

Spatioangular Resolution Tradeoffs in Integral Photography

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D. Salesin, S. Nayar, C. Intwala*

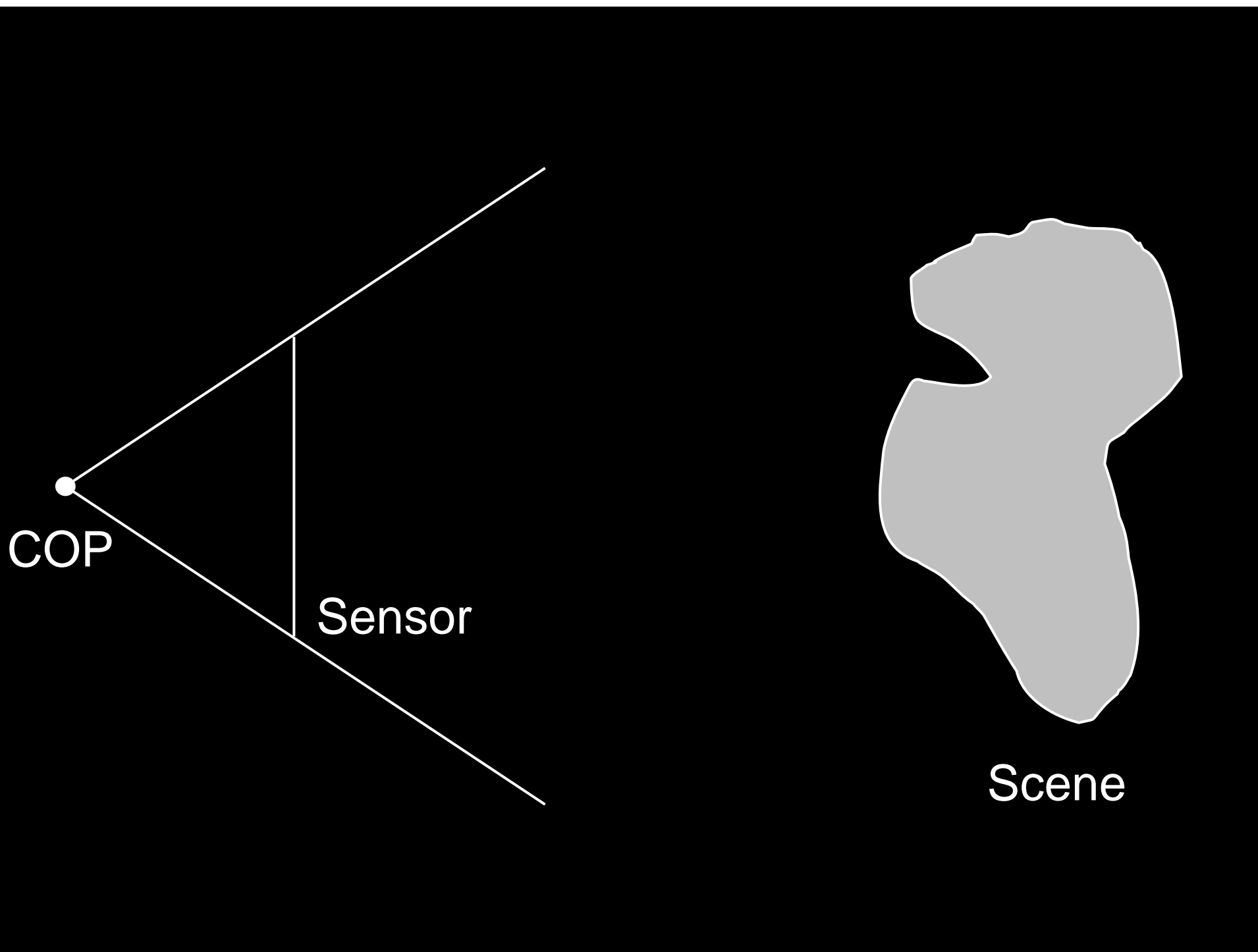
EGSR 2006

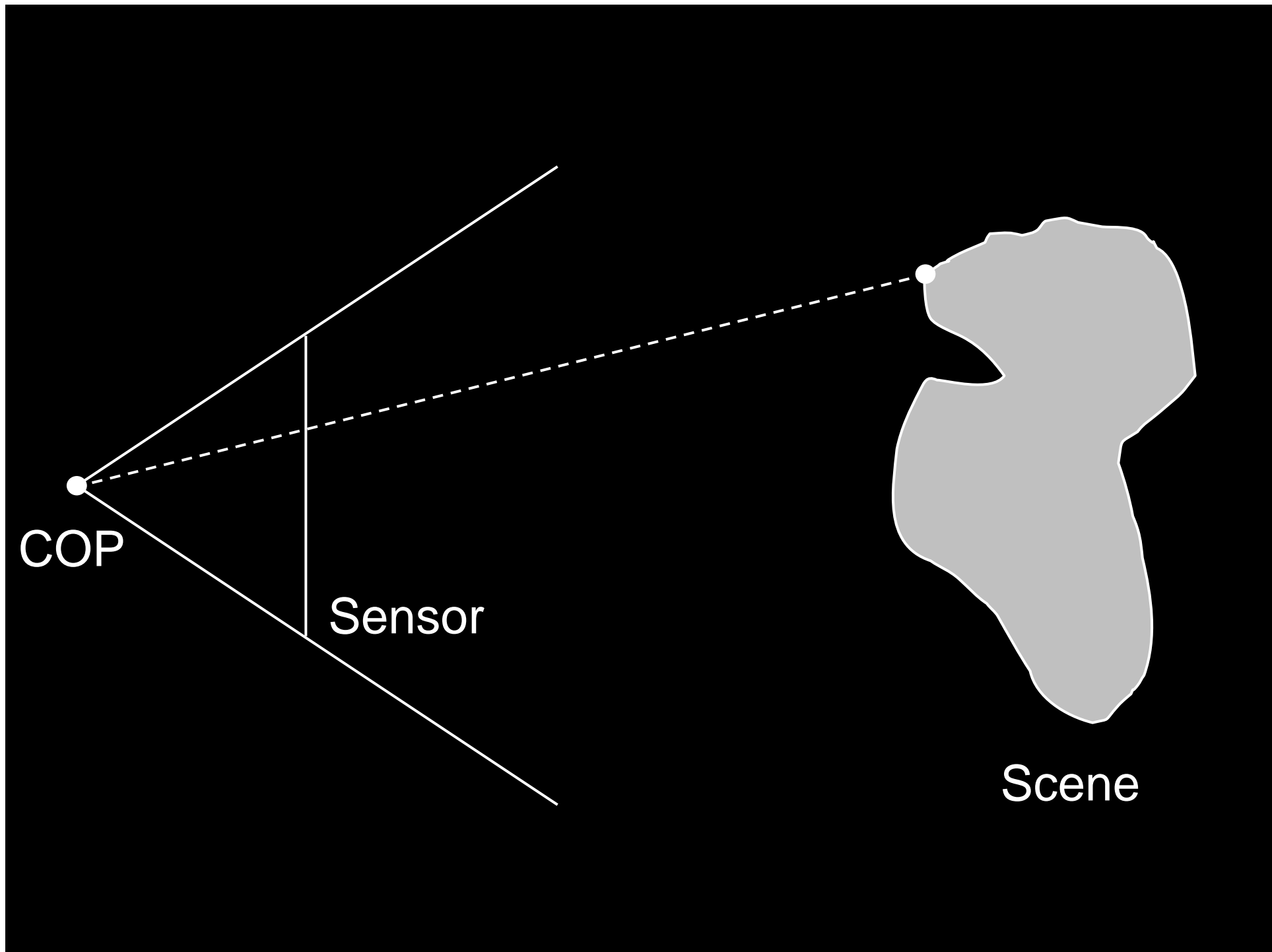
Capturing parallax

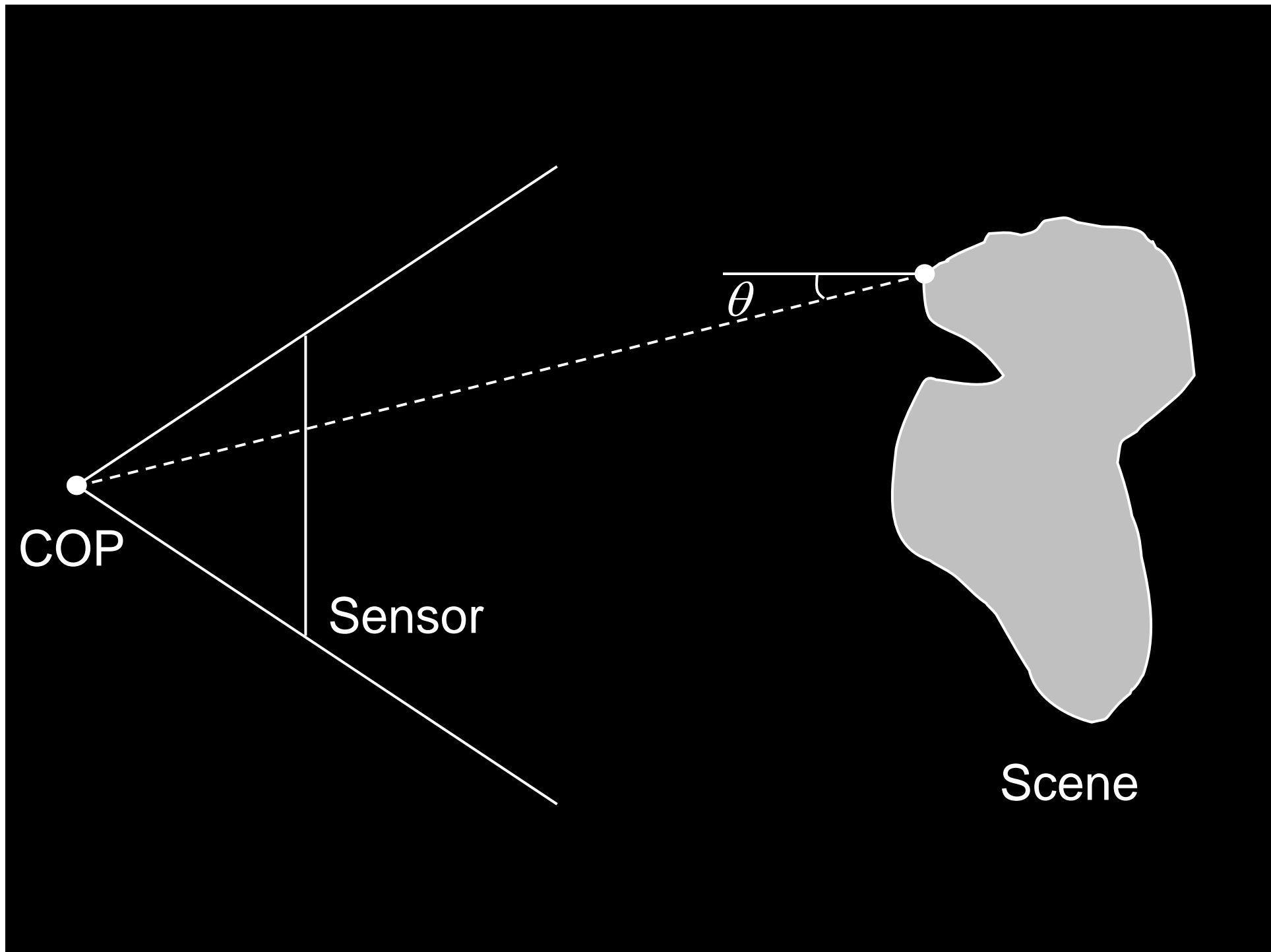
Approaches:

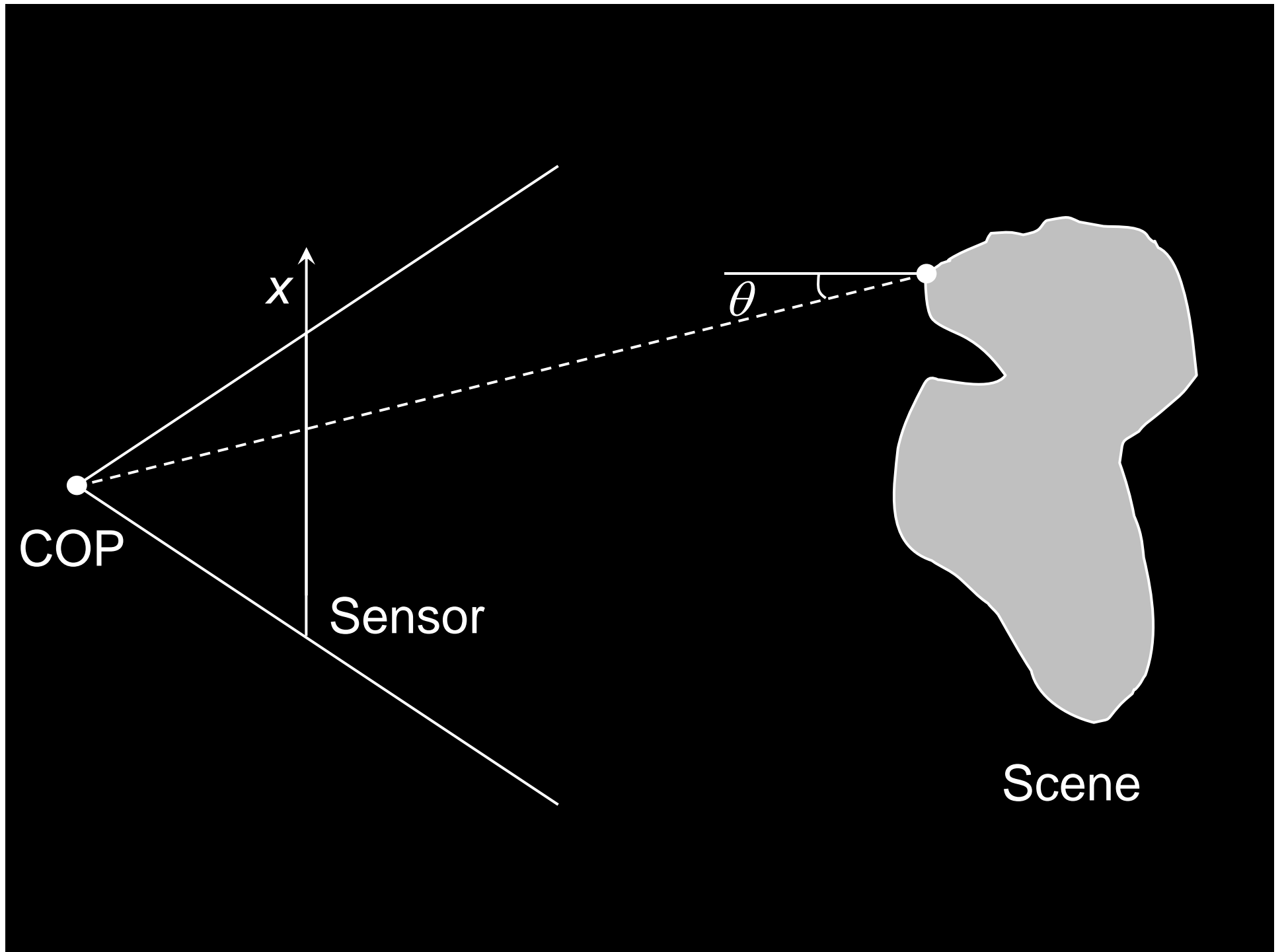
- Multiple photographs
- Multiple cameras
- Spatially multiplexed viewpoints on one sensor
 - Admits to compact design
 - Can handle moving scenes

