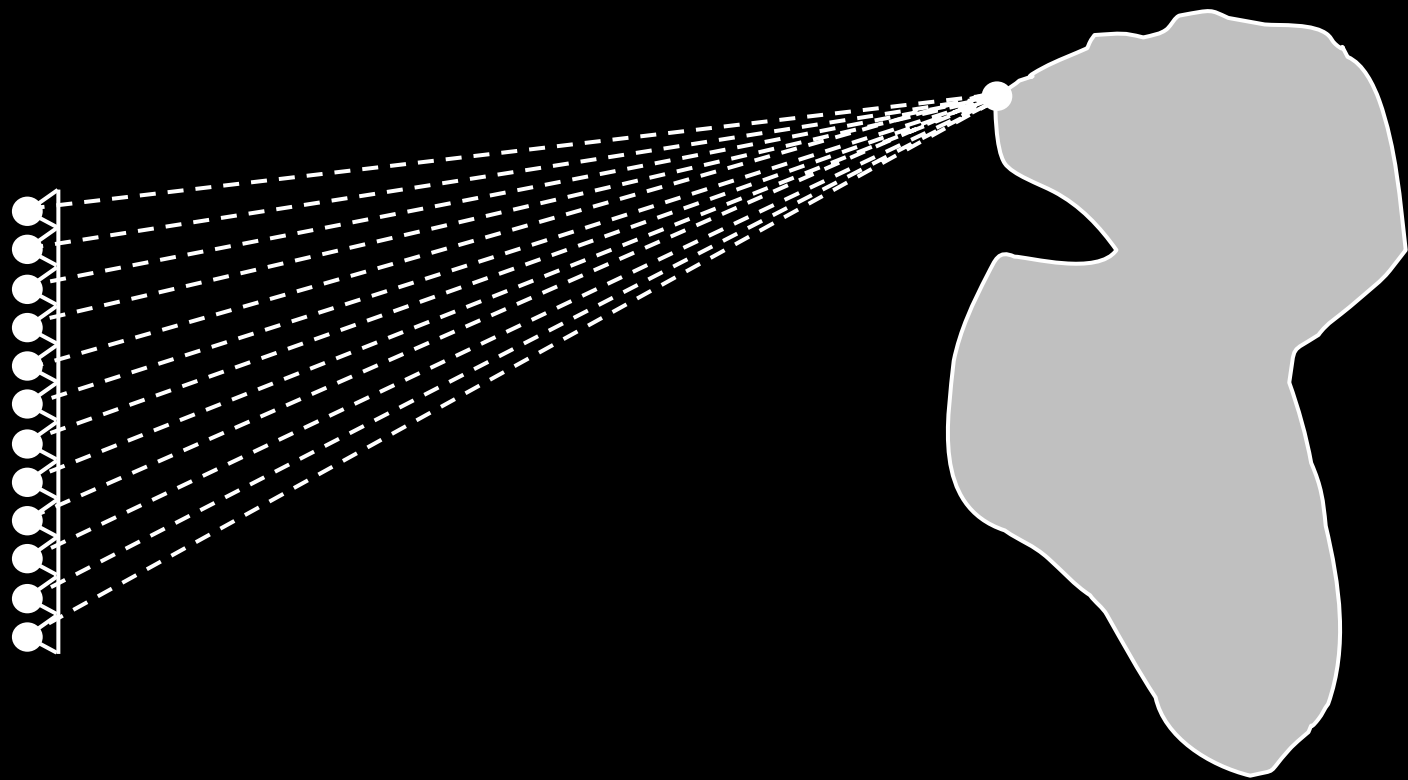
Spatial



Angular



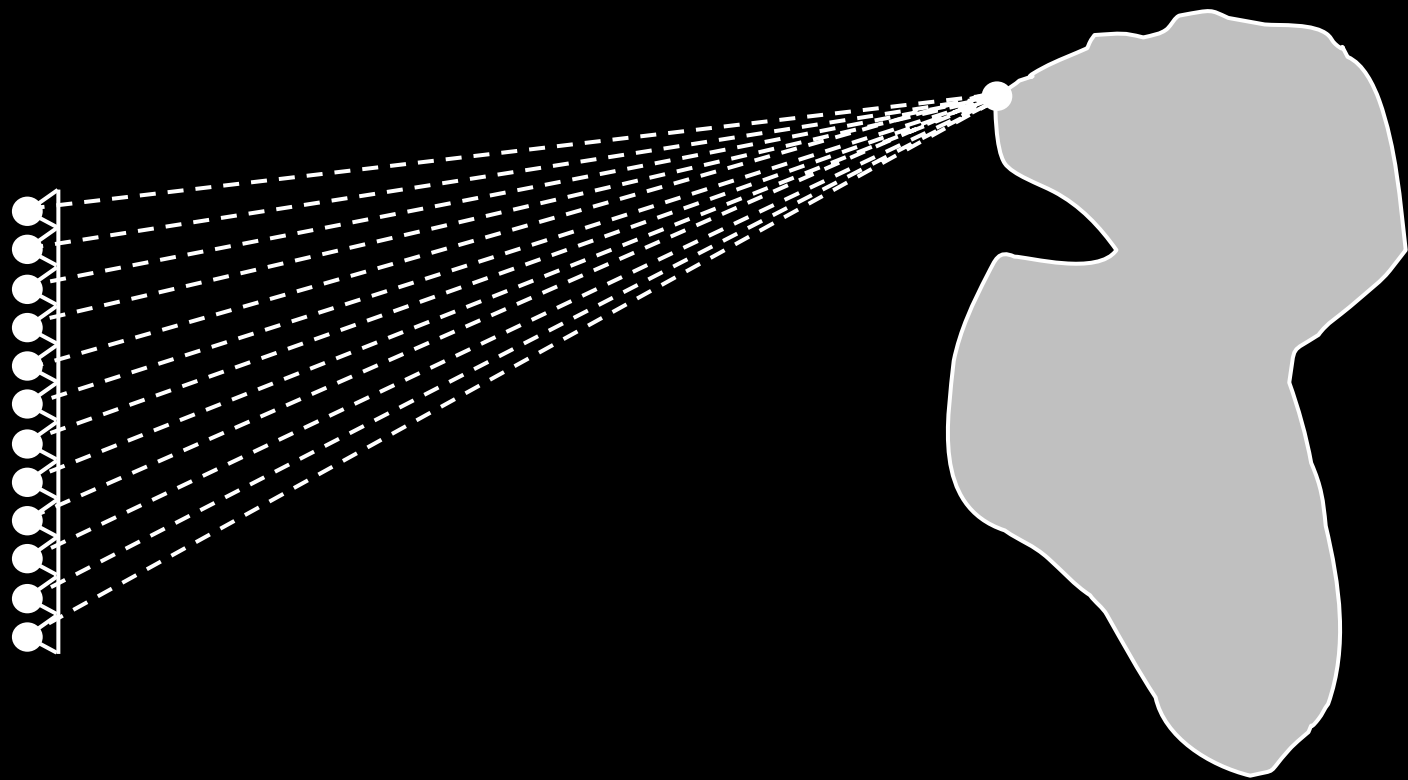




Spatial



Angular



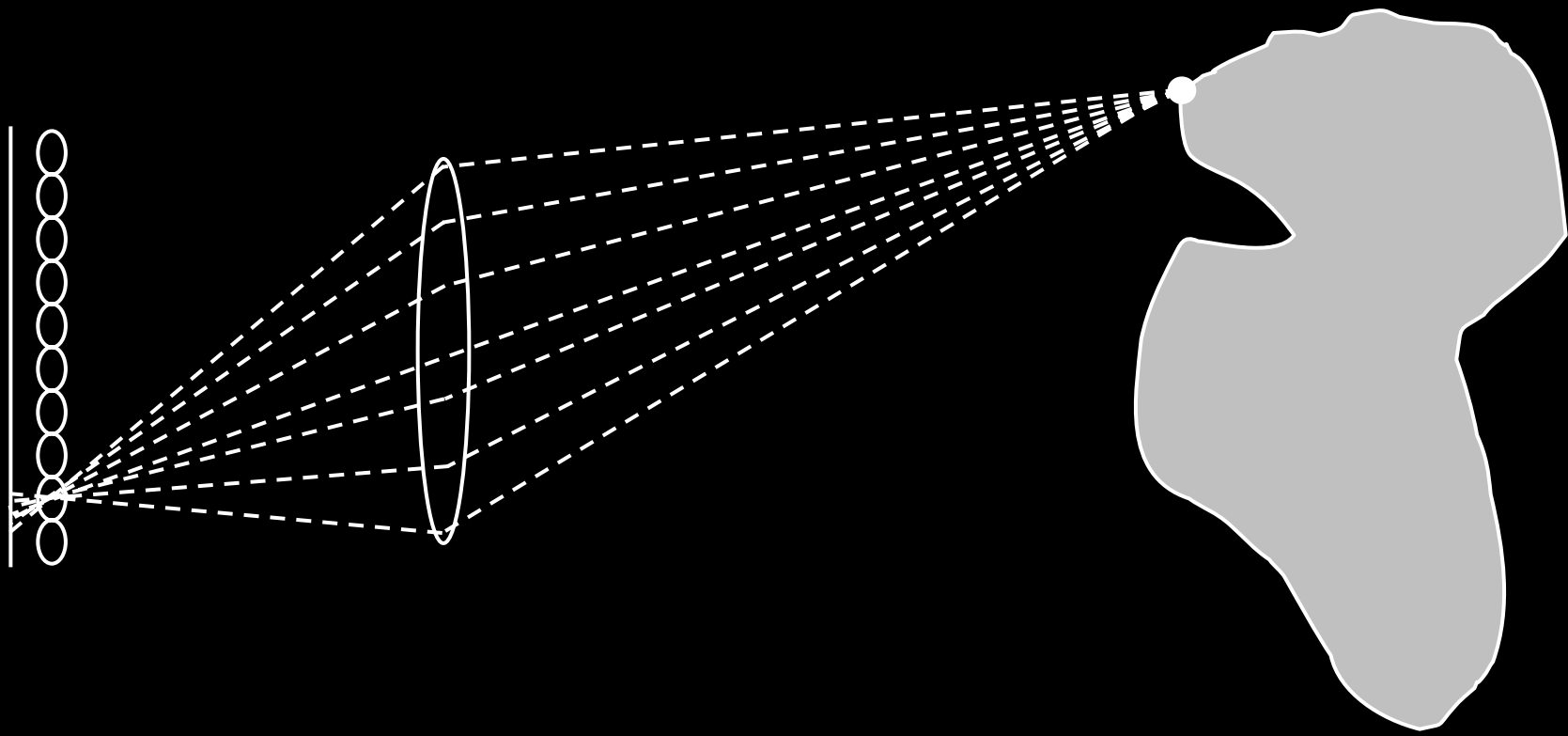
Spatial



Angular

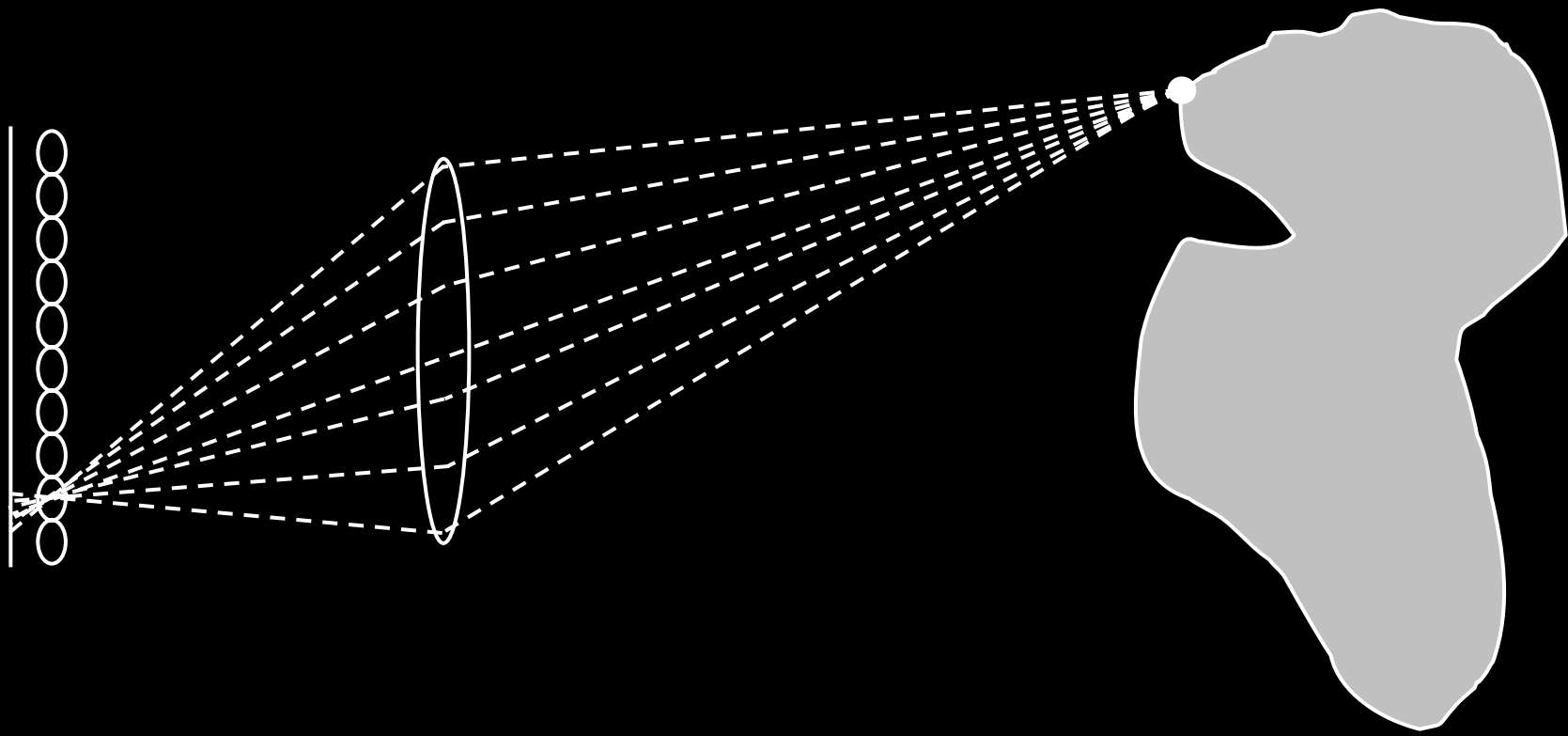


[Ng *et al.* '05]



[Ng *et al.* '05]