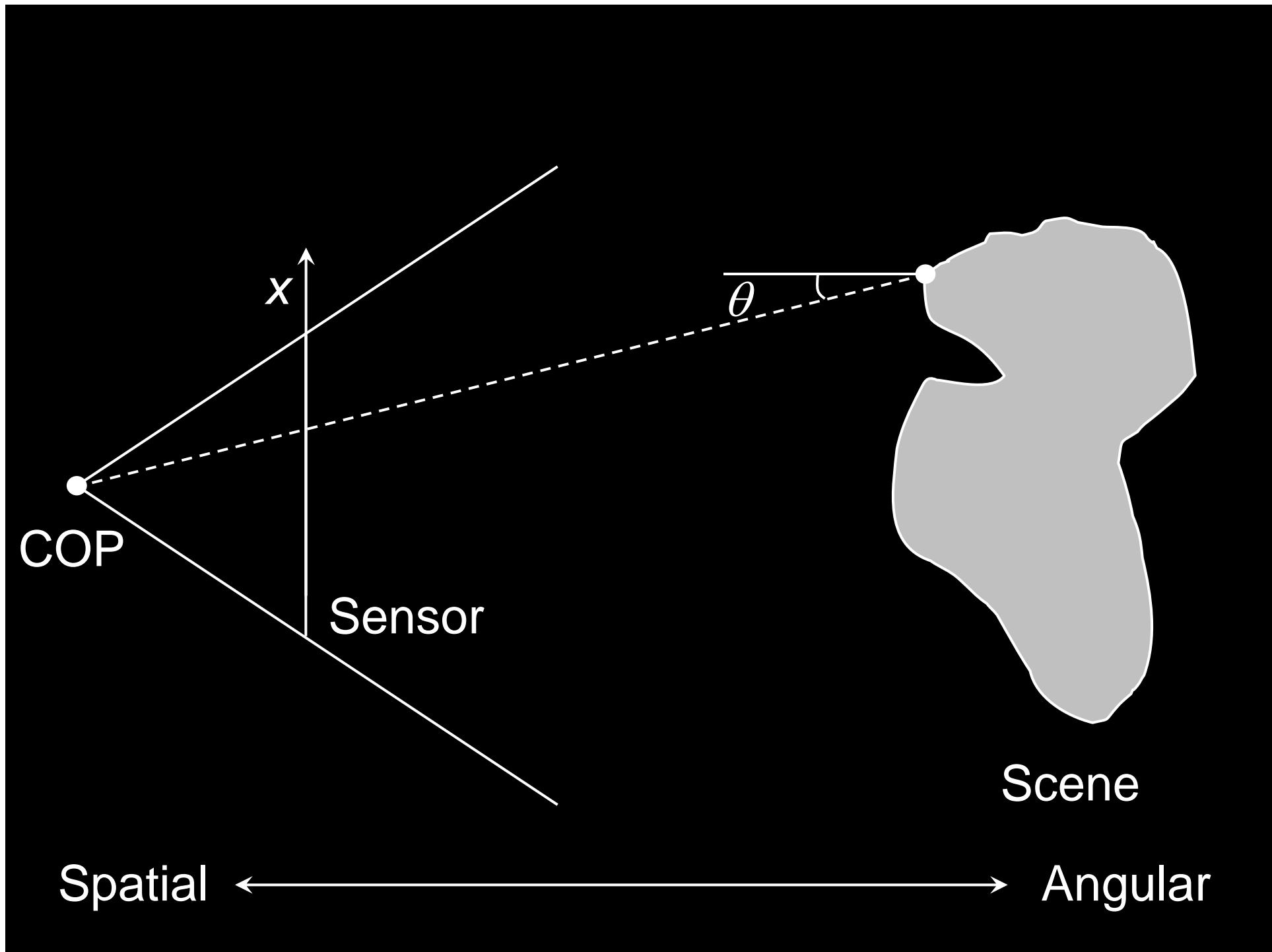
What are the multiplexing tradeoffs?

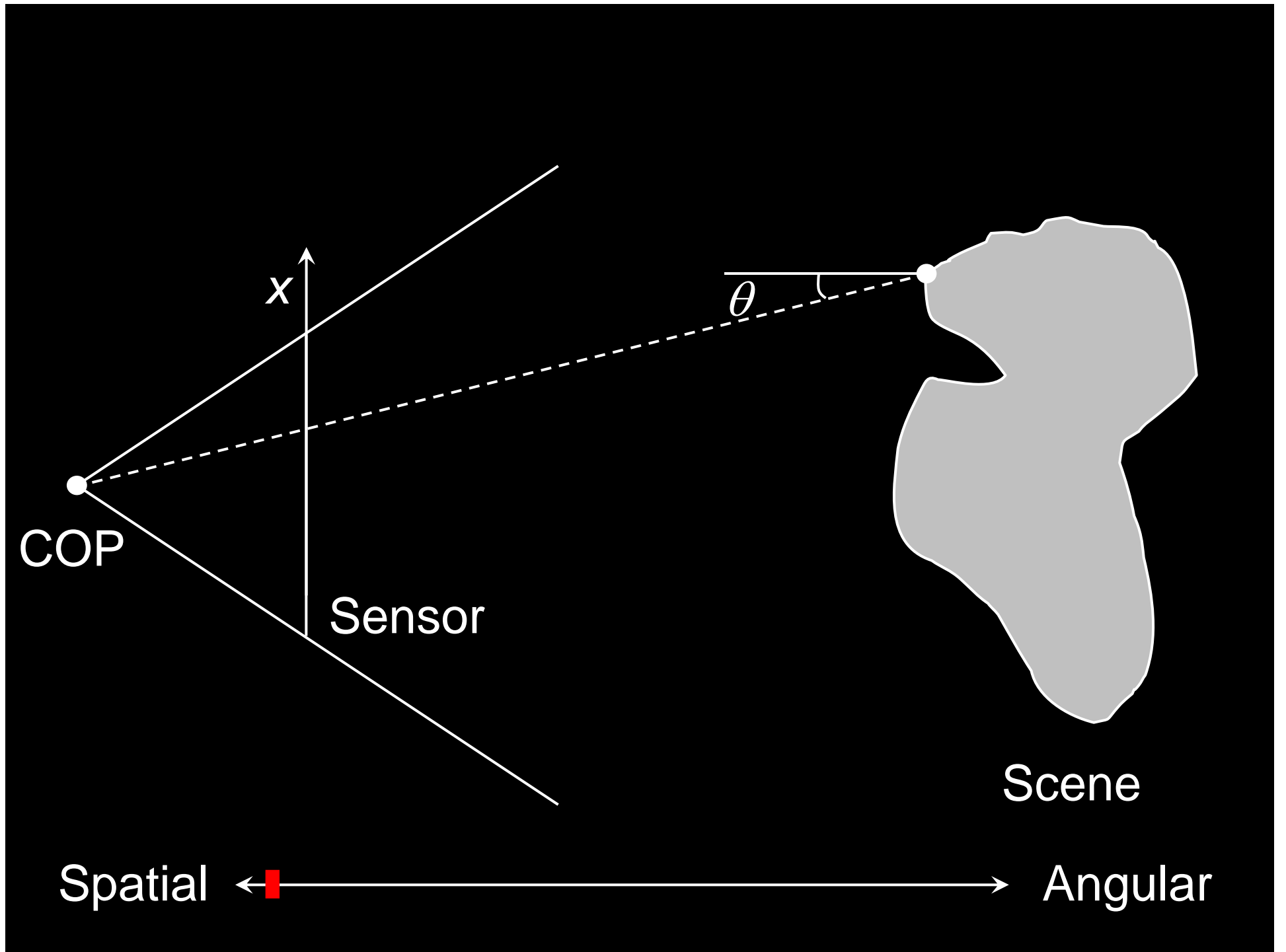


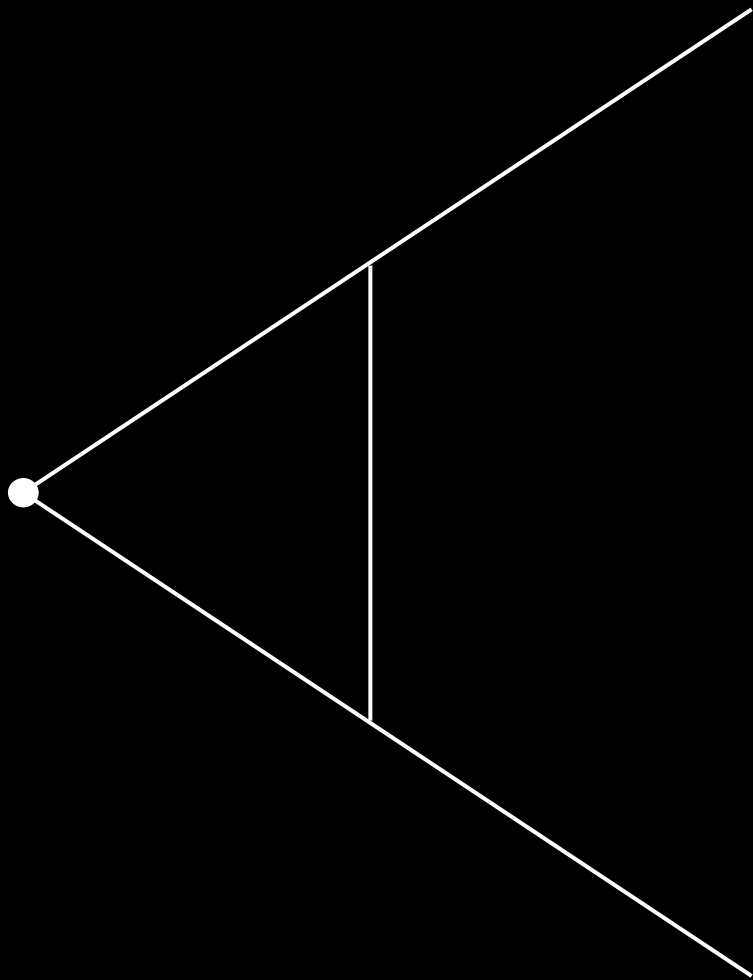








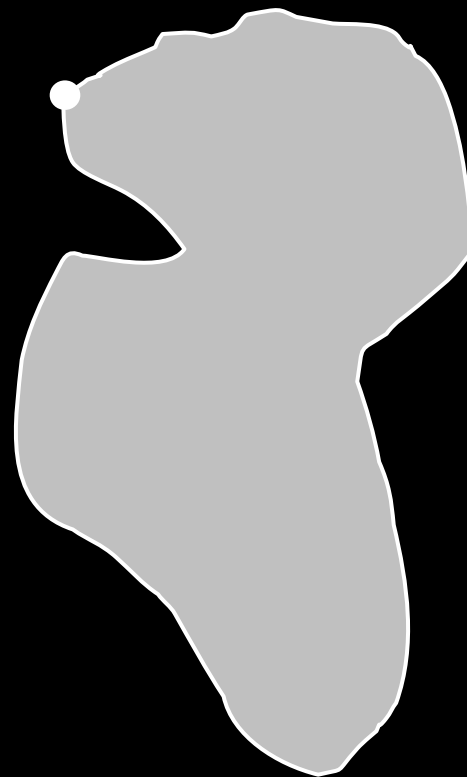
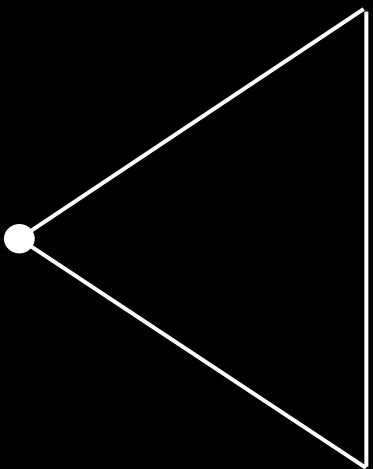


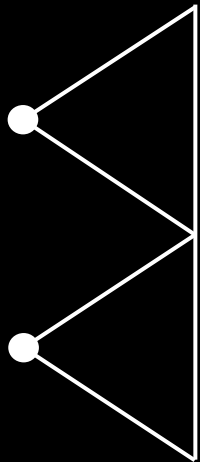


Spatial

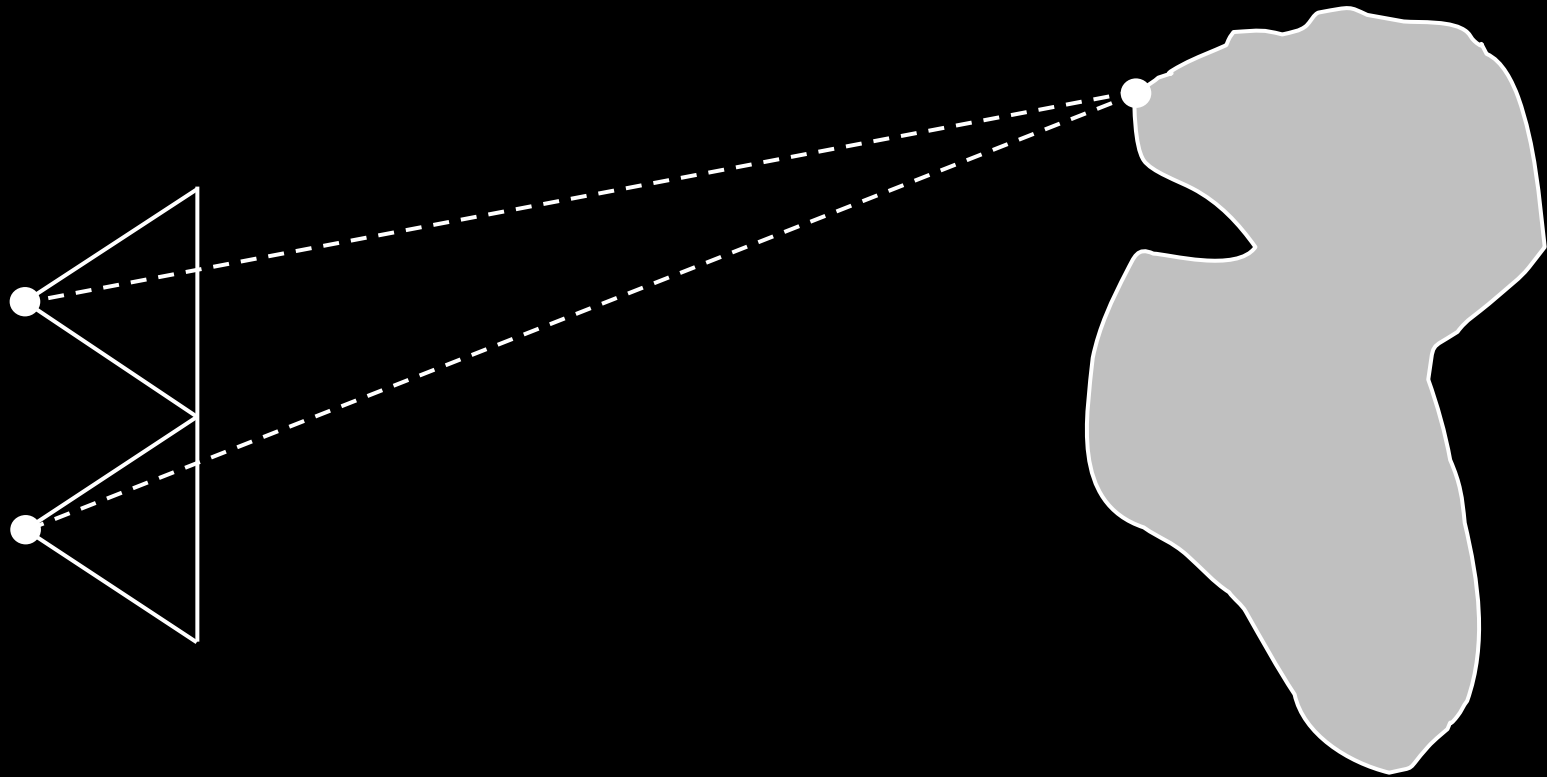


Angular

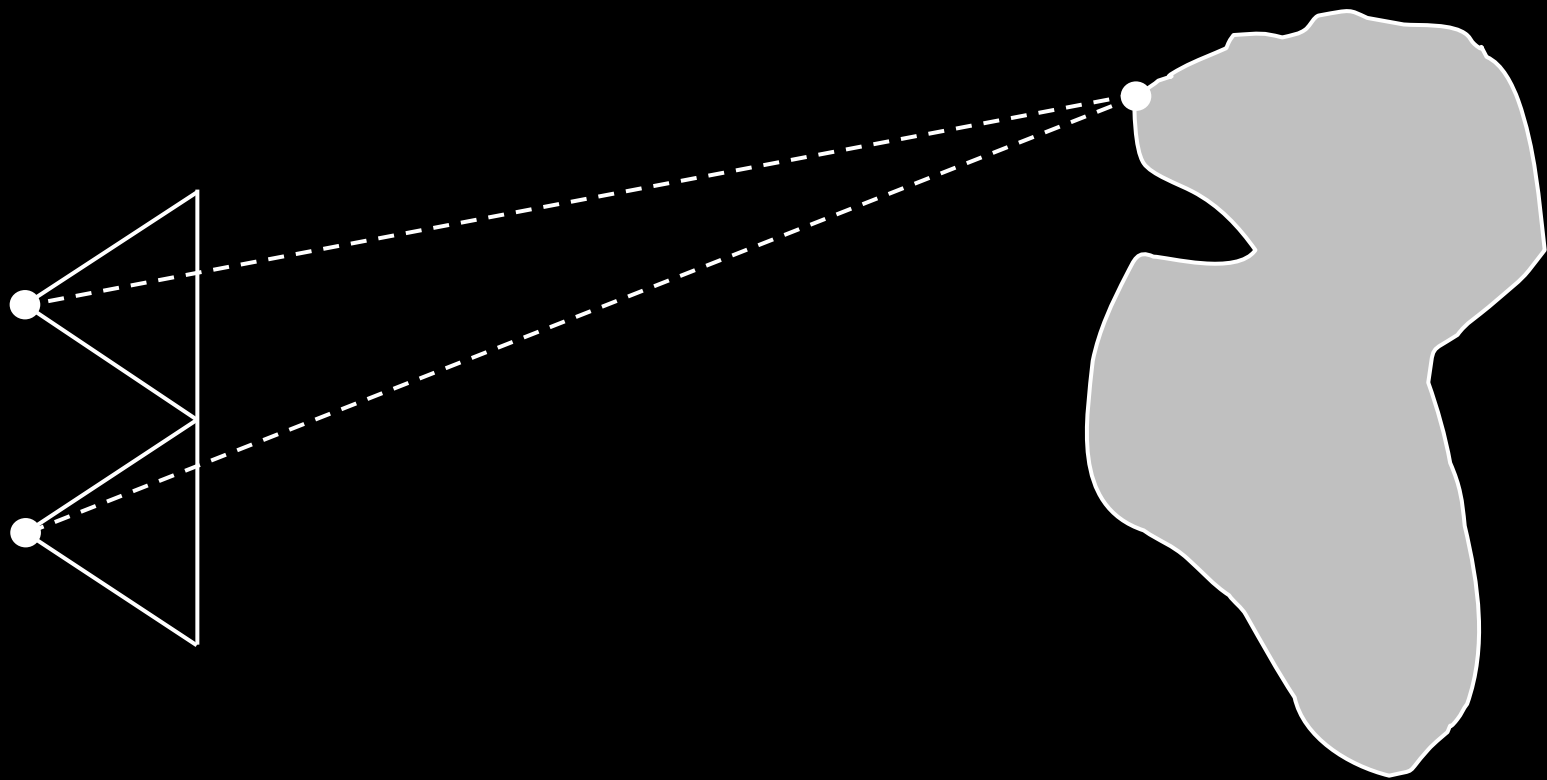




[Nene and Nayar '98]



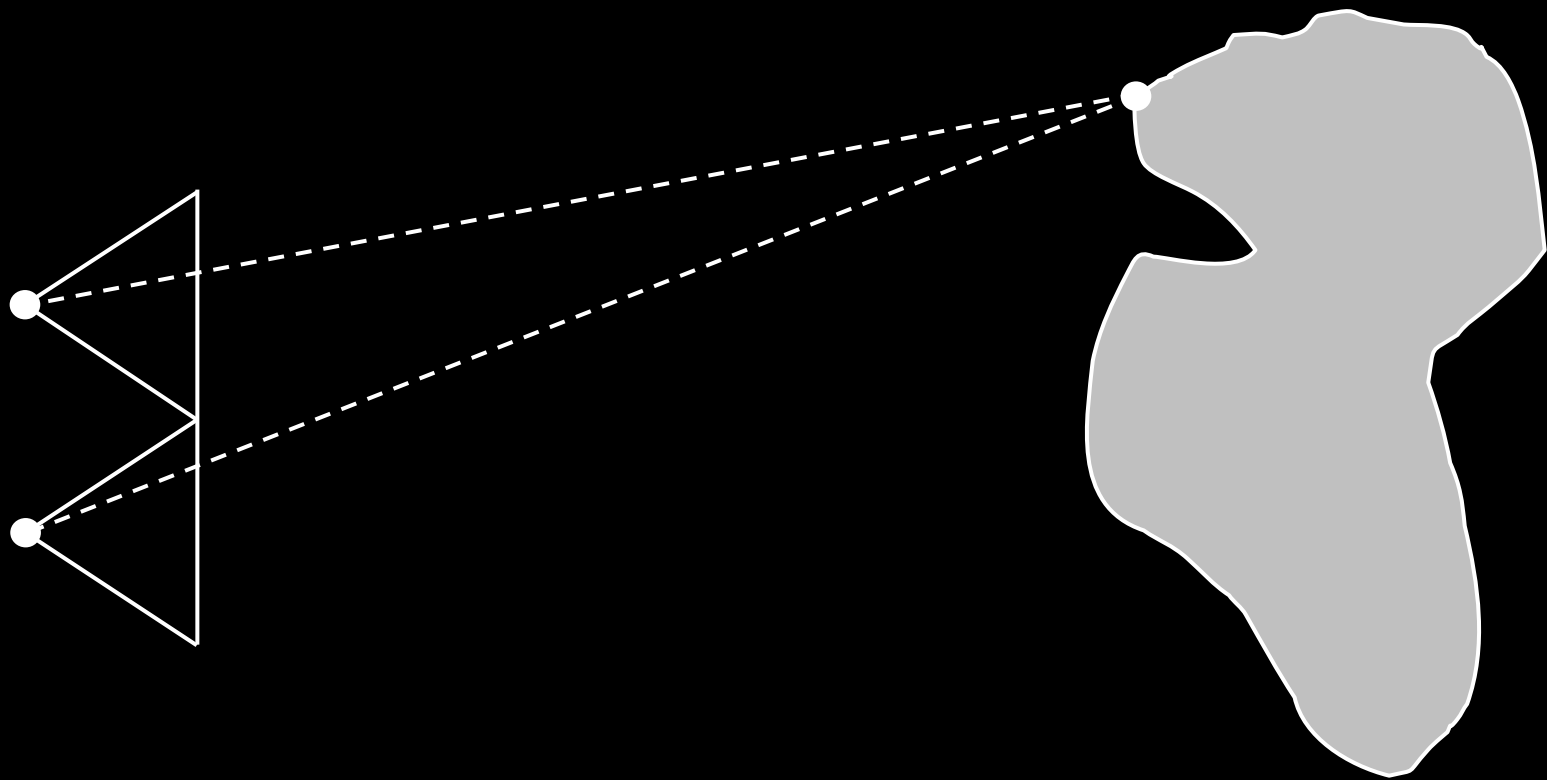
[Nene and Nayar '98]



Spatial



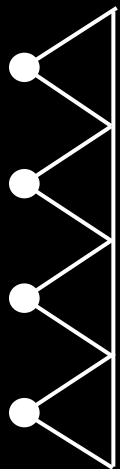
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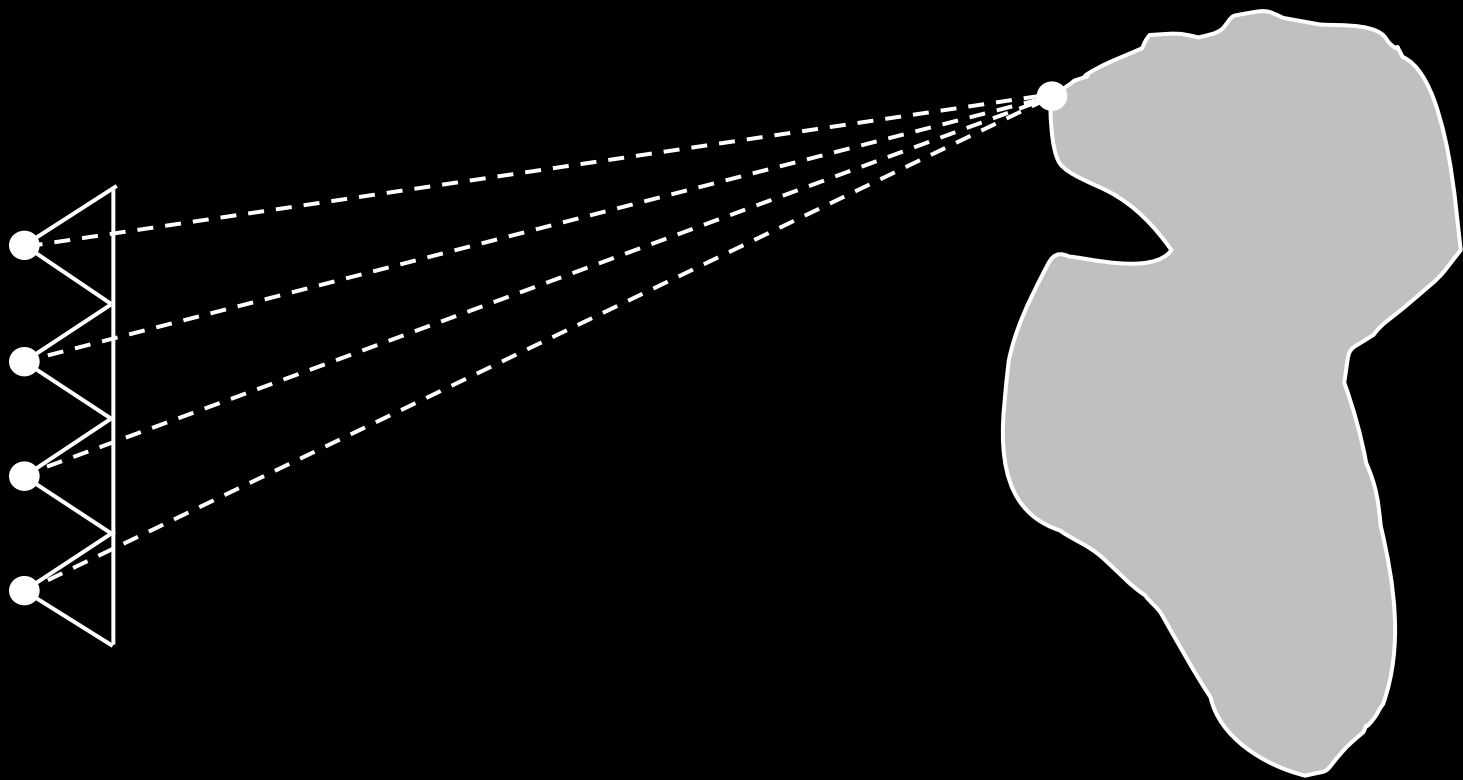