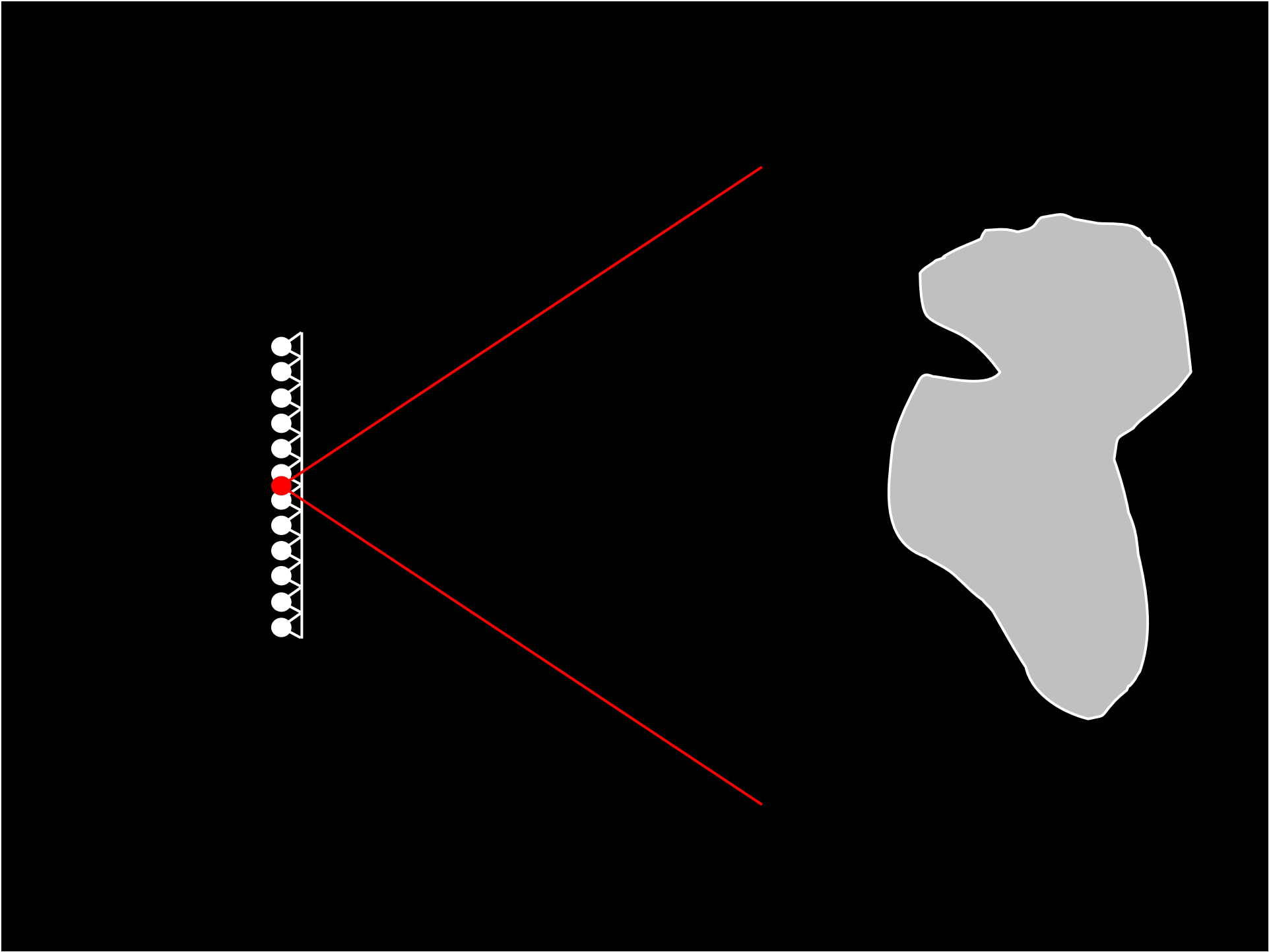


Spatial

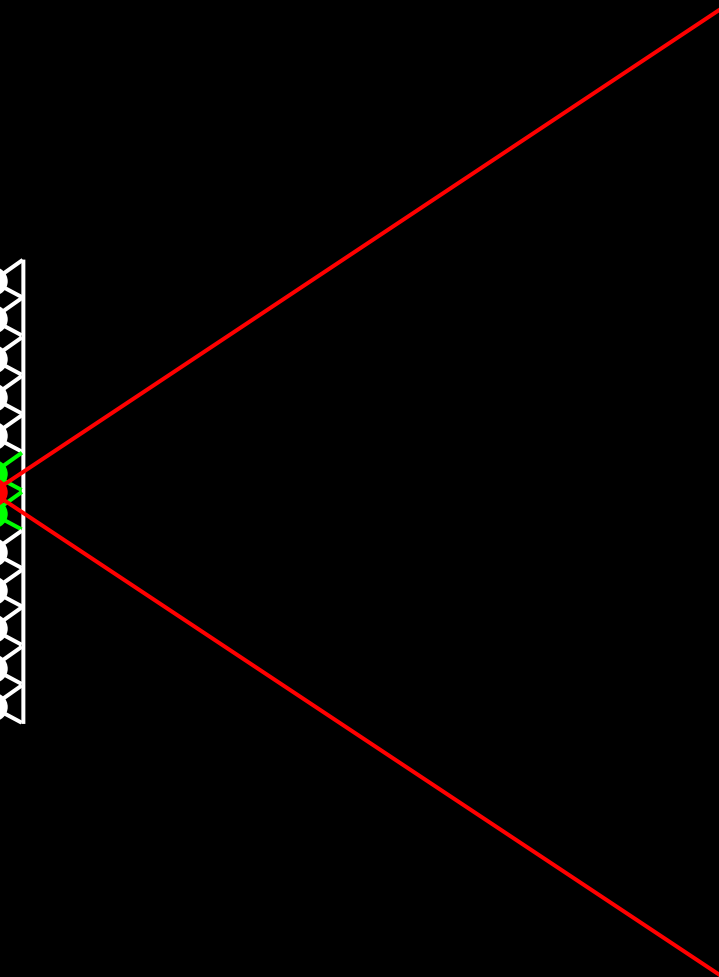


Angular

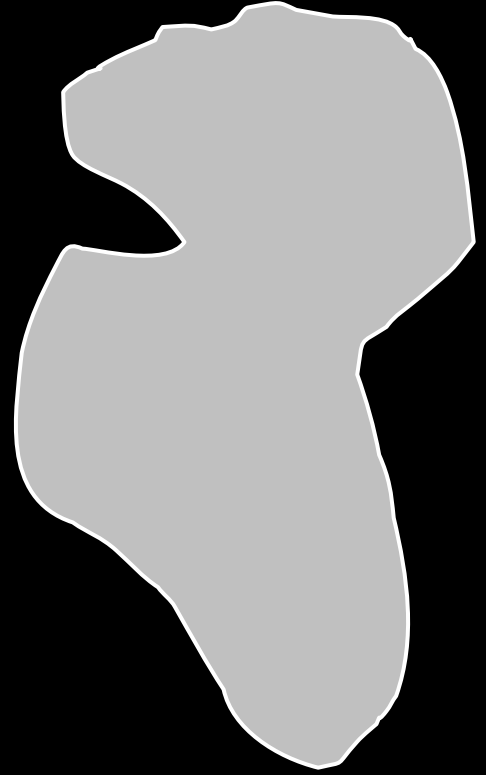




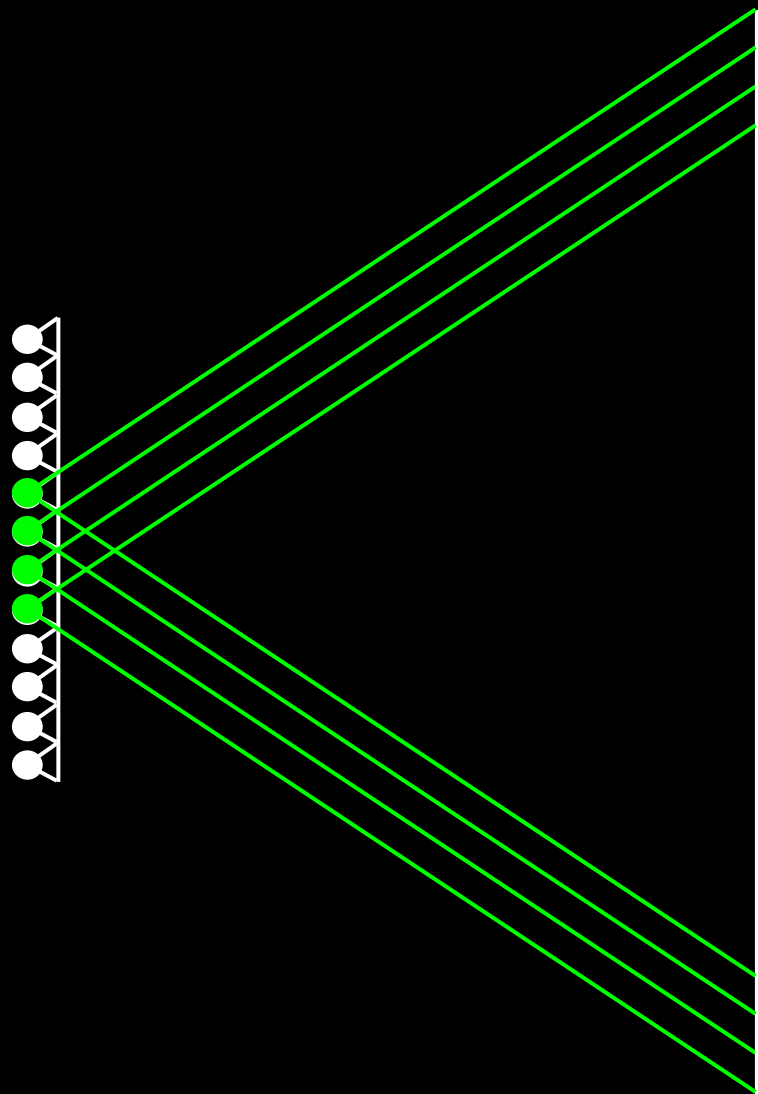
Straight  
interpolation





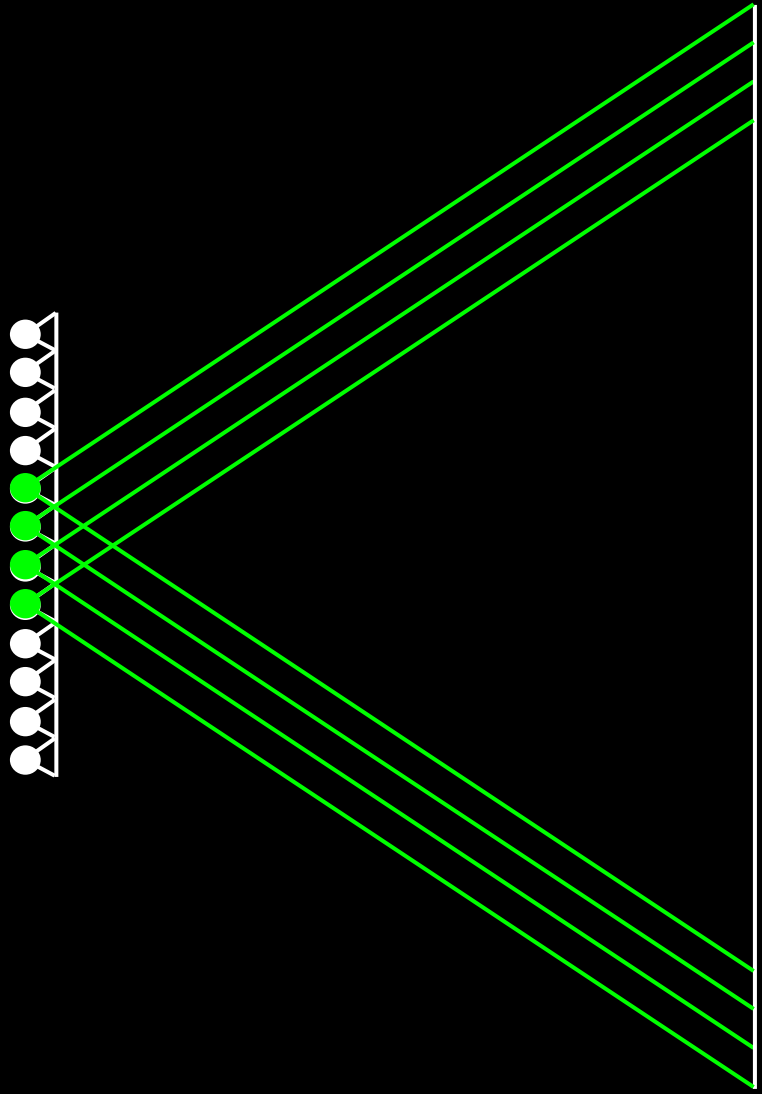