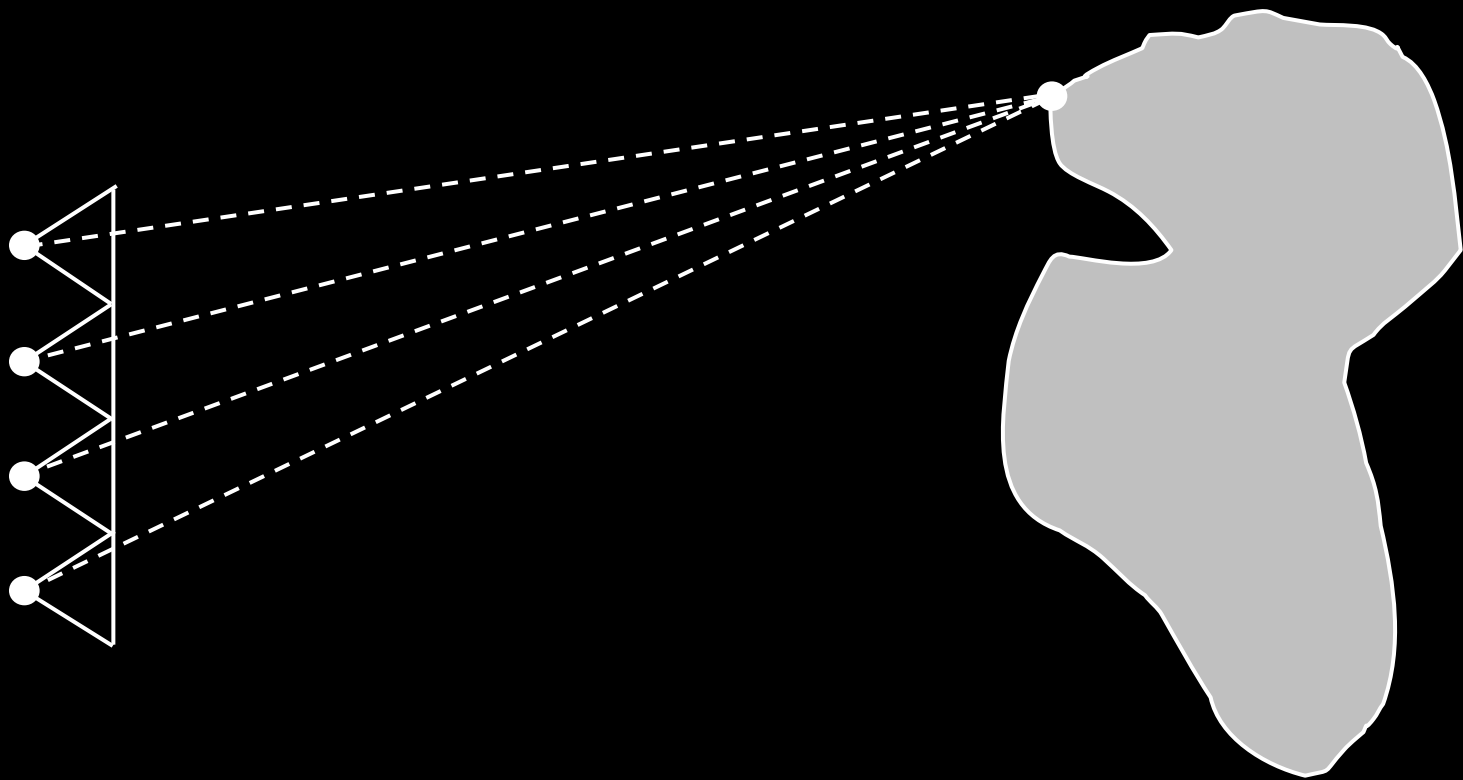
Spatial



Angular



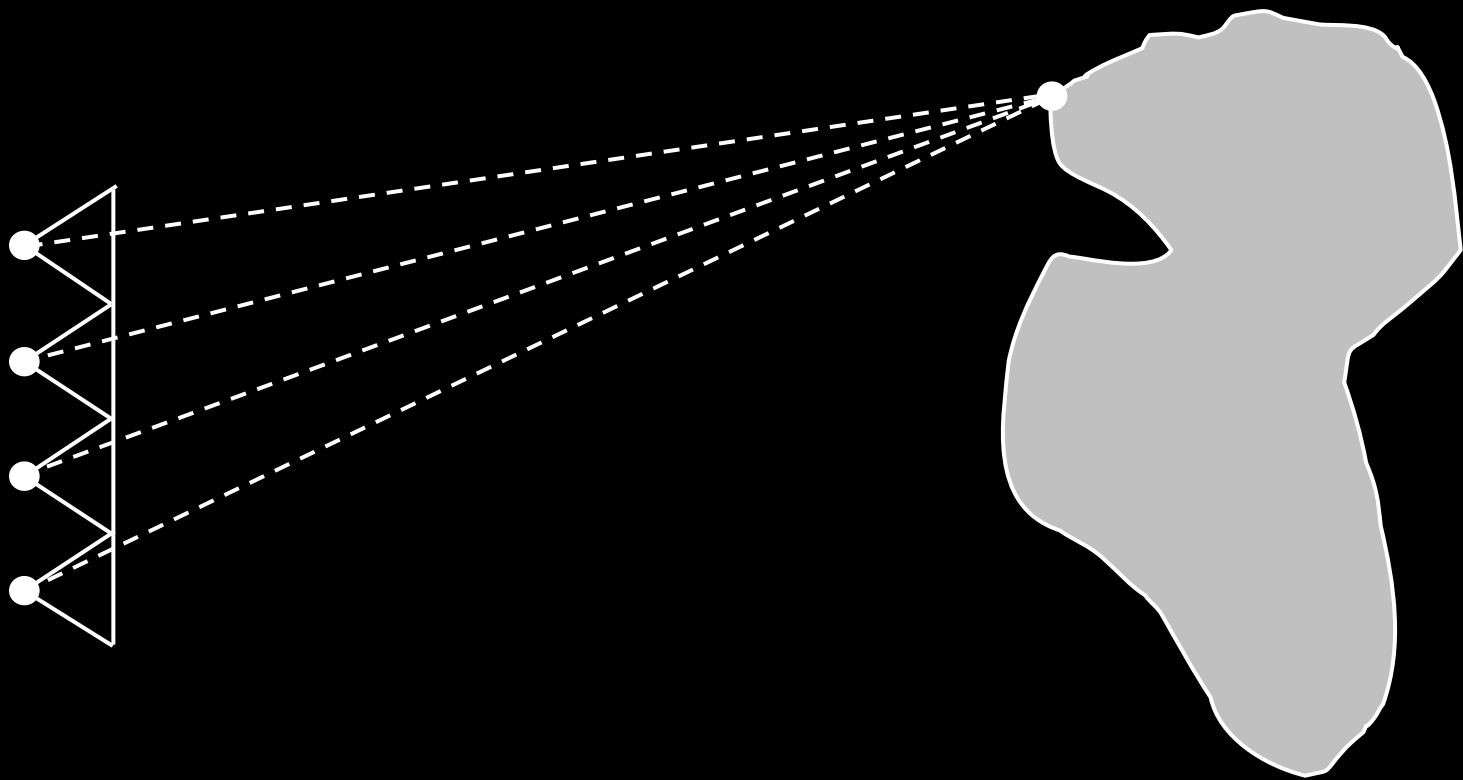




Spatial



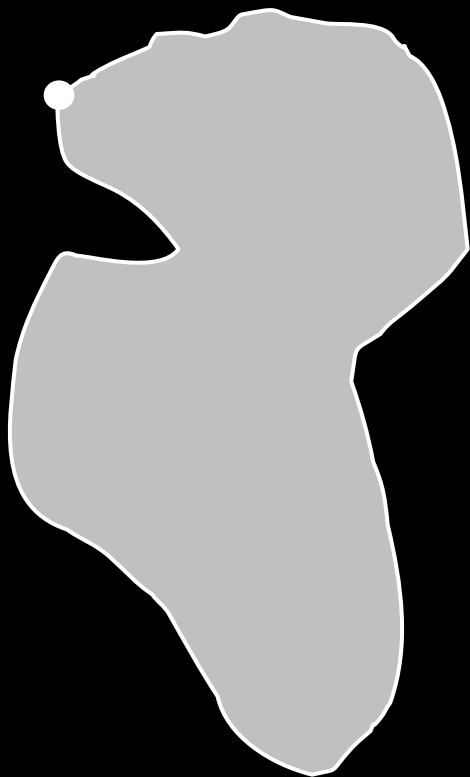
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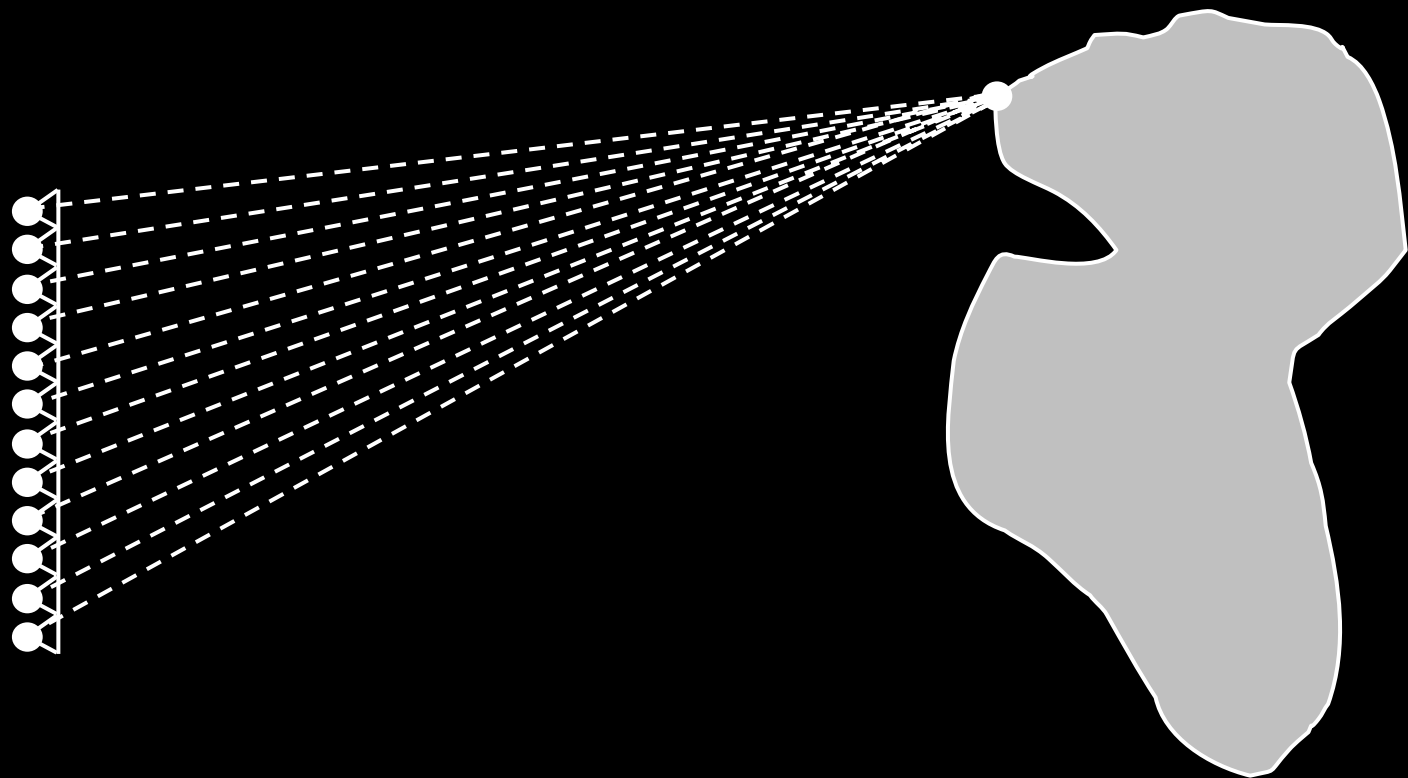


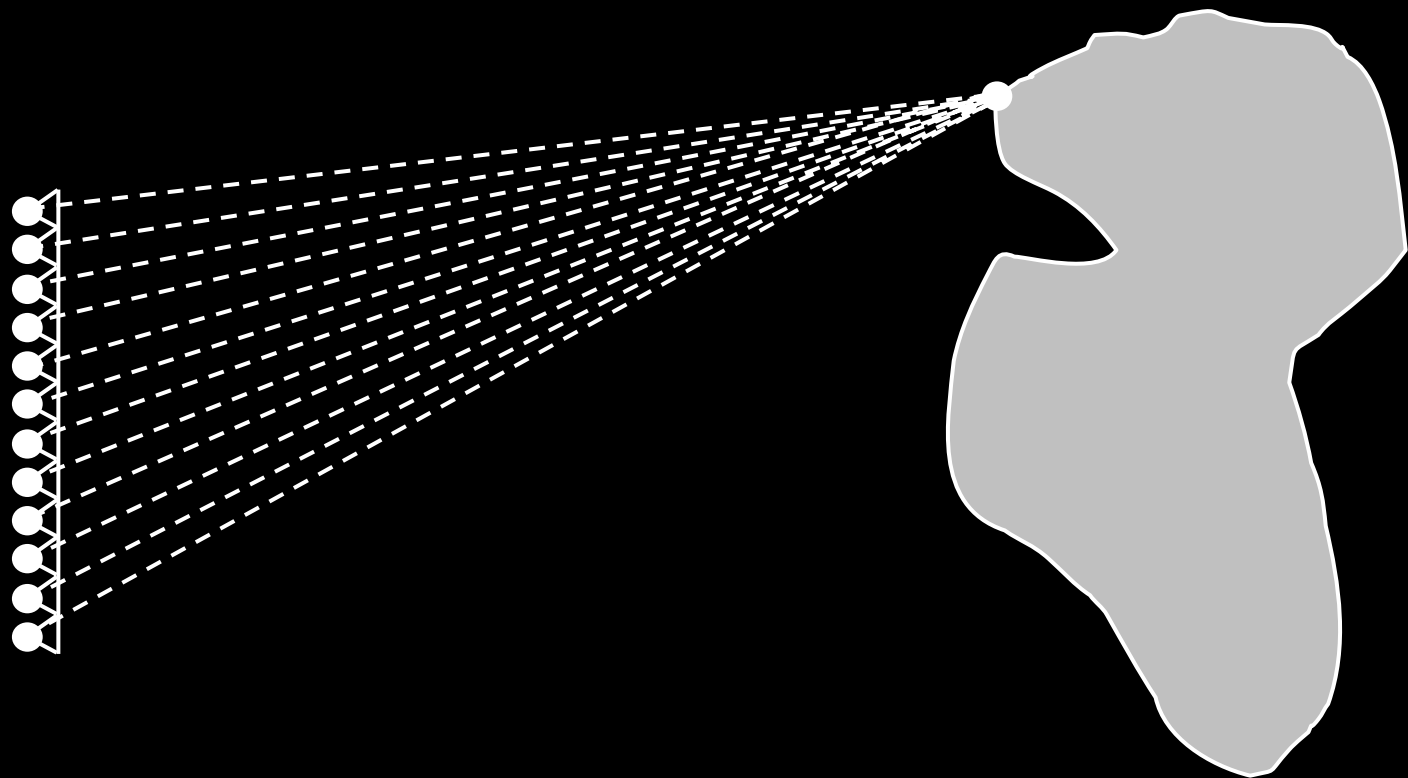
Spatial



Angular



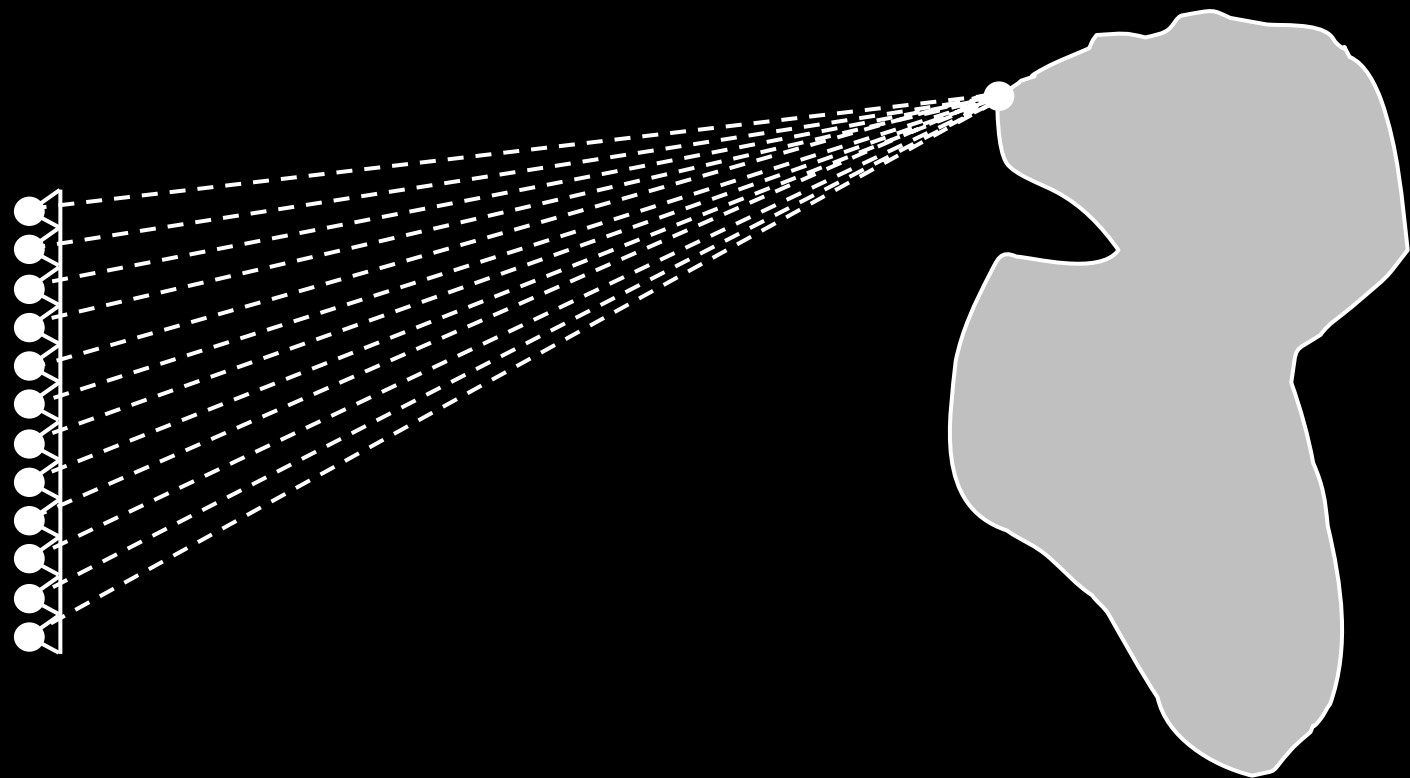




Spatial



Angular



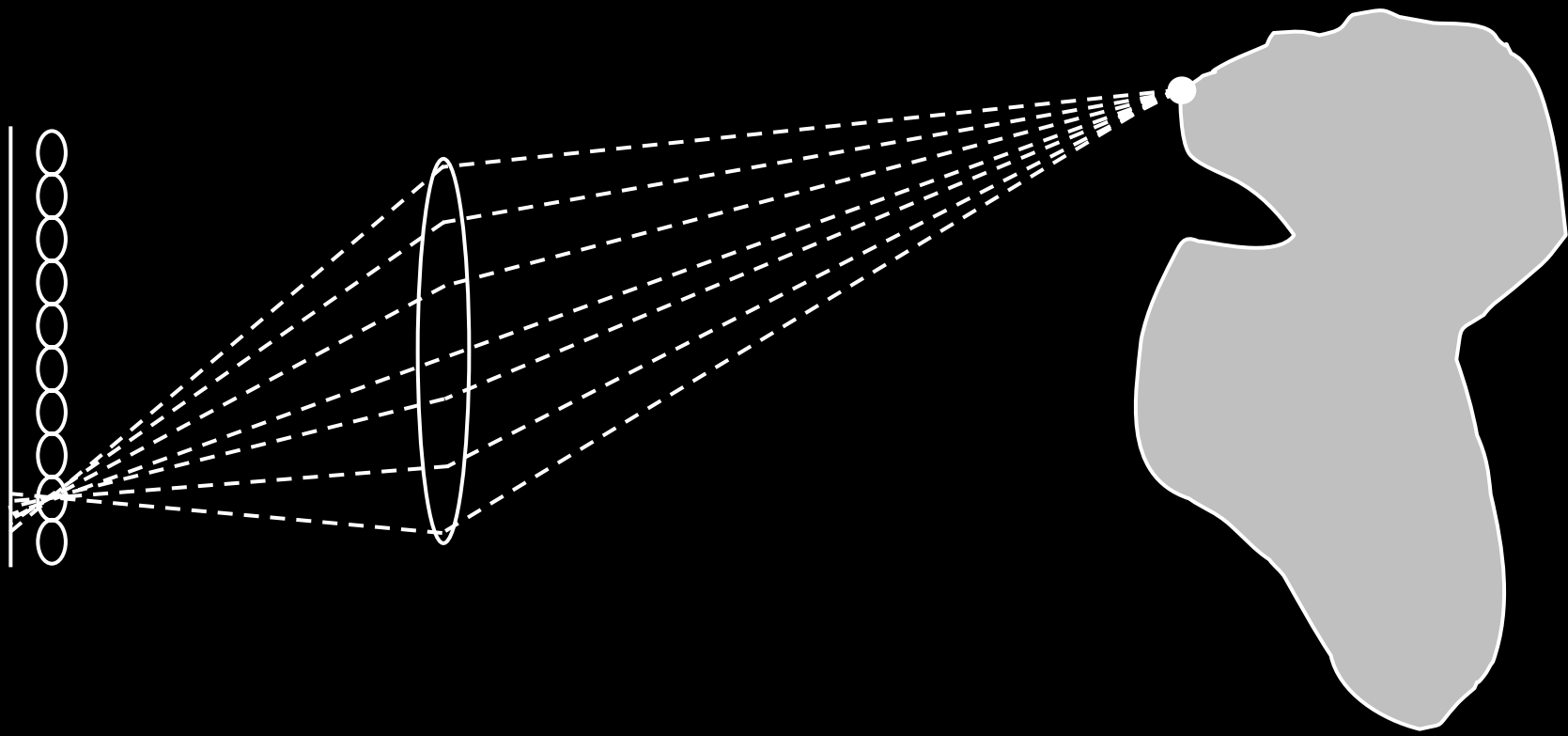
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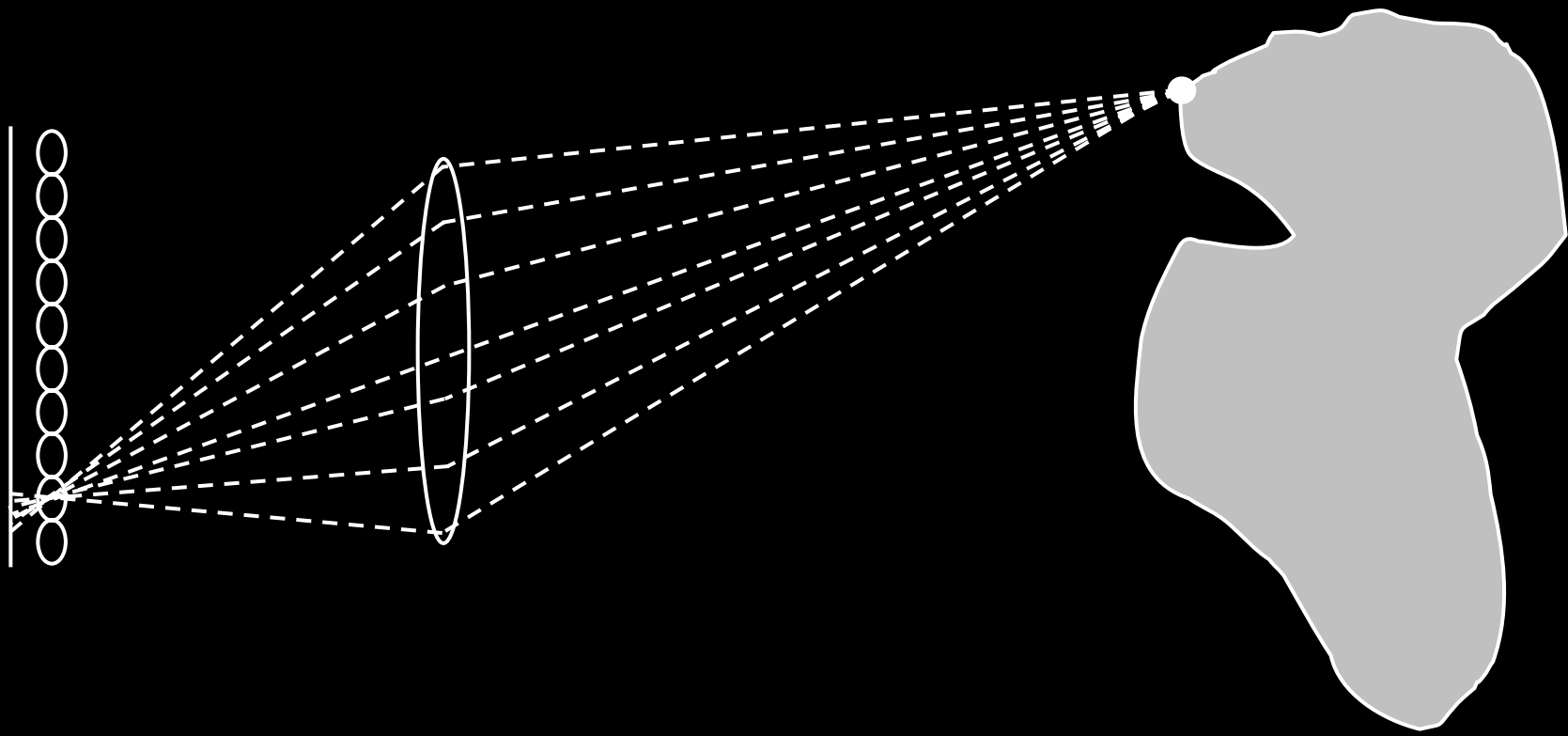
Angular



[Ng *et al.* '05]



[Ng *et al.* '05]