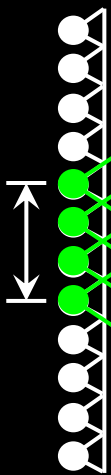


In-focus plane



In-focus plane

Aperture

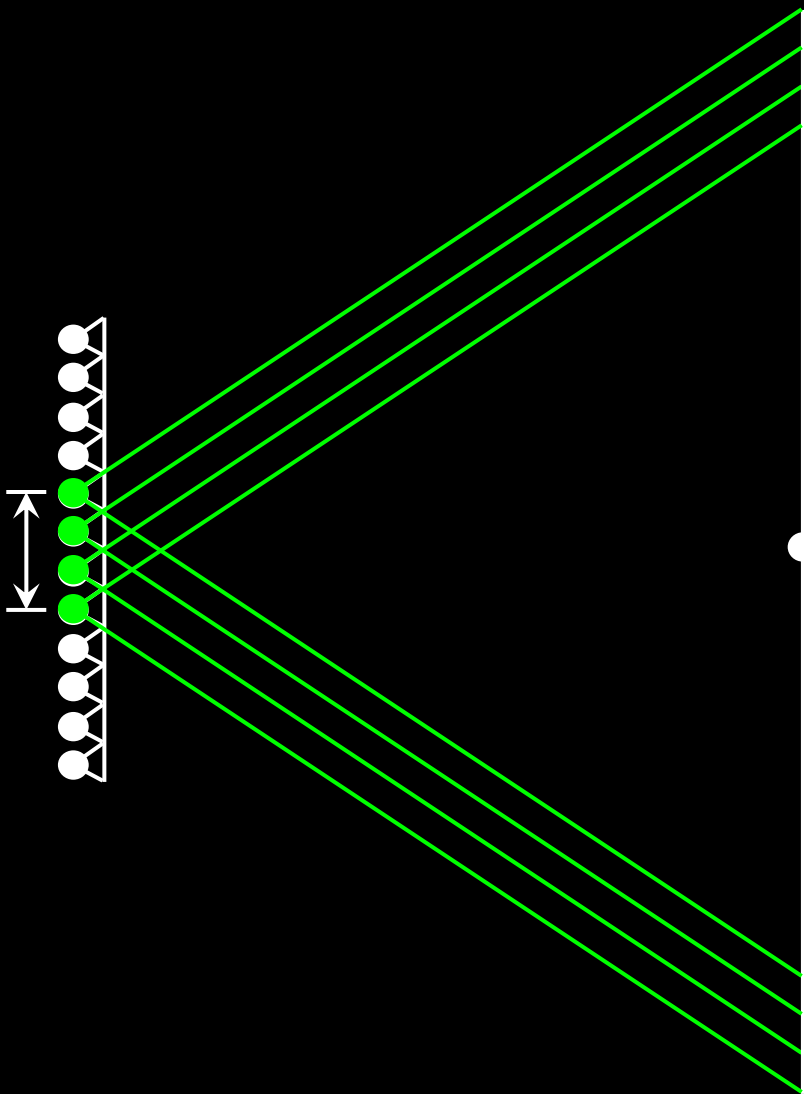


In-focus plane





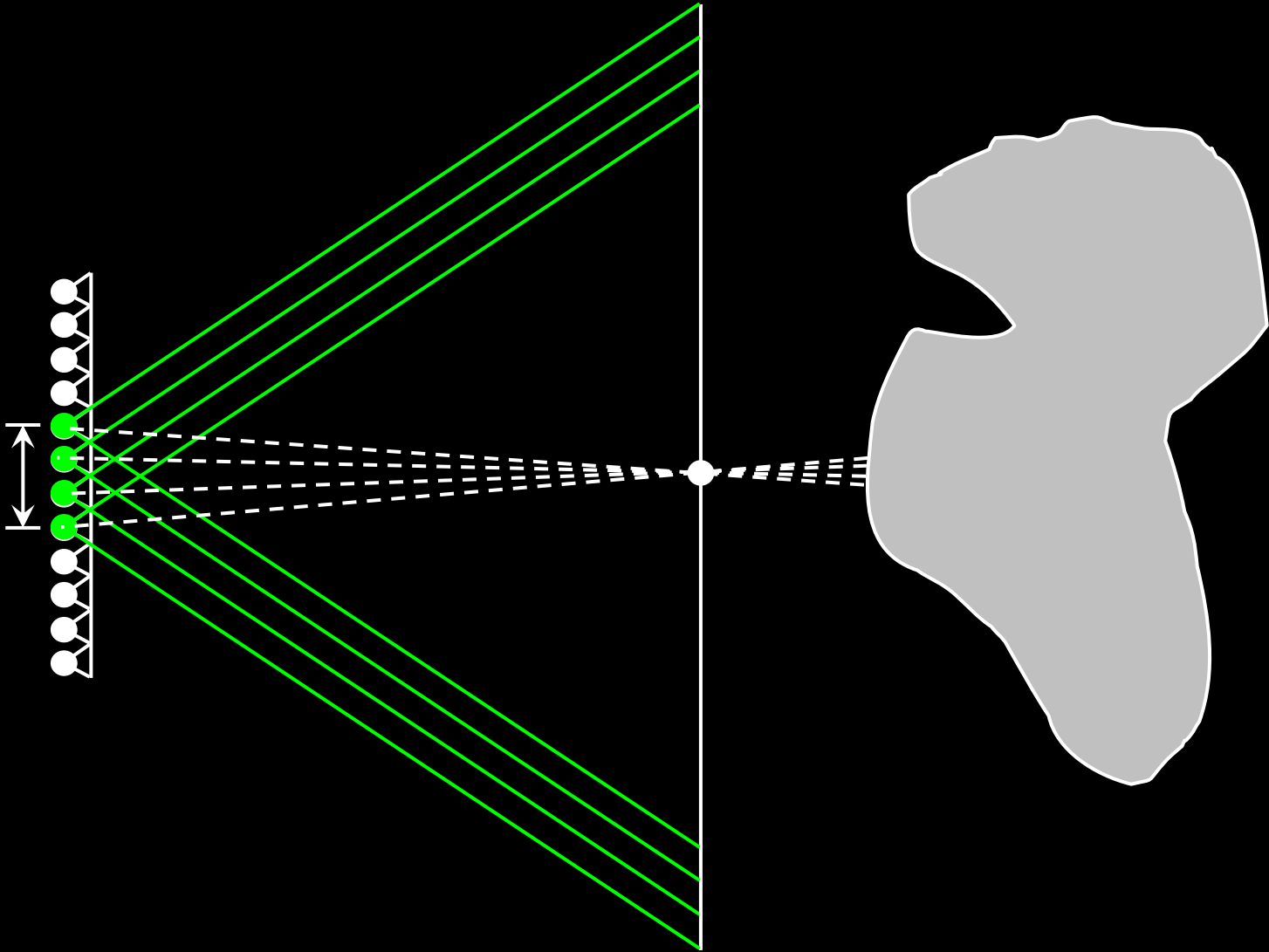
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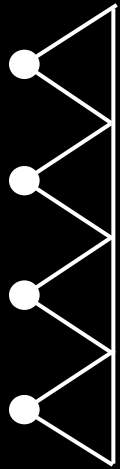
In-focus plane

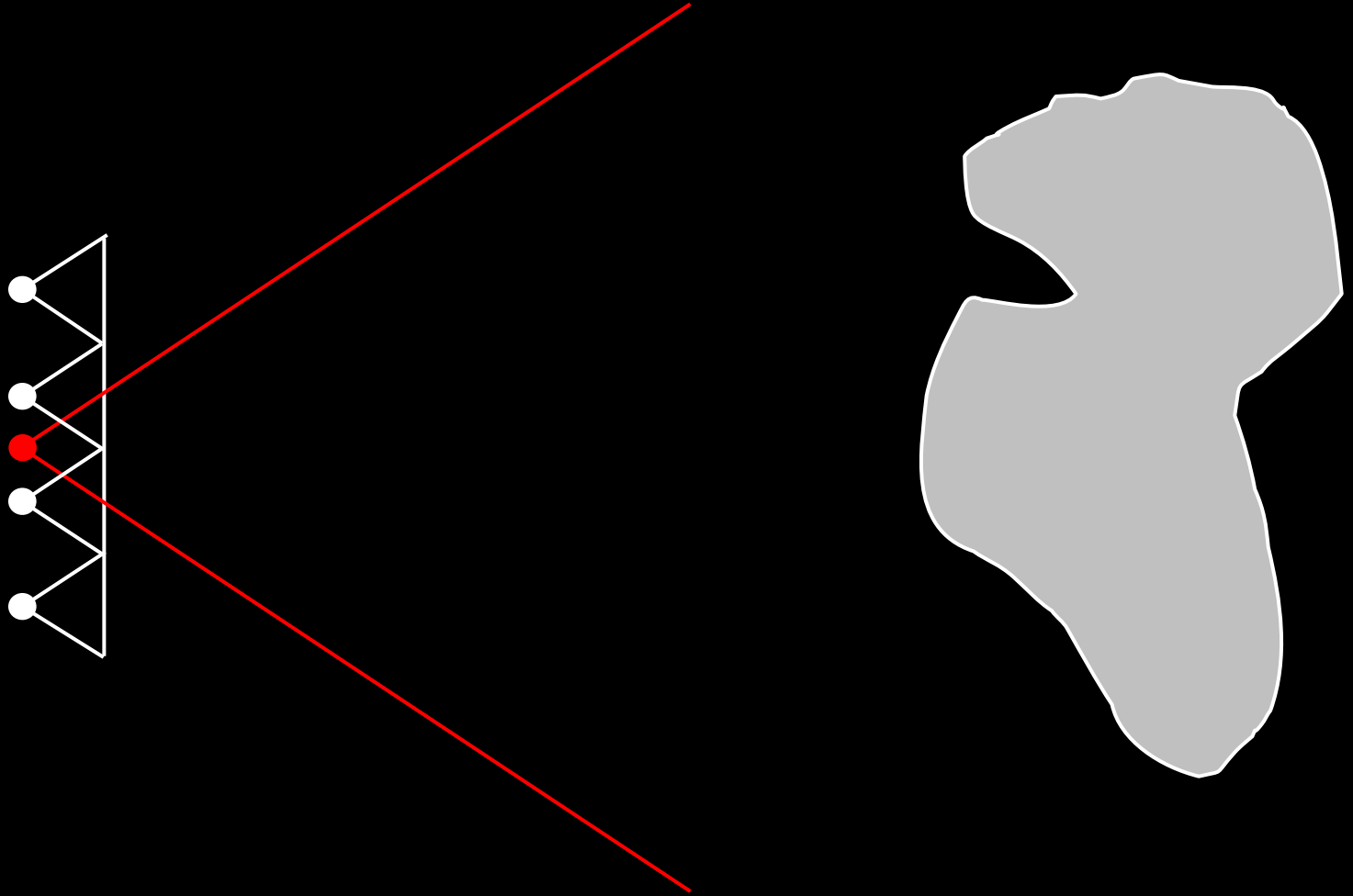


Aperture

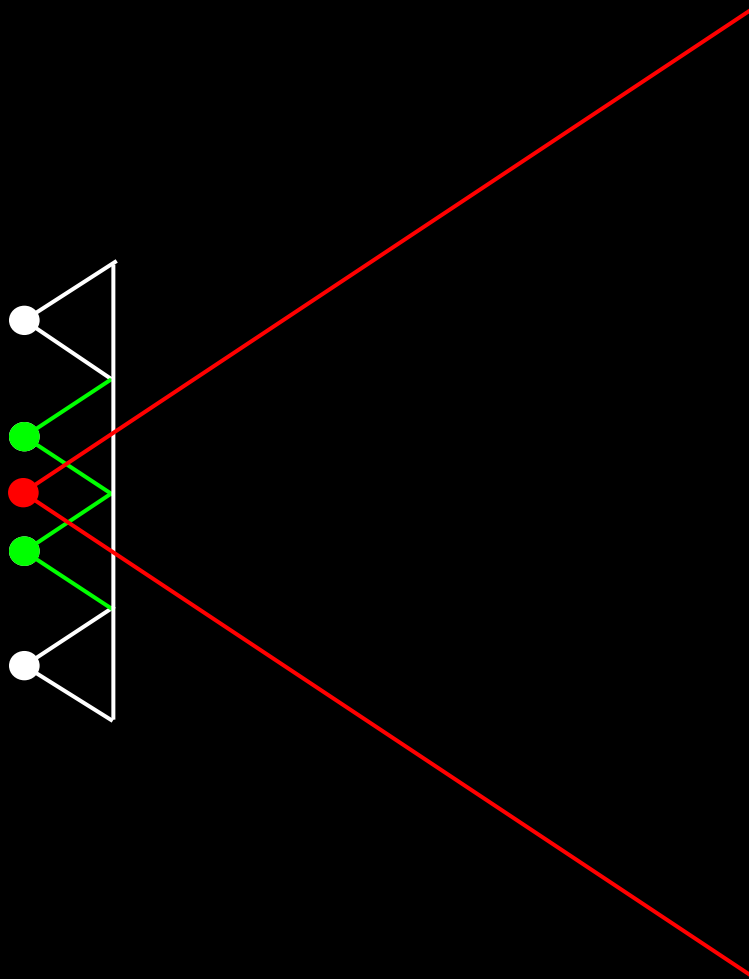
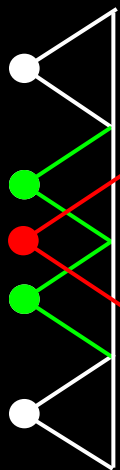


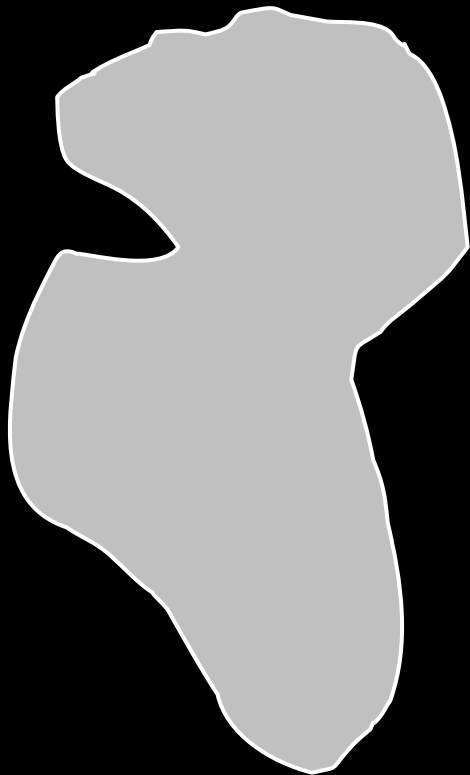
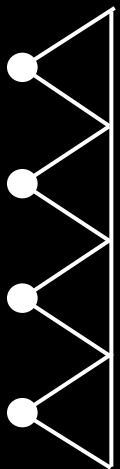
In-focus plane