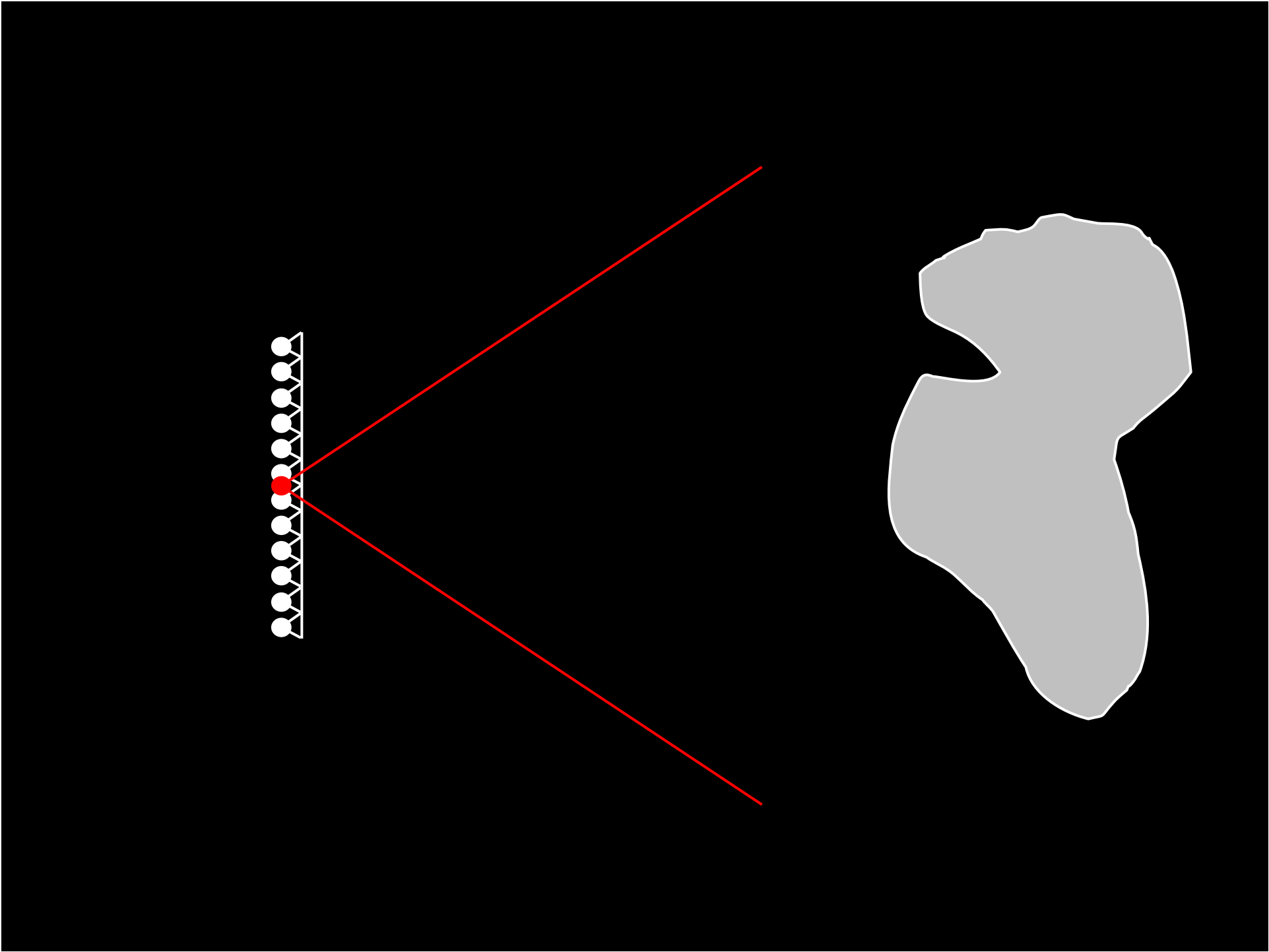


Spatial

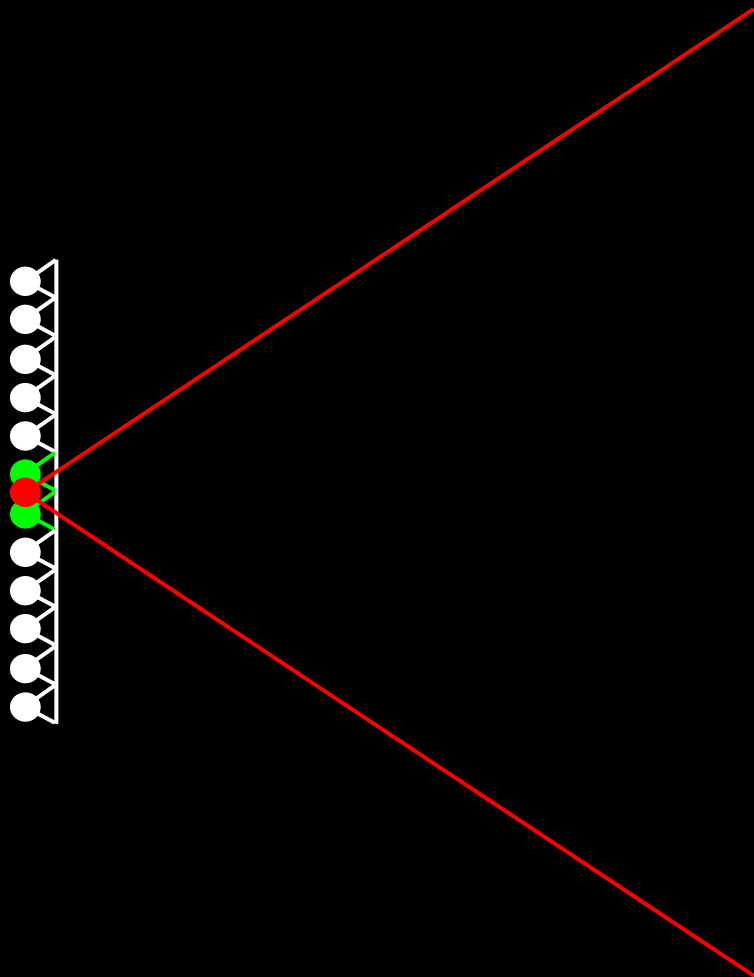


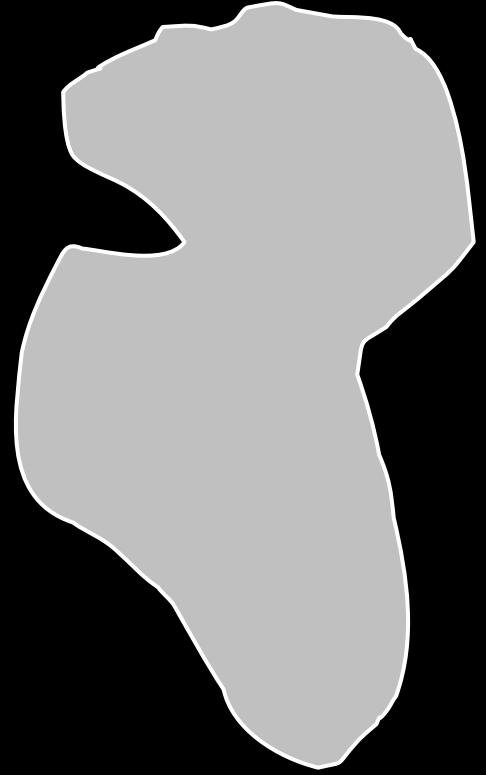
Angular

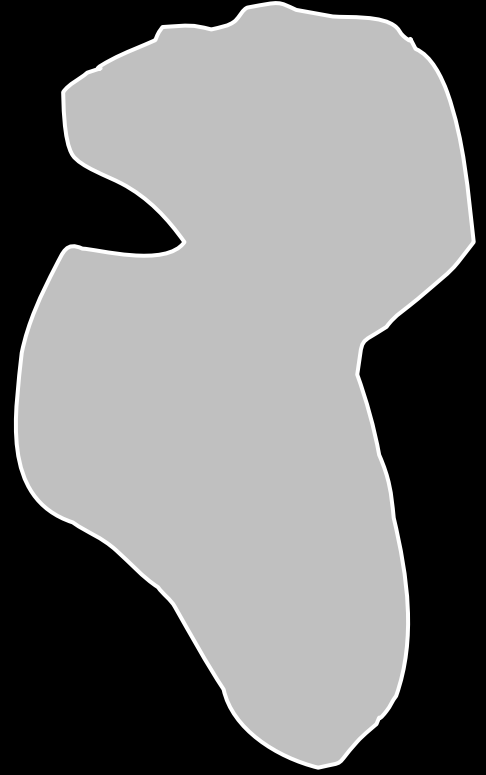




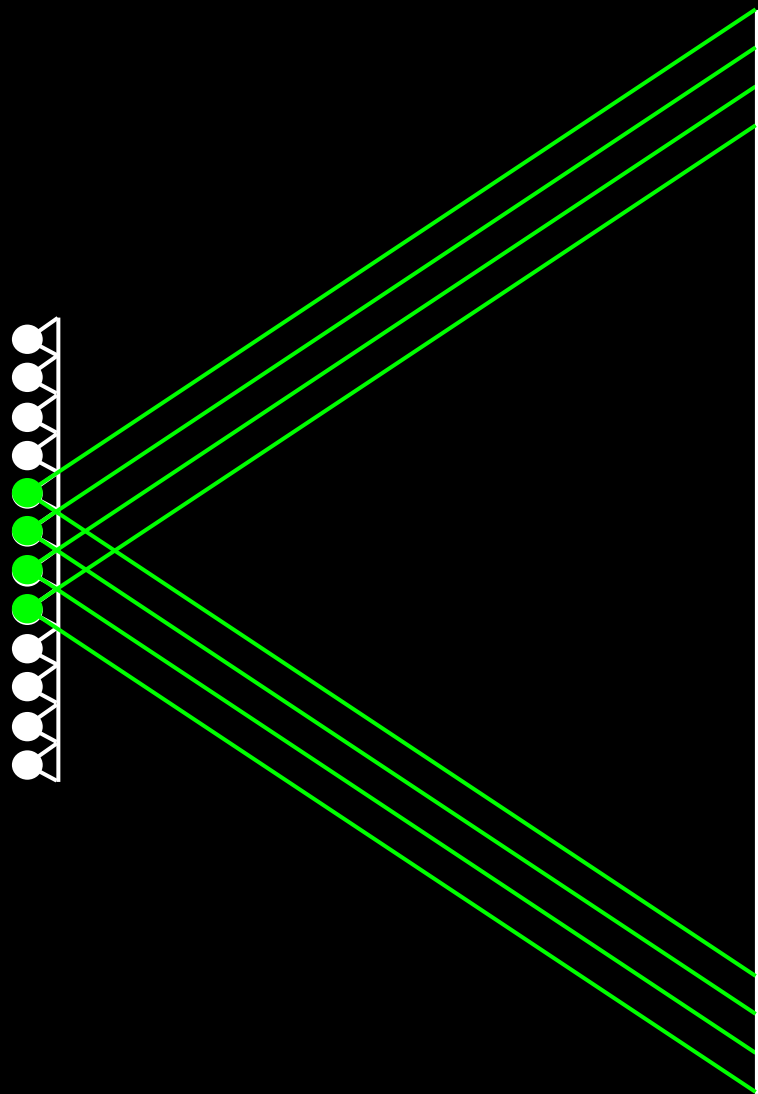
Straight
interpolation





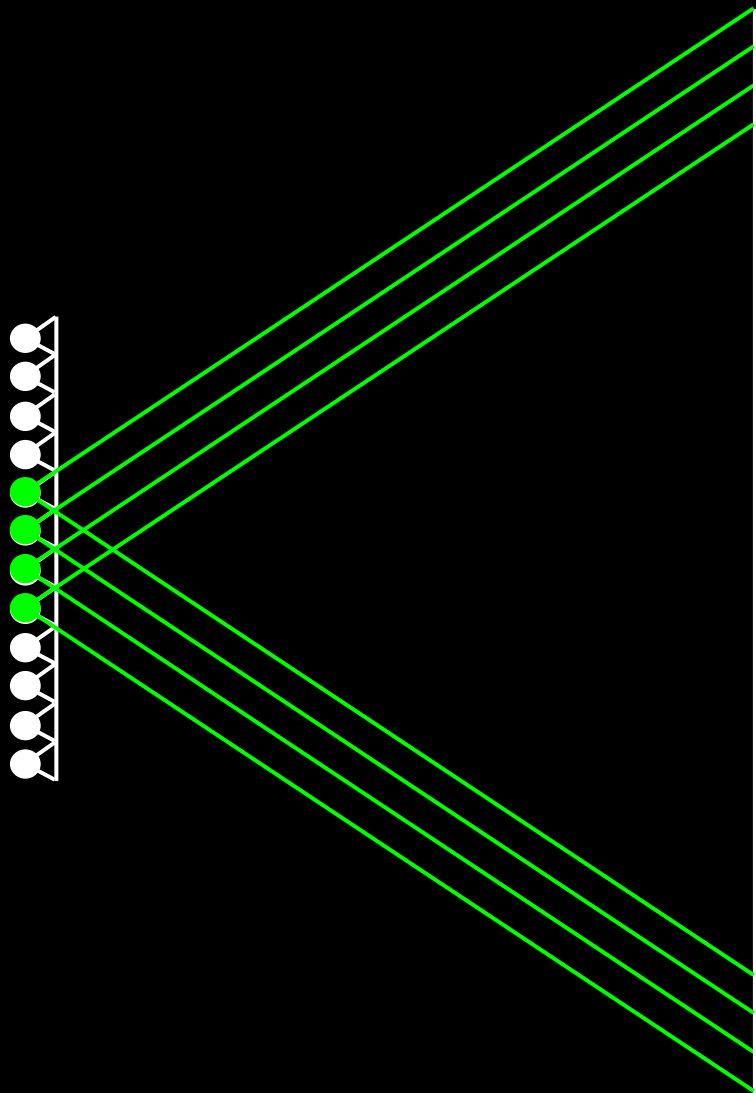
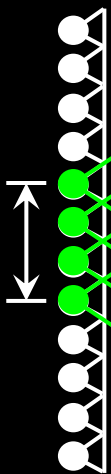


In-focus plane



In-focus plane

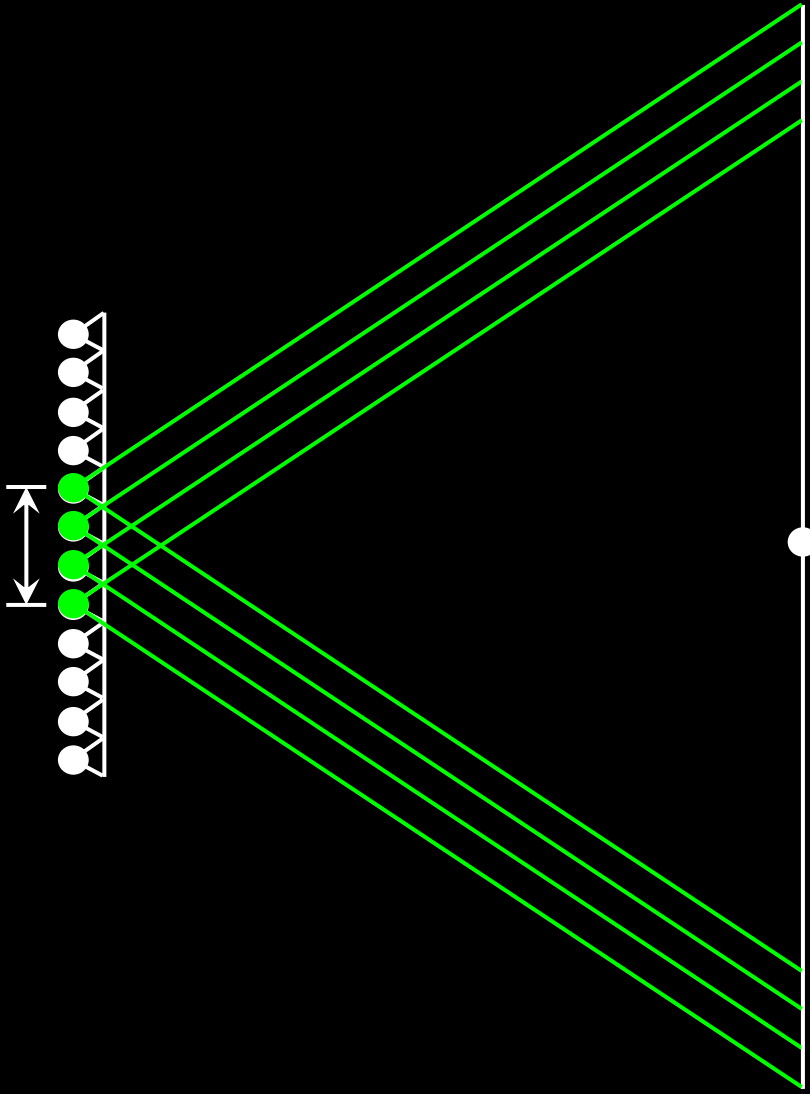
Aperture



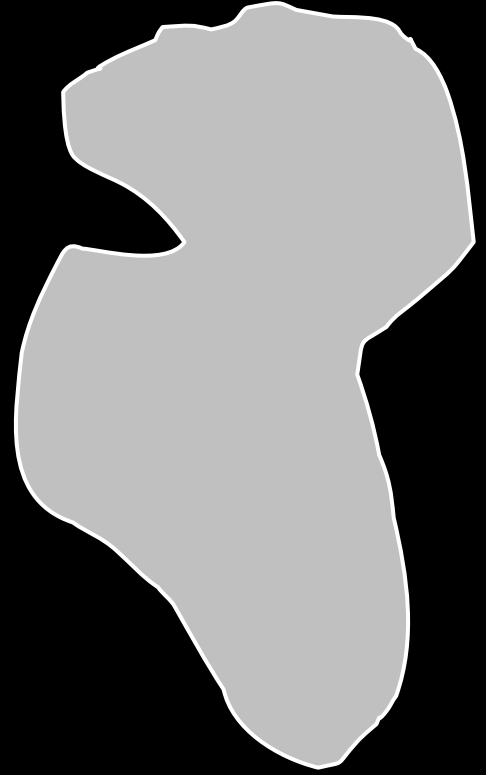
In-focus plane



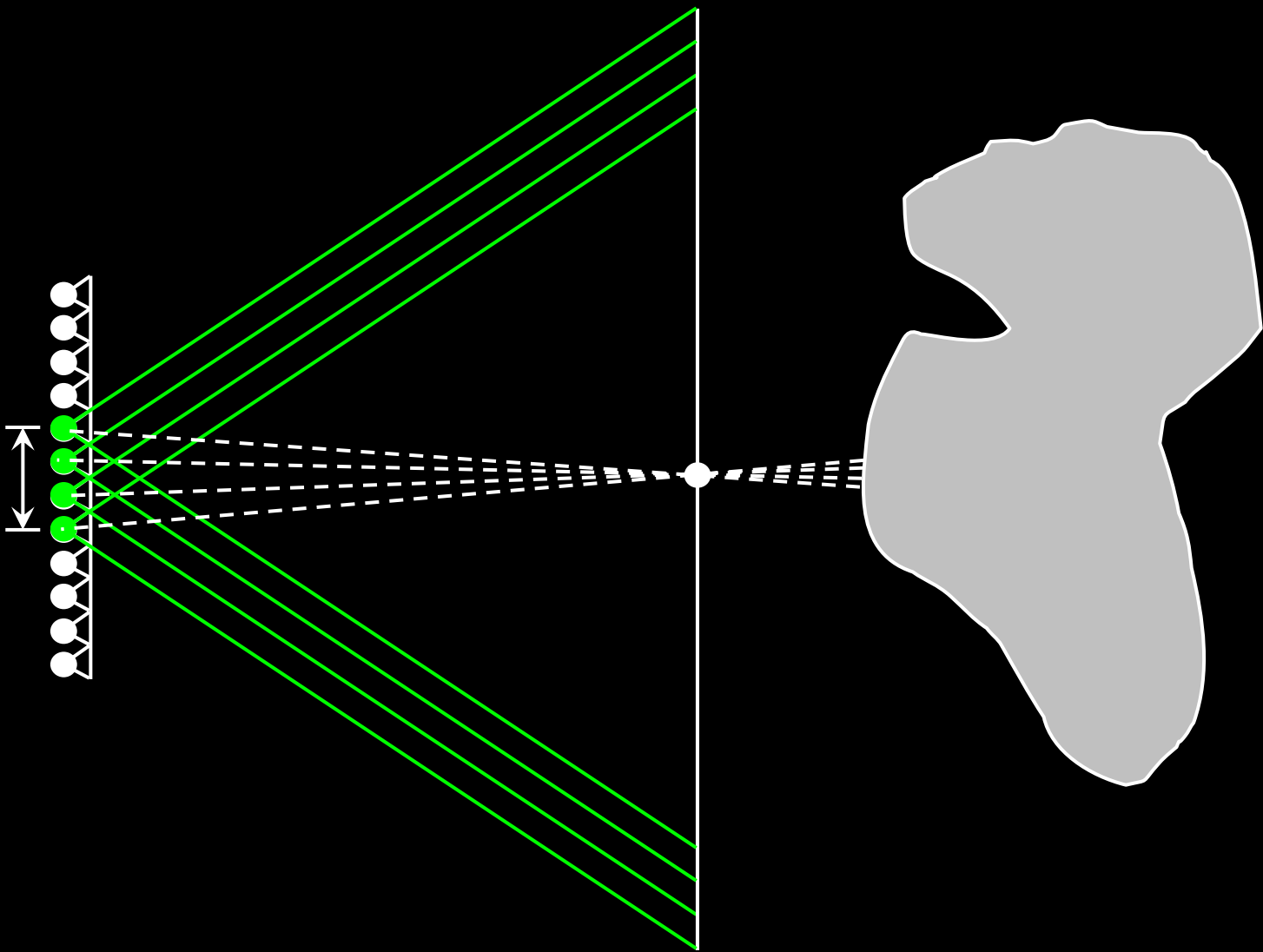
Aperture



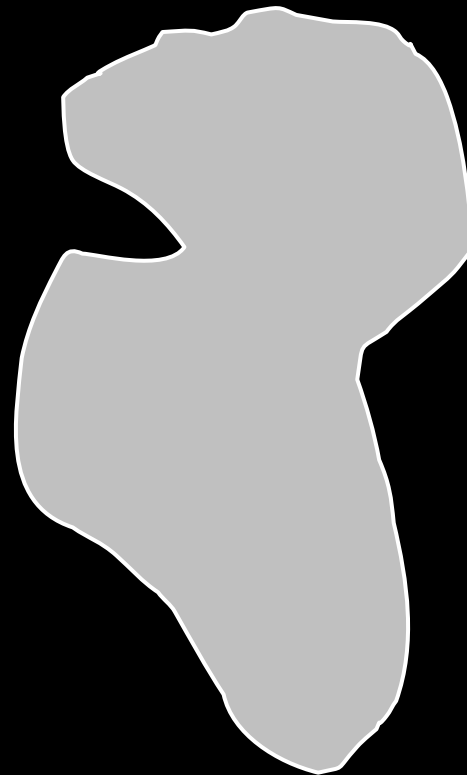
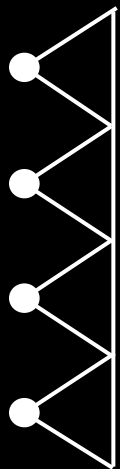
In-focus plane