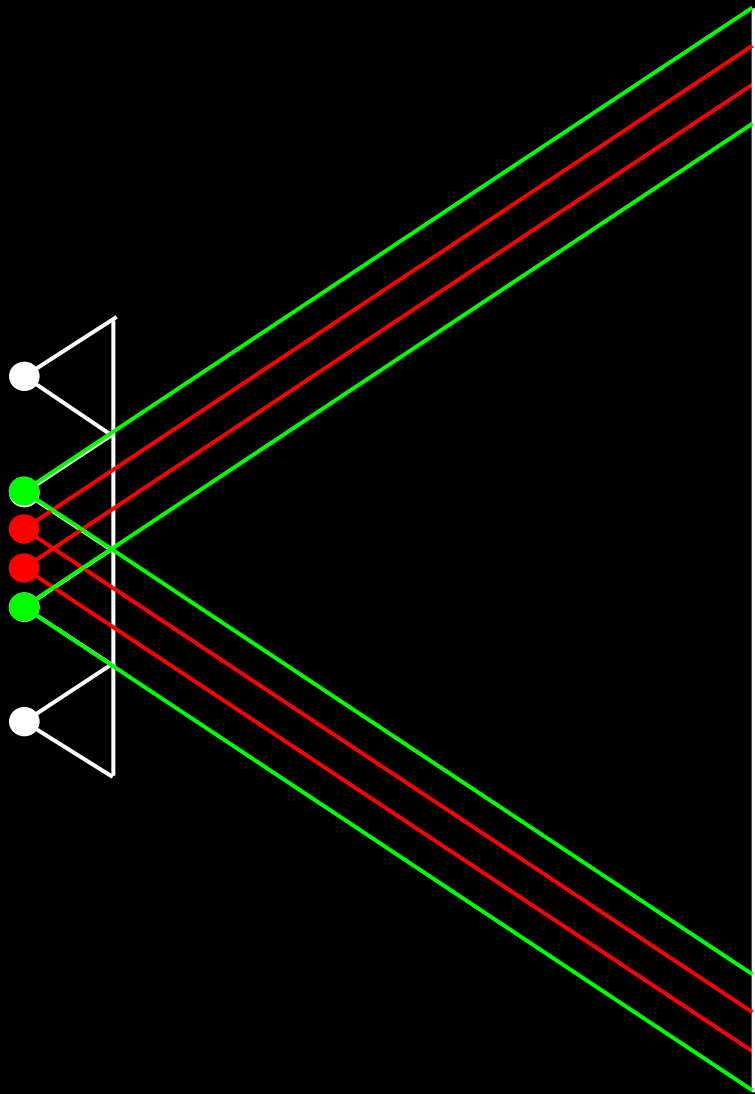


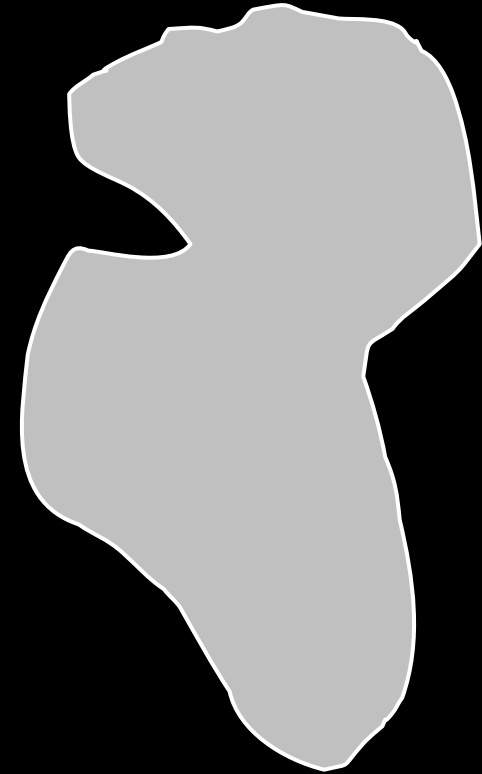
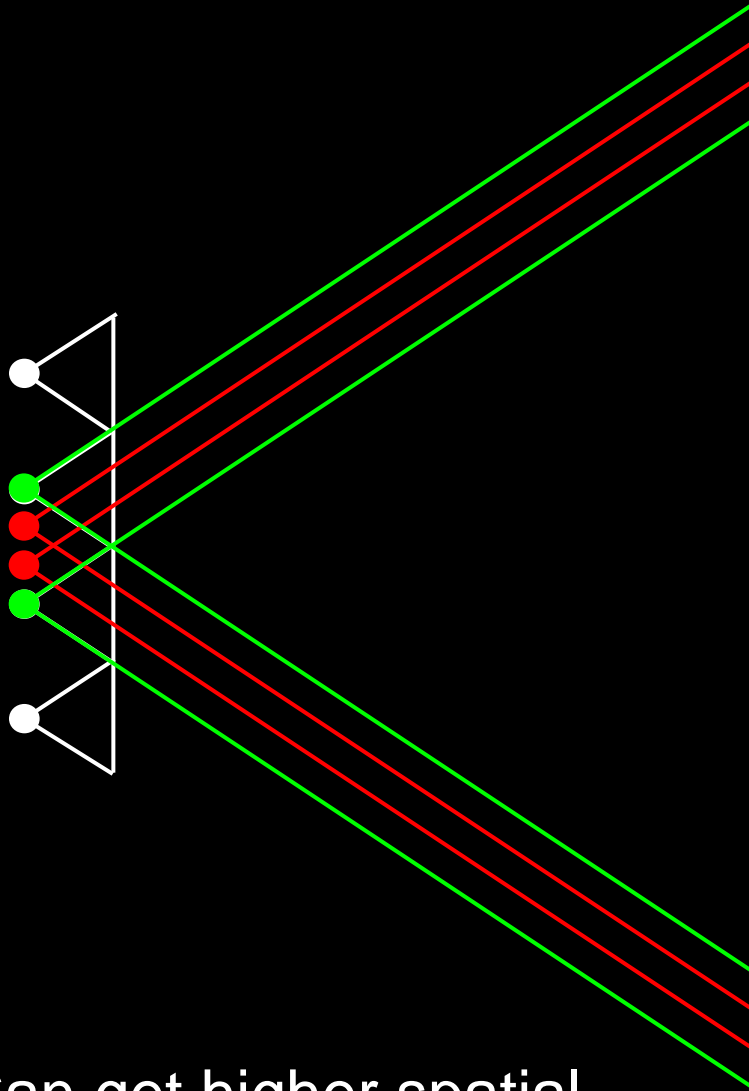


View  
interpolation



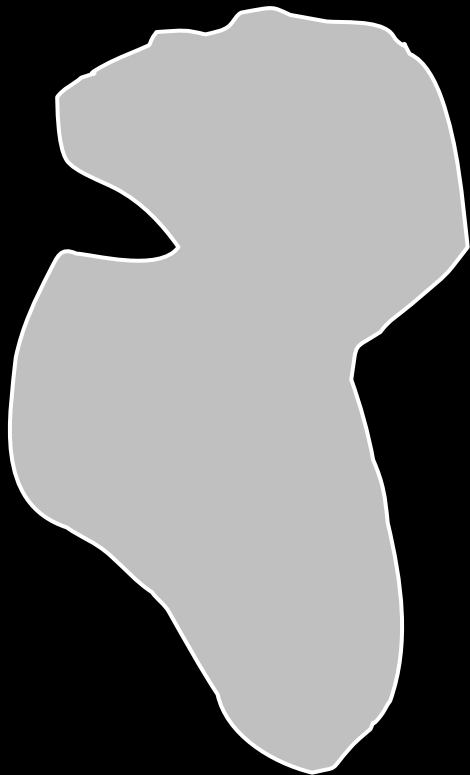
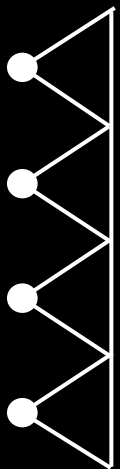


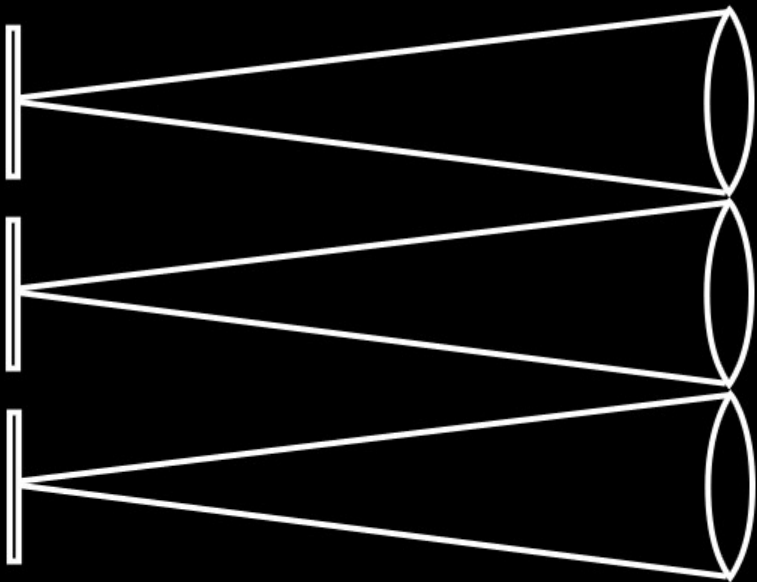


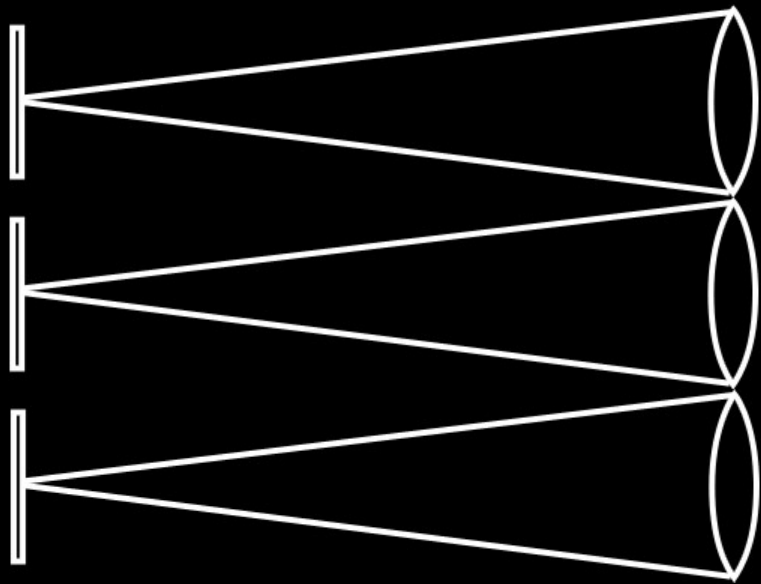


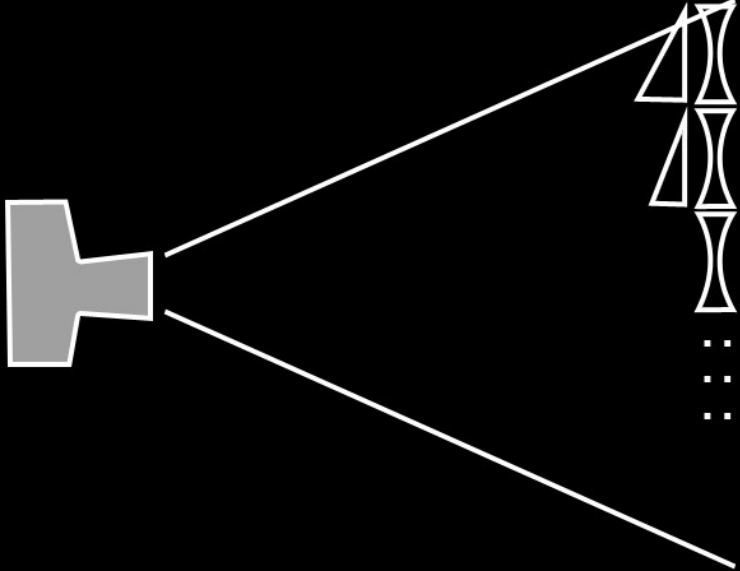
*Upshot:* Can get higher spatial resolution, but must do some vision to interpolate.

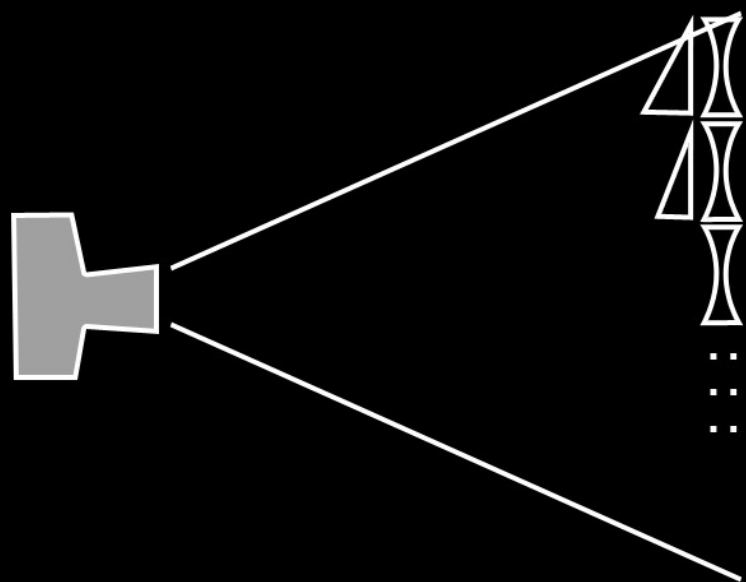


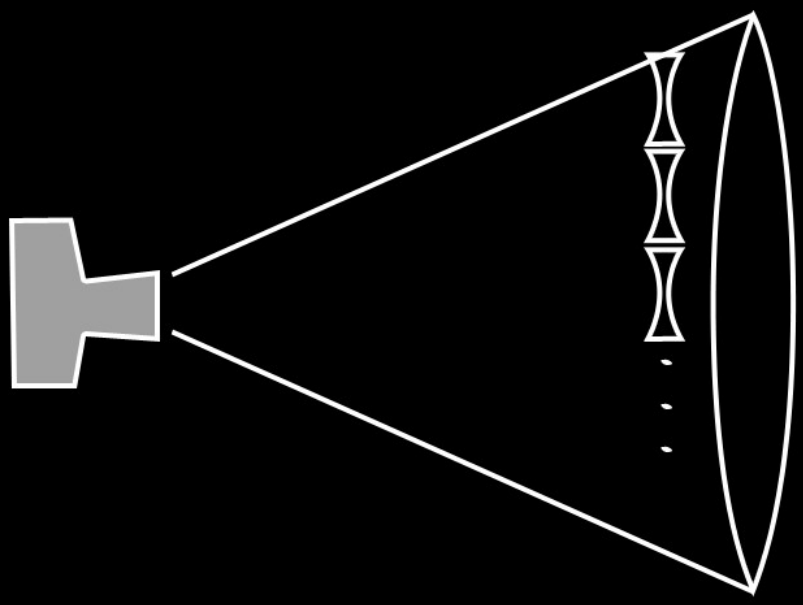


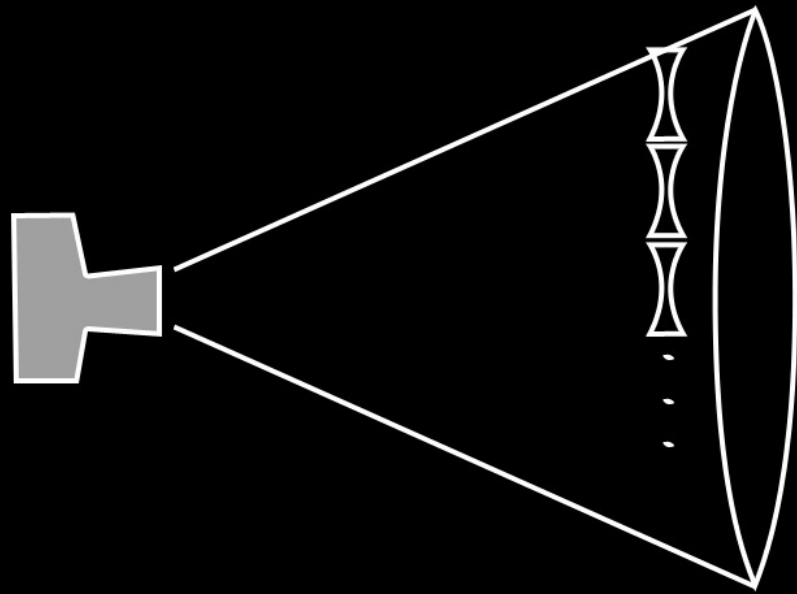






















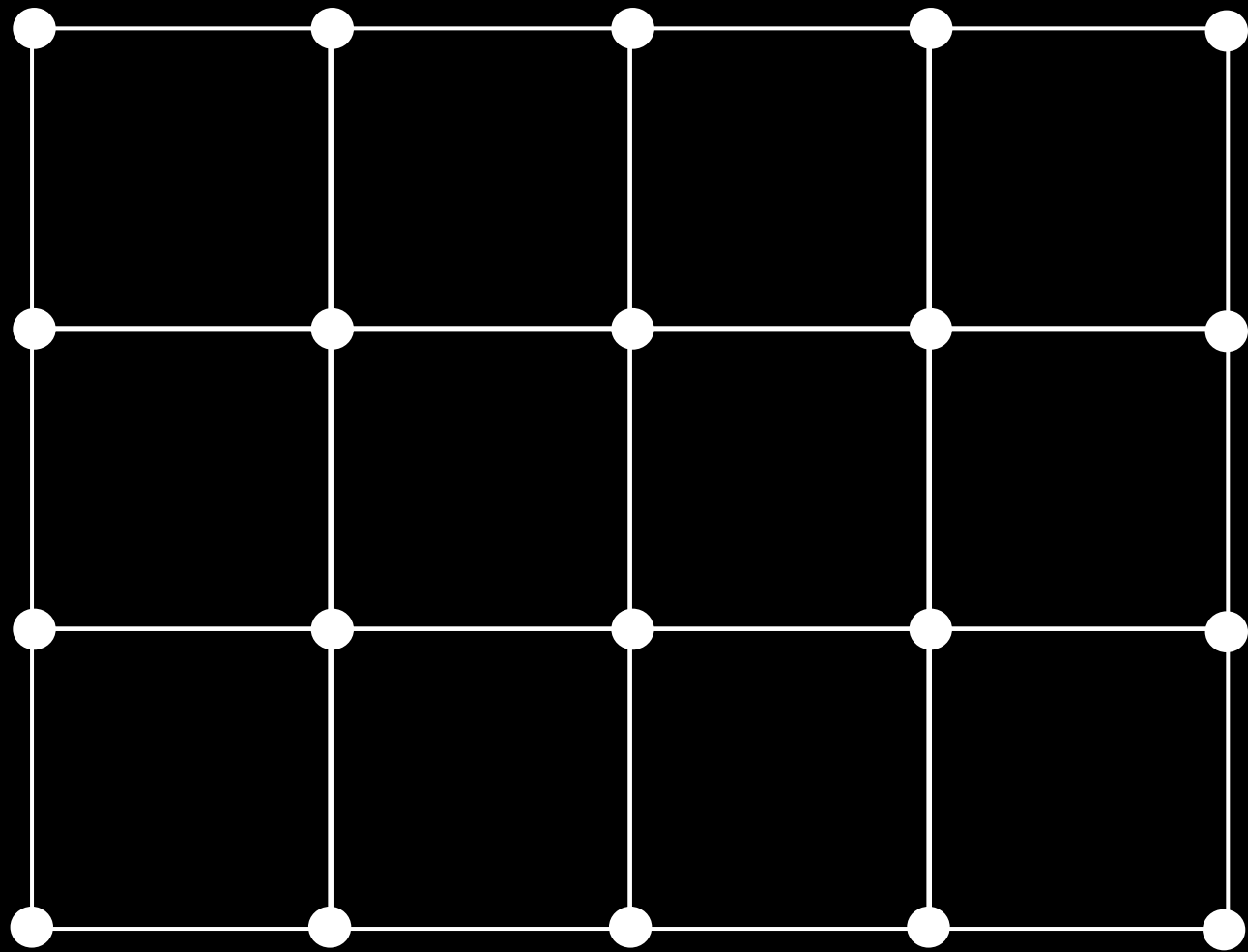


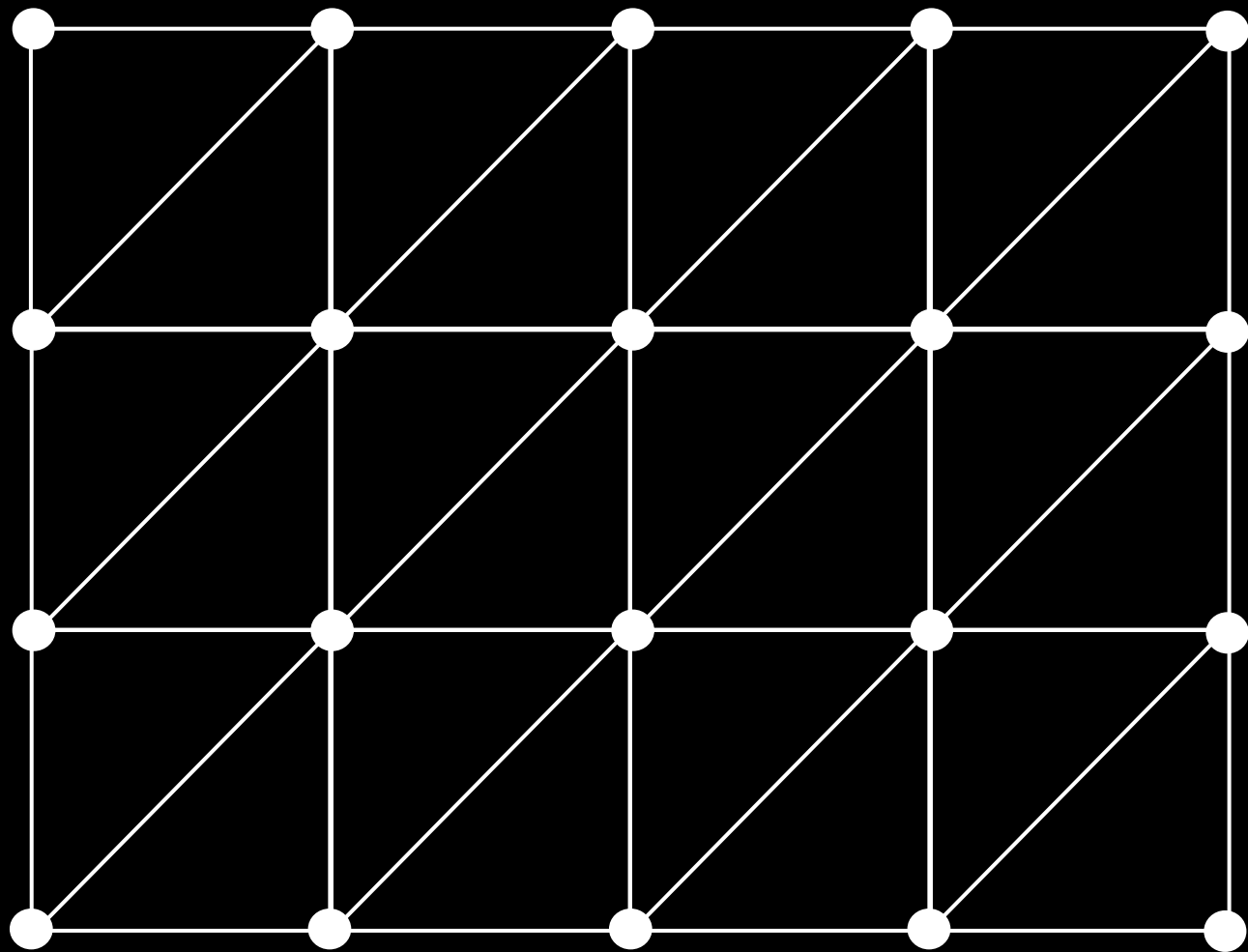


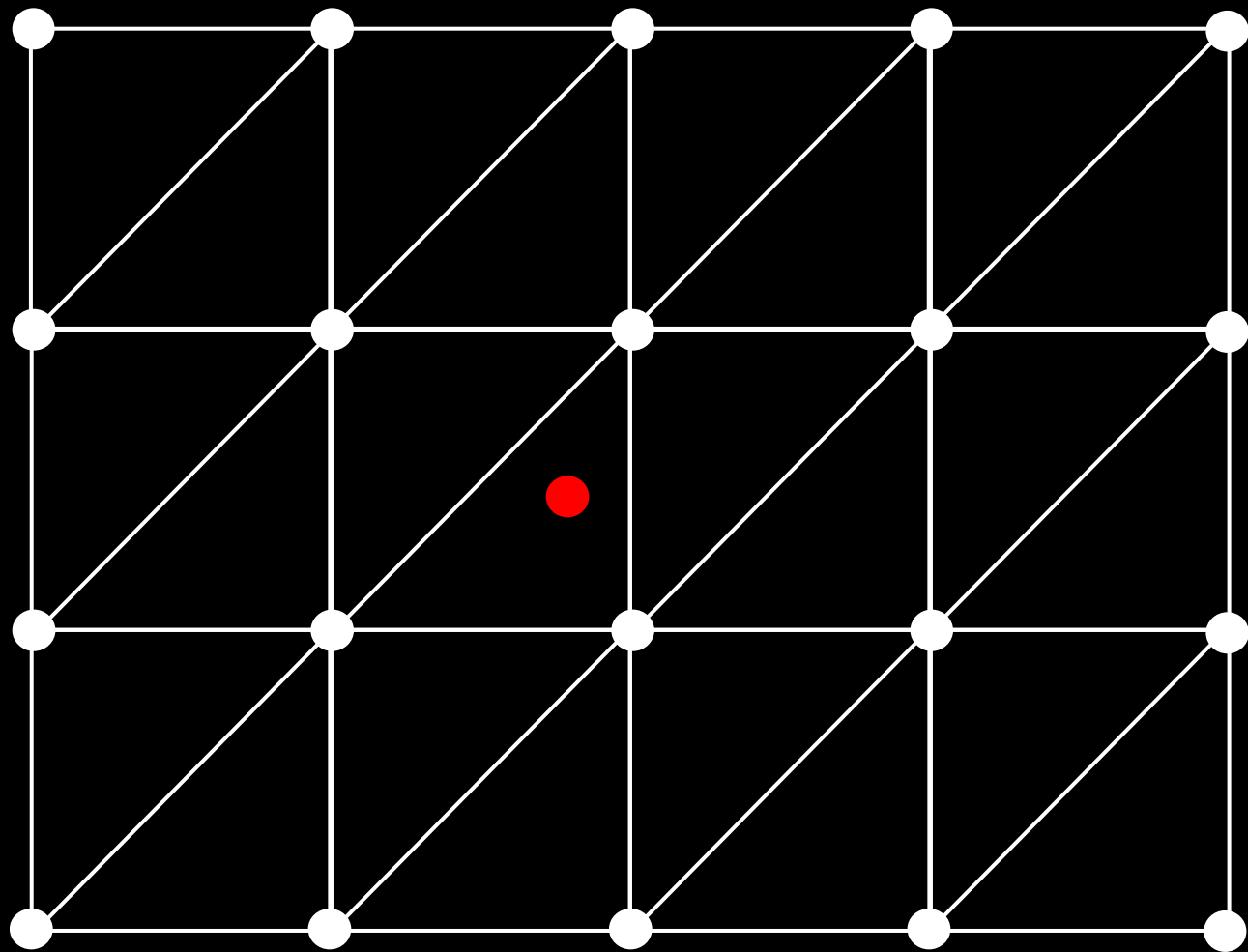