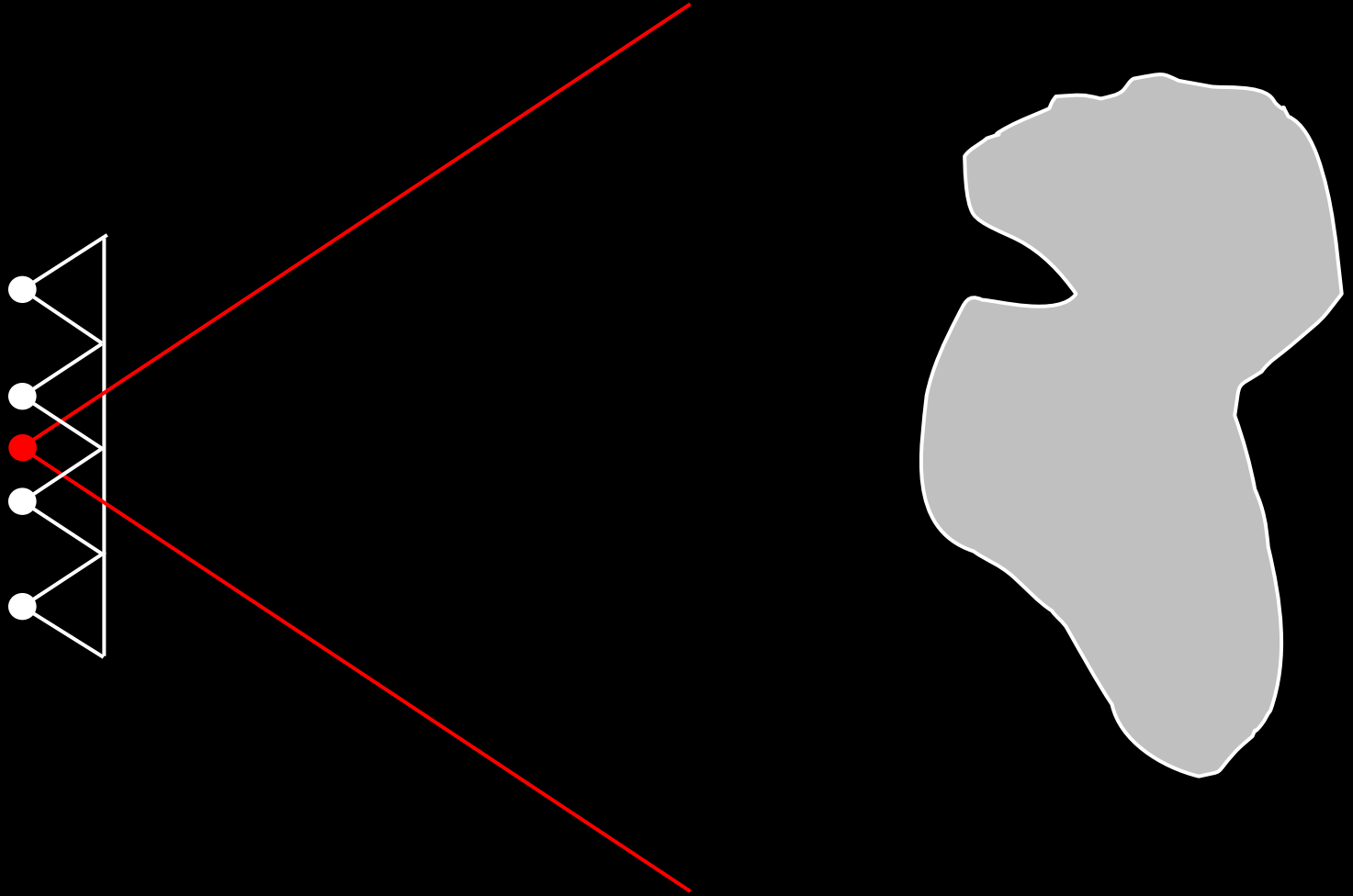


Aperture

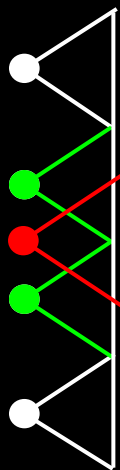


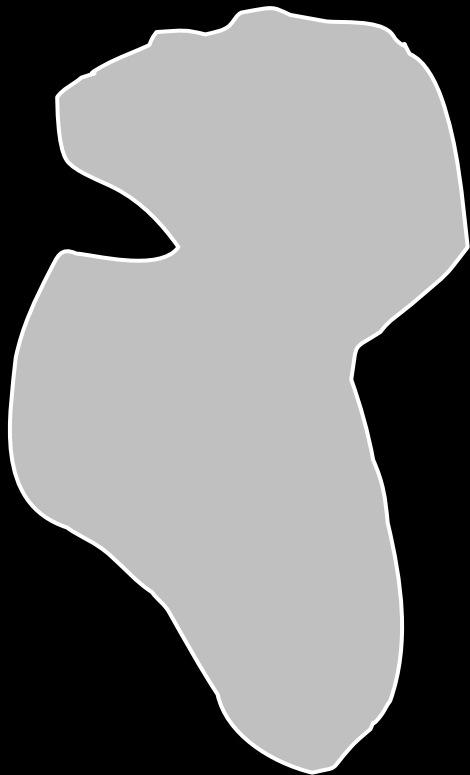
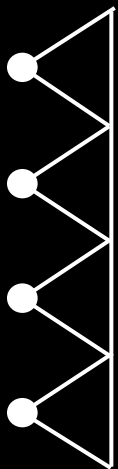
In-focus plane

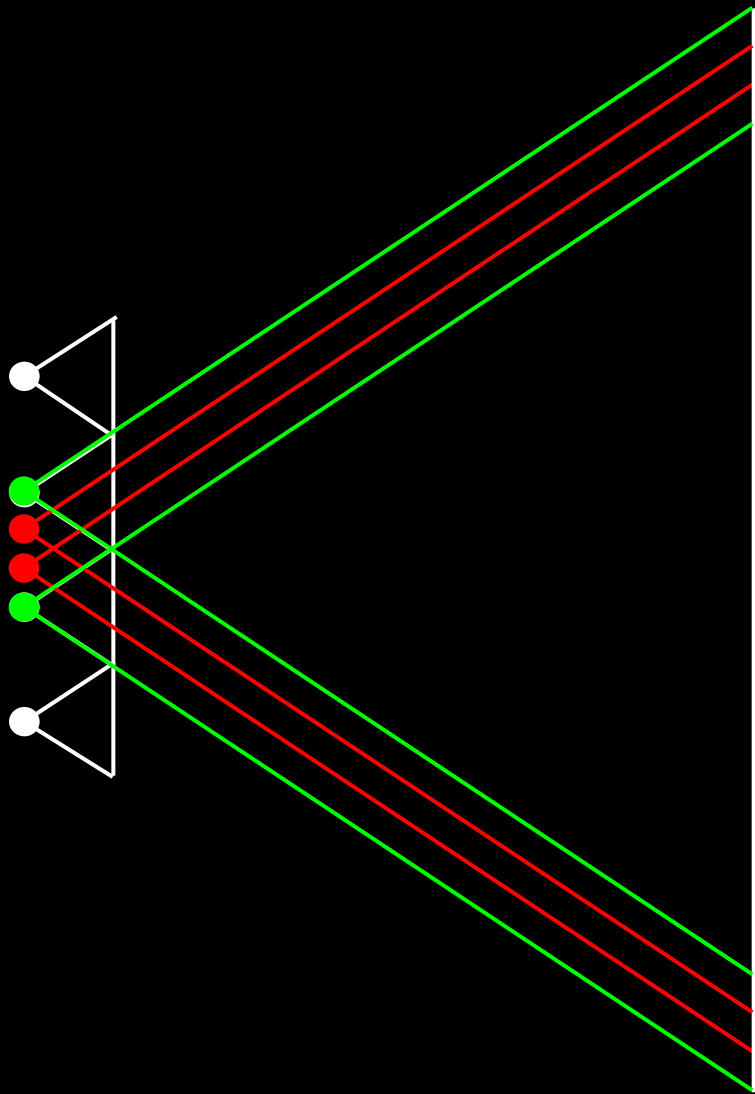


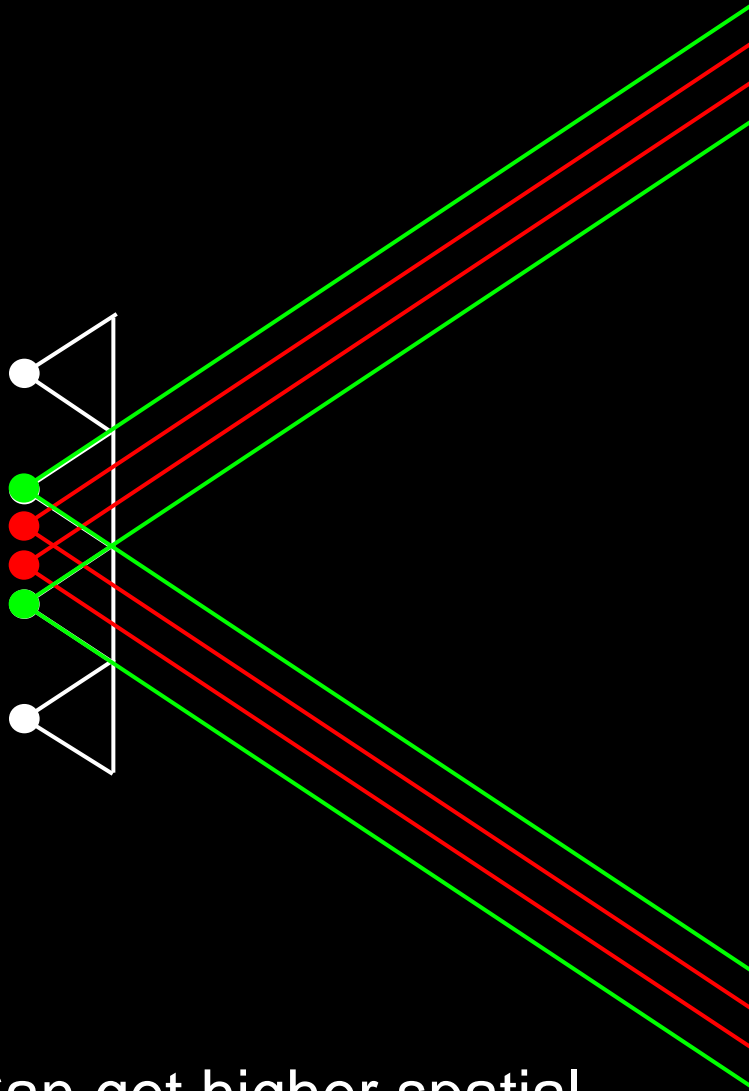


View
interpolation

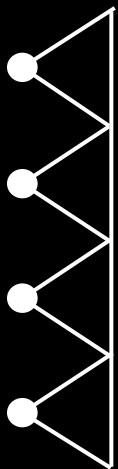


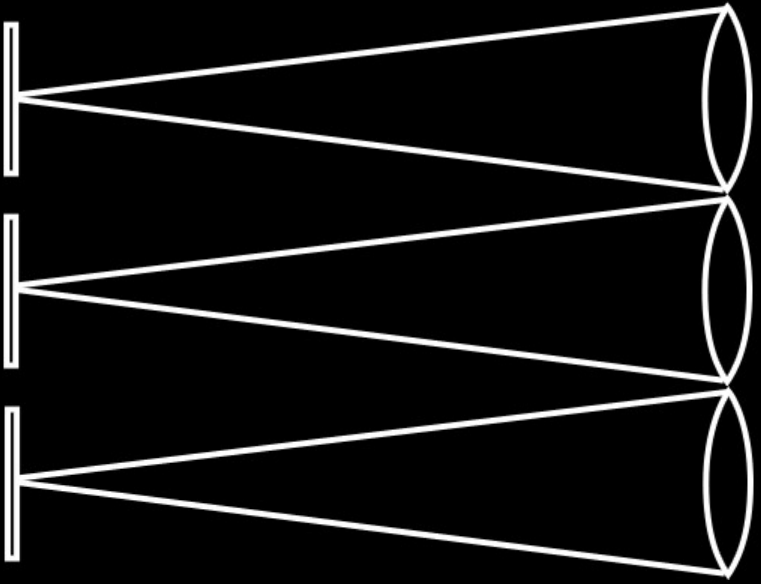


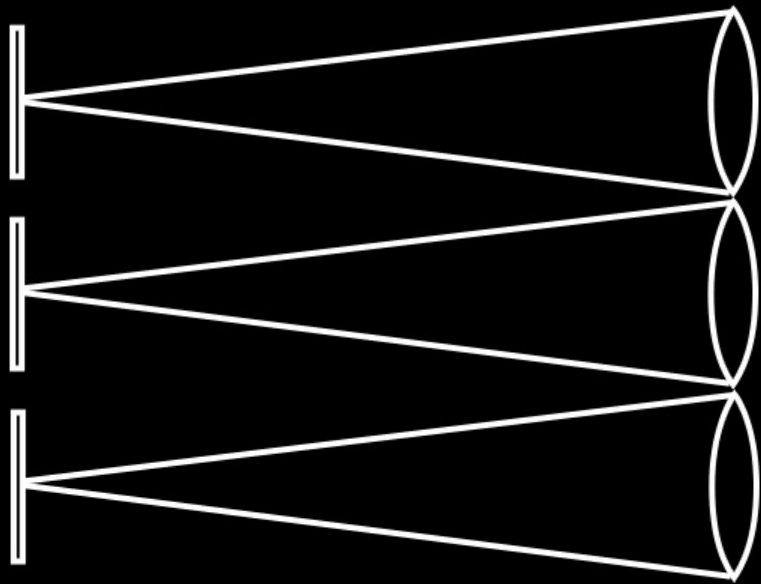


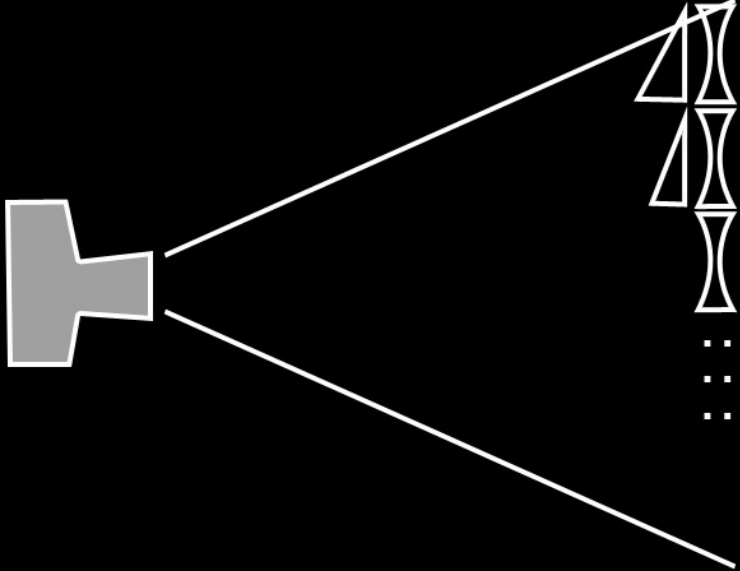


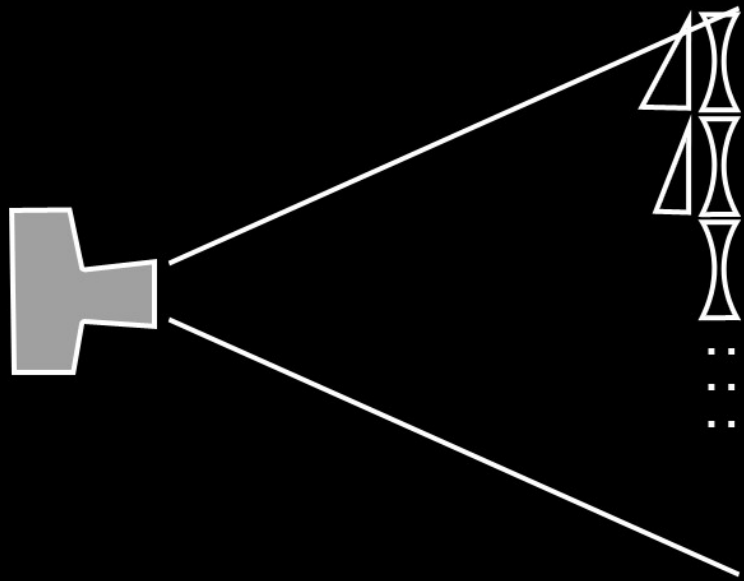
Upshot: Can get higher spatial resolution, but must do some vision to interpolate.