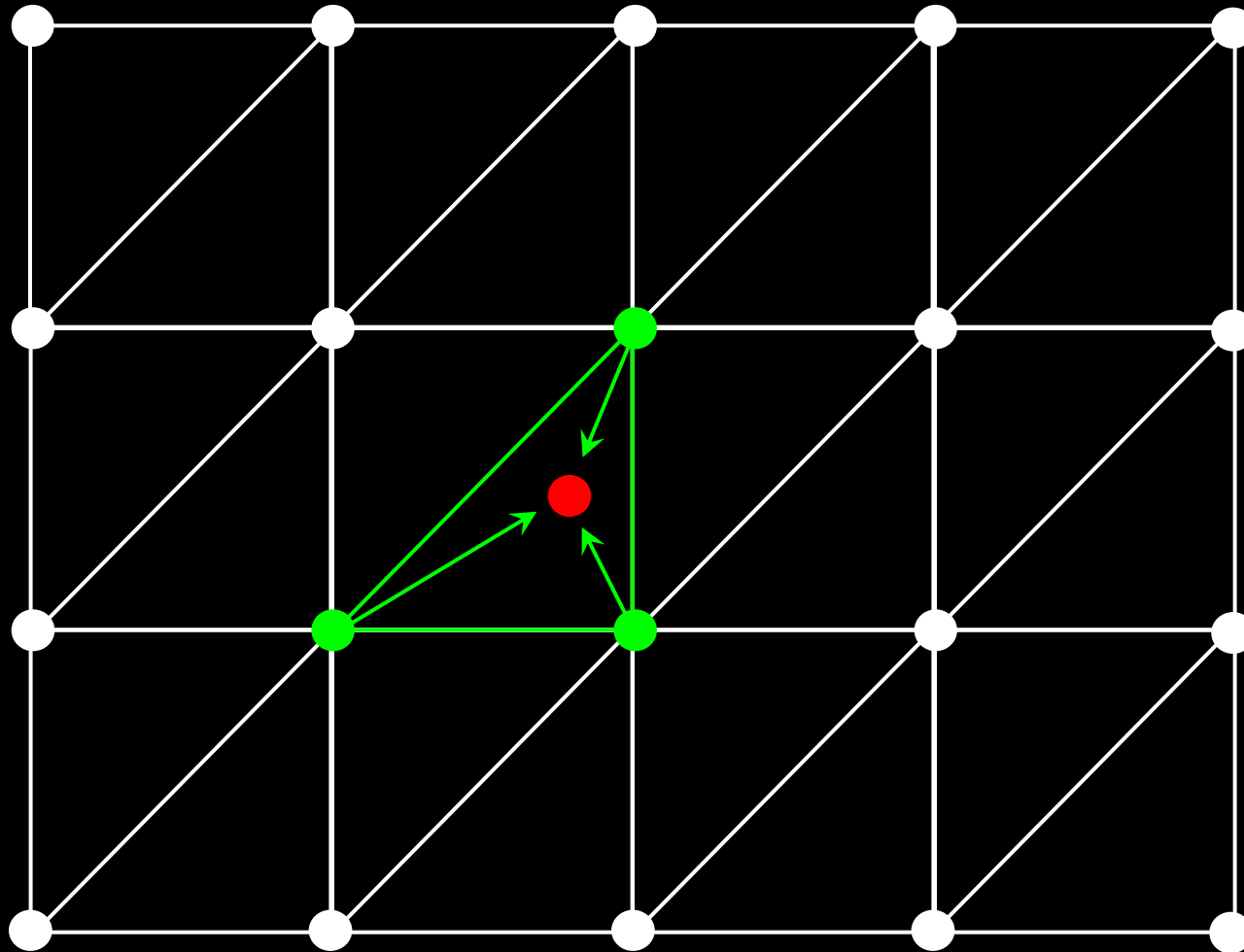








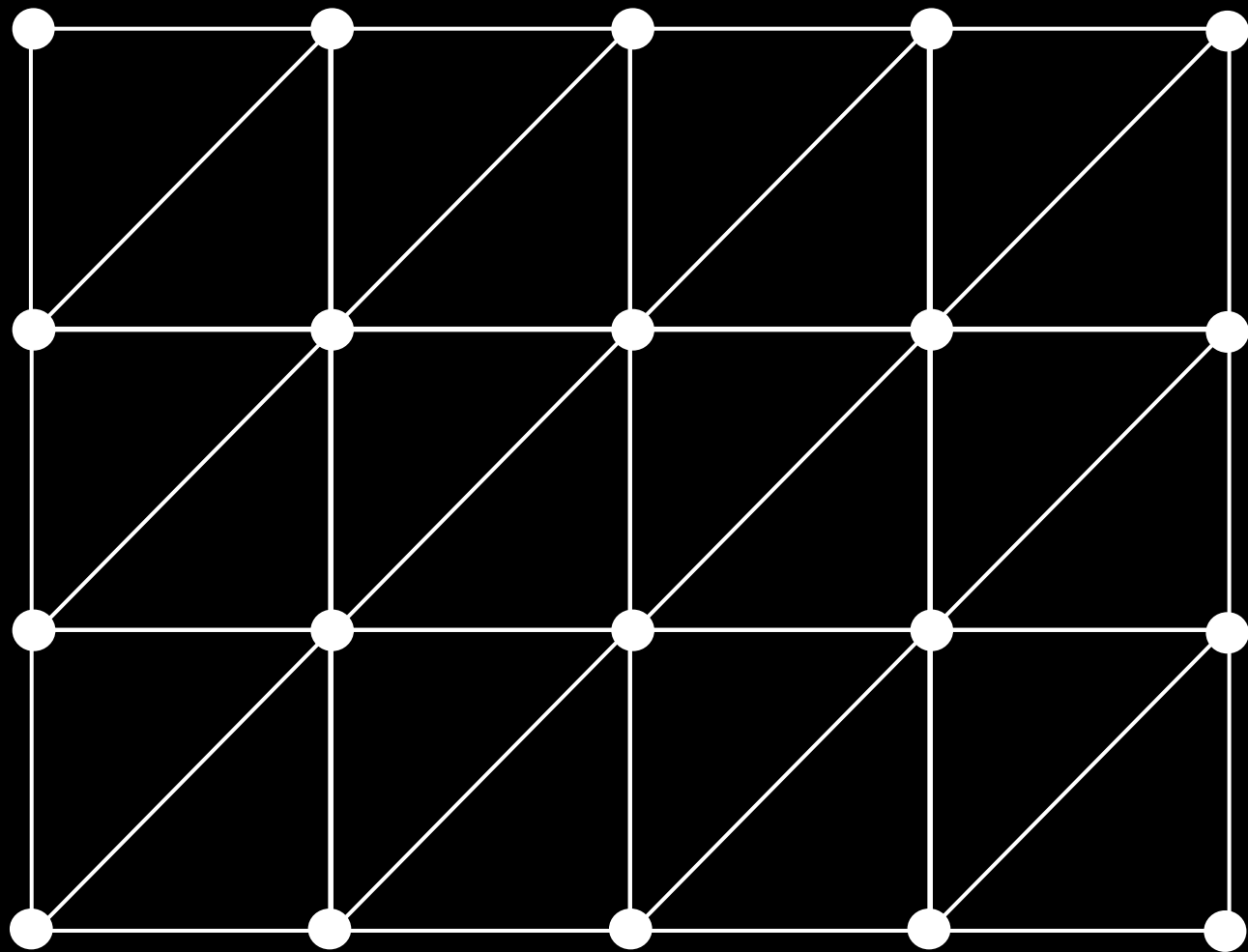
# Tri-view interpolation

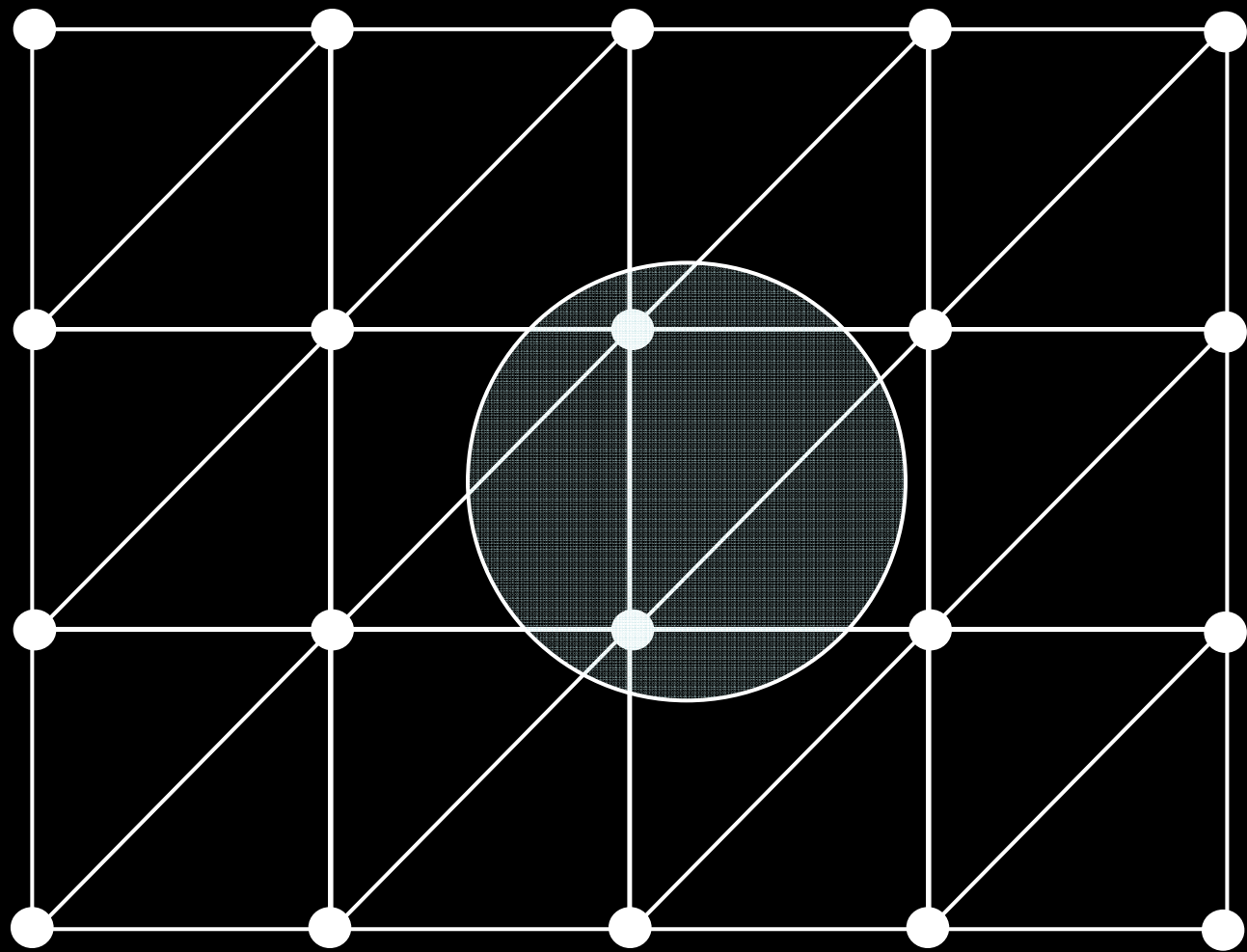


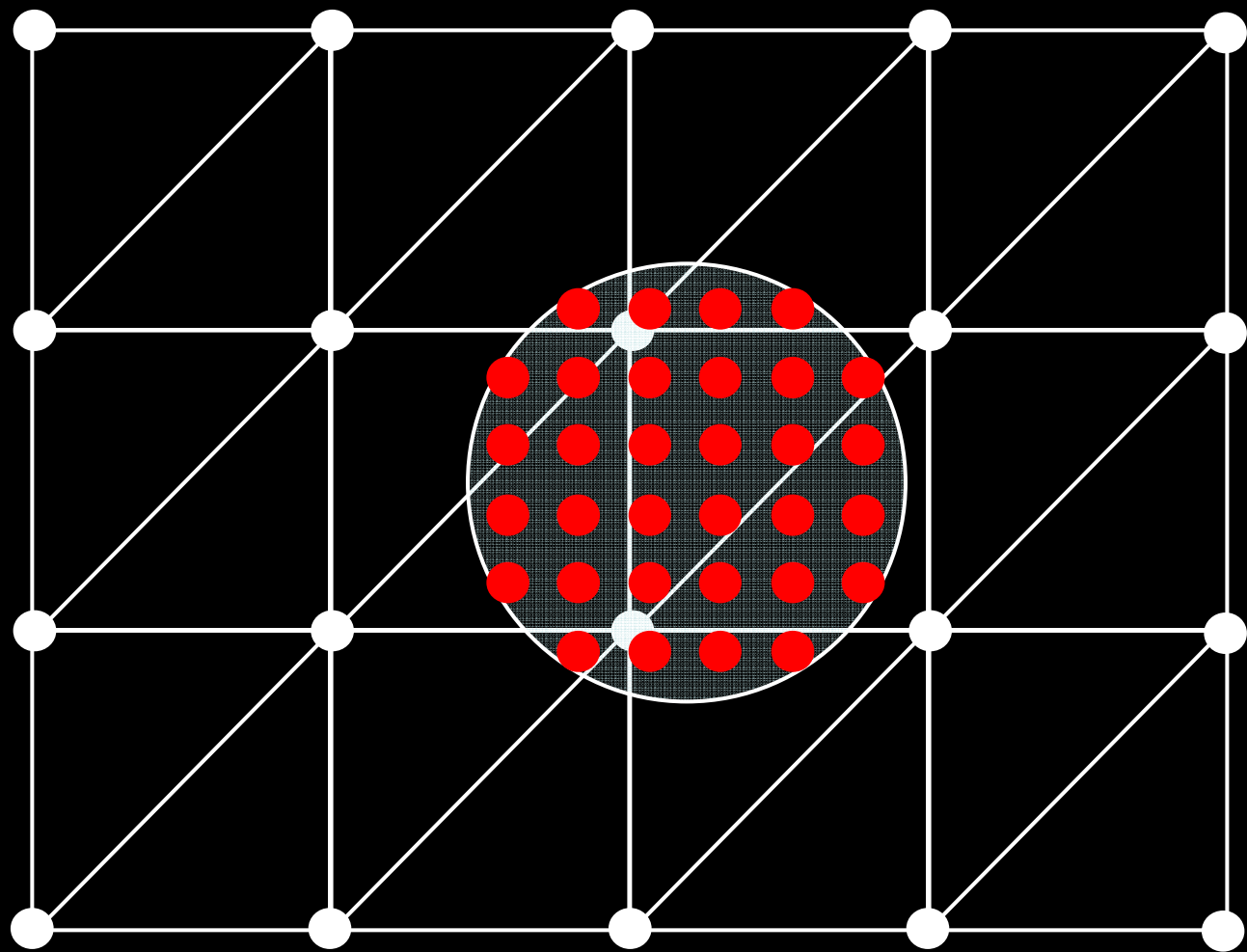
Approach based on [Zitnick *et al.* '04] [Zitnick *et al.* '05]

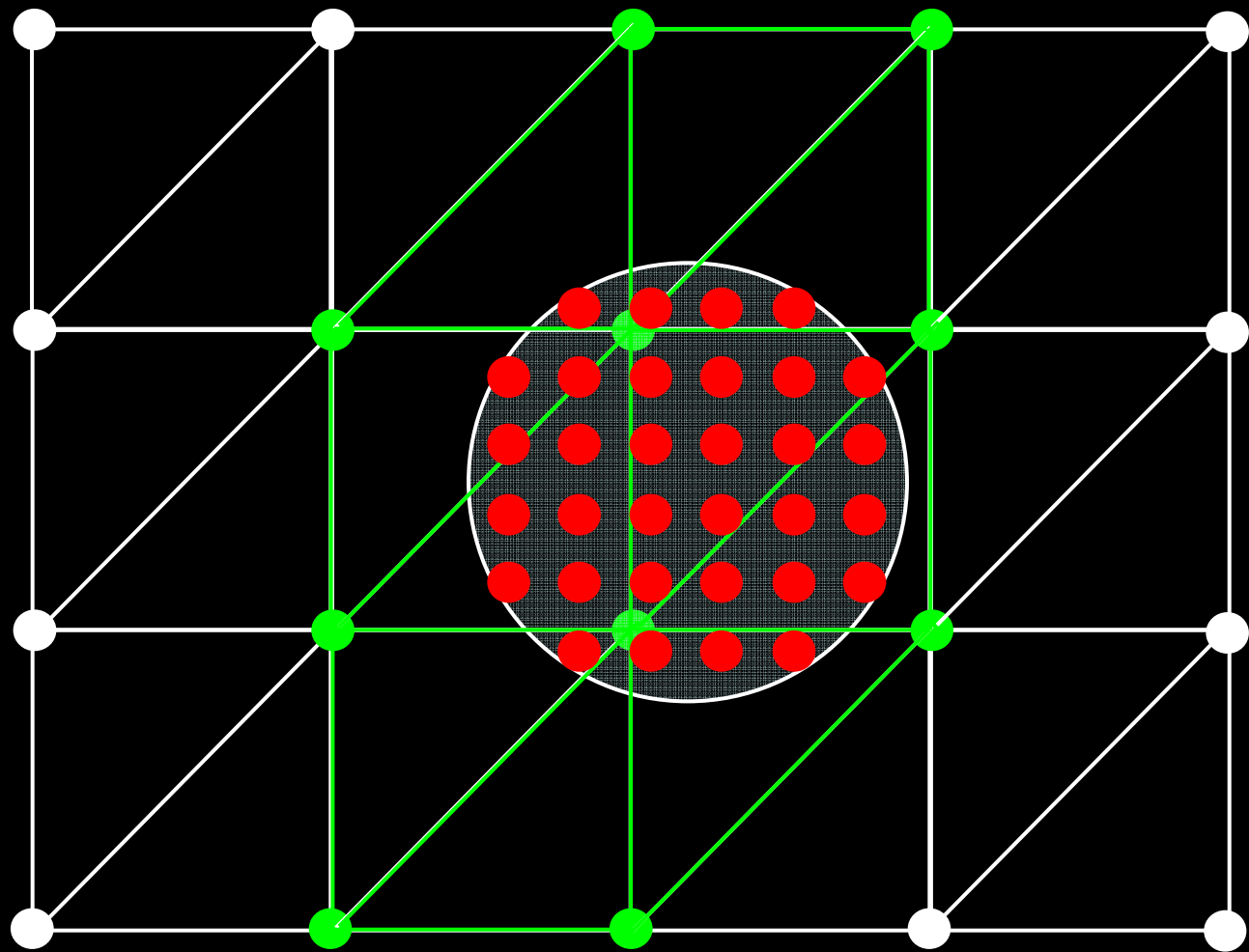
























## Advantages

- Optics external to camera
- Higher spatial res



## Disadvantages

- Optics external to camera
- Need to address aberrations (e.g., with better optics)
- View interpolation can fail

## Observation

- Synthetic aperture tolerates some view interpolation errors