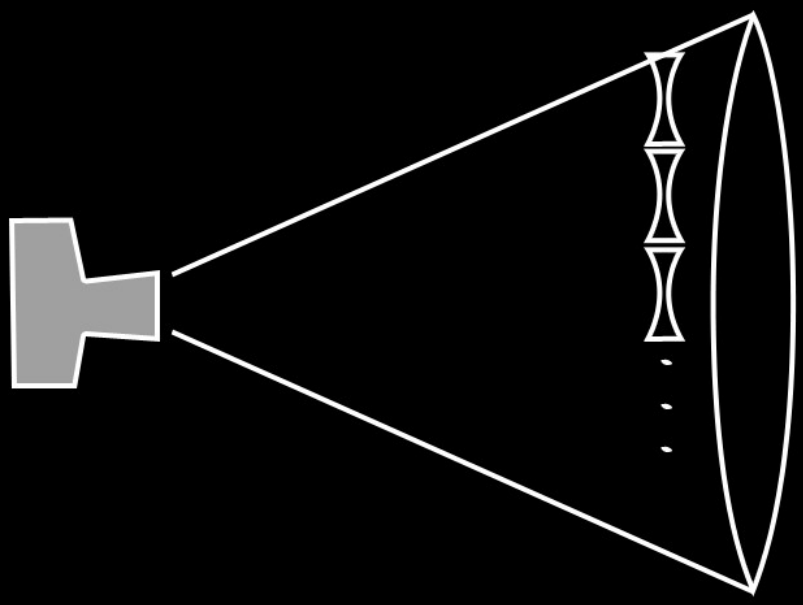


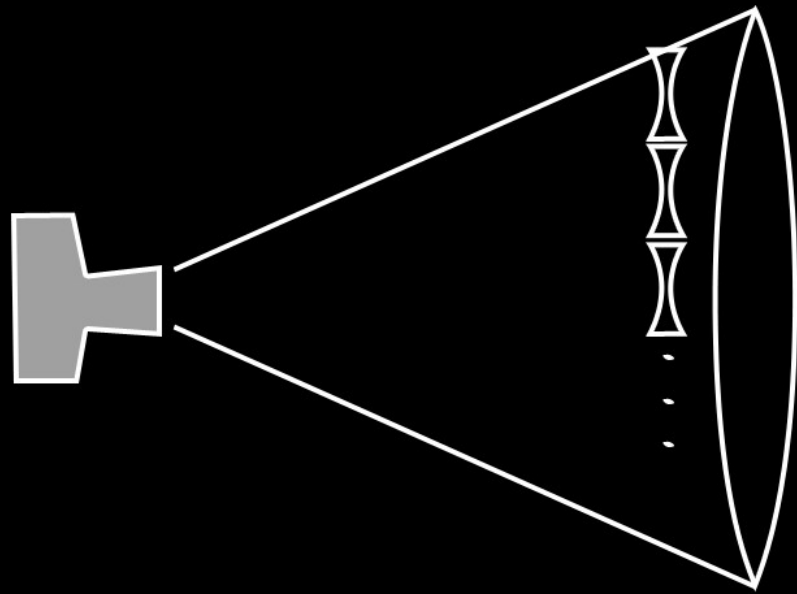












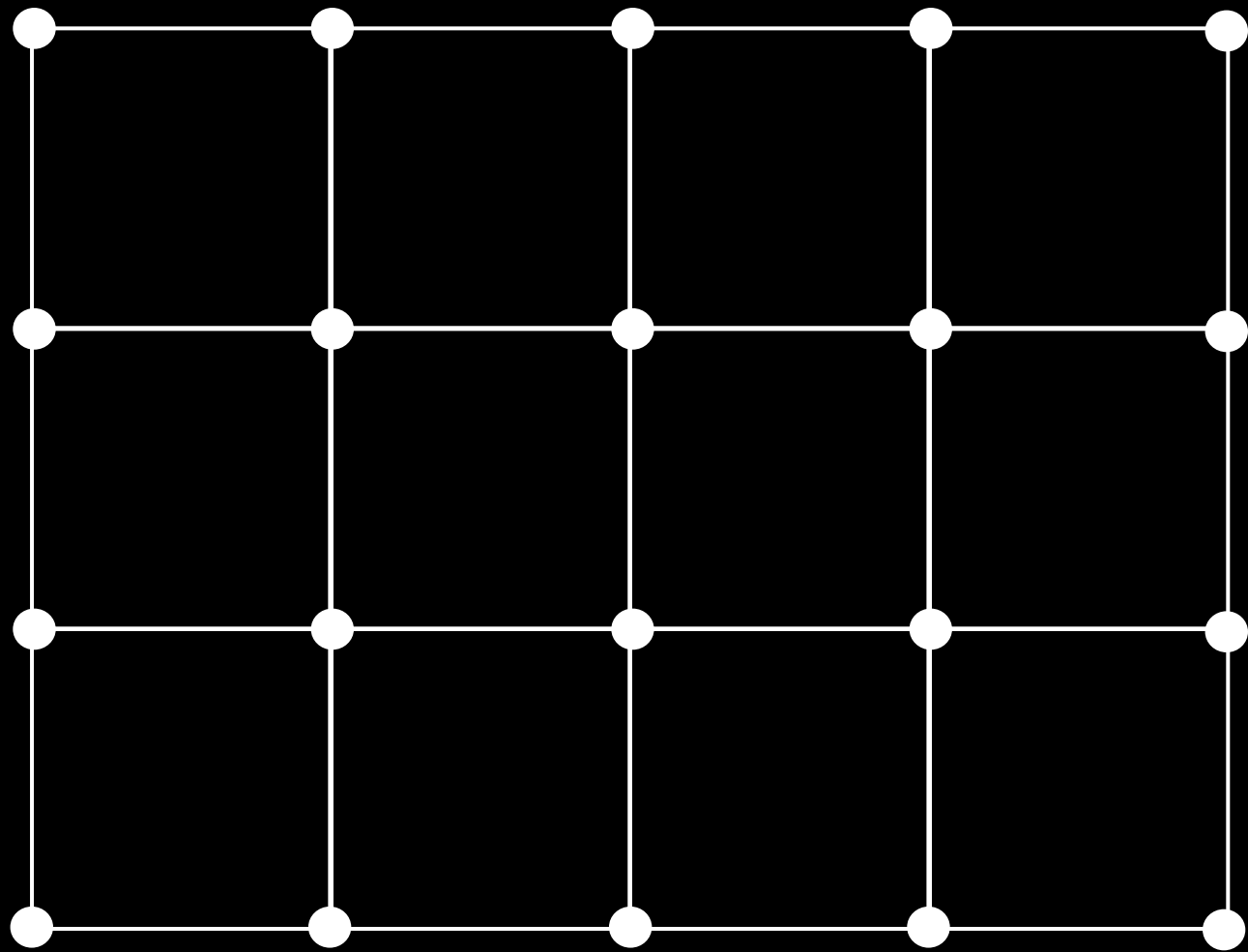


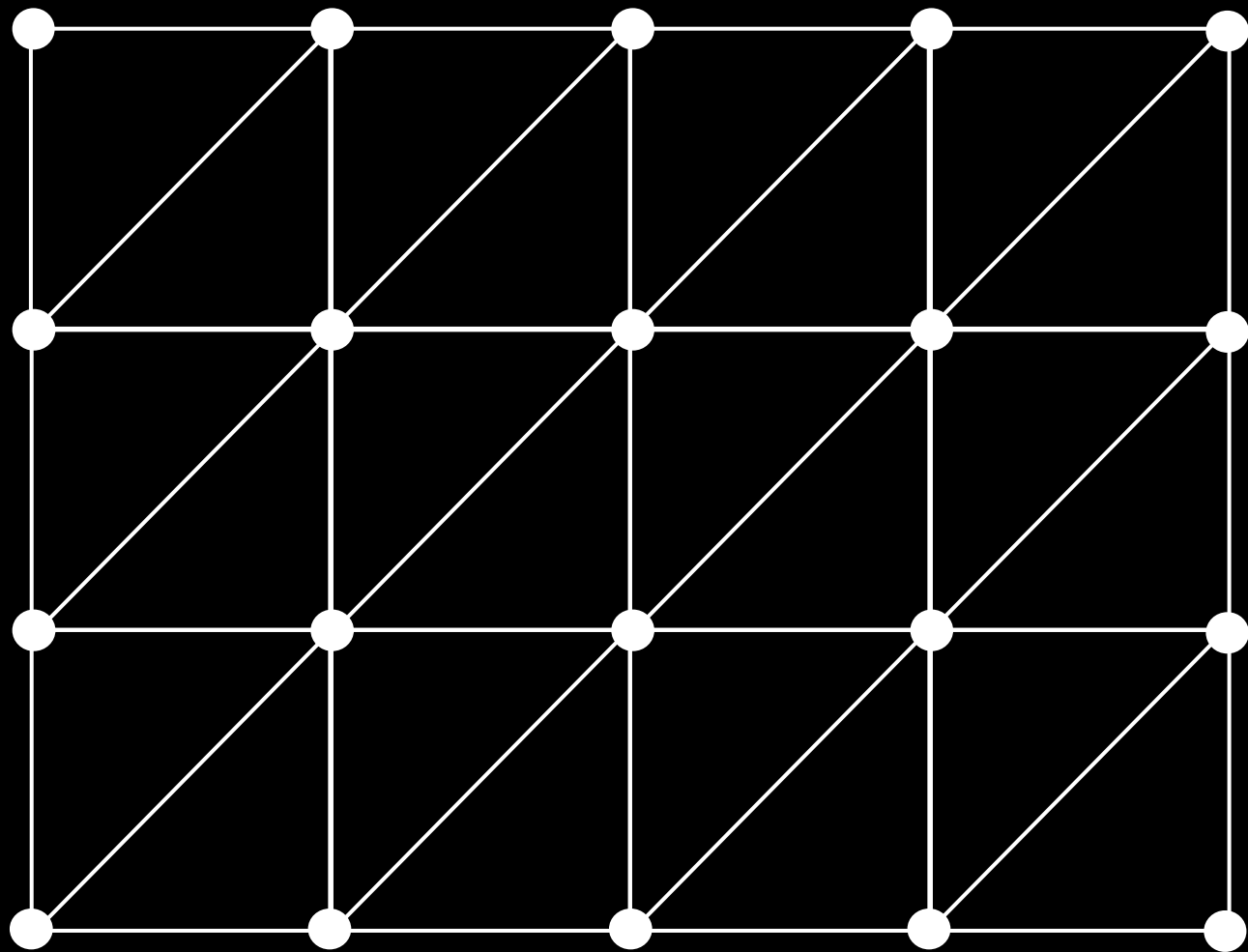


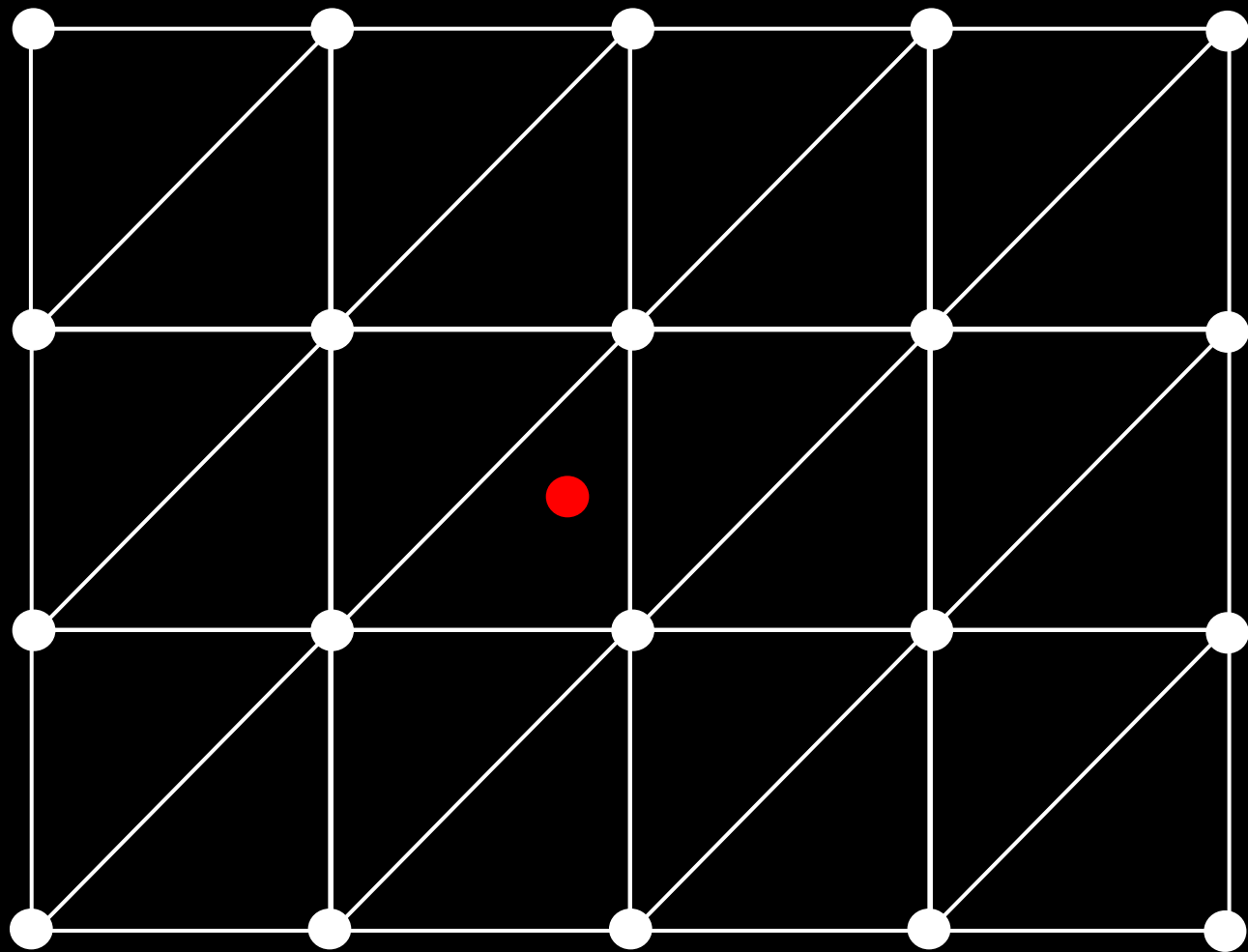




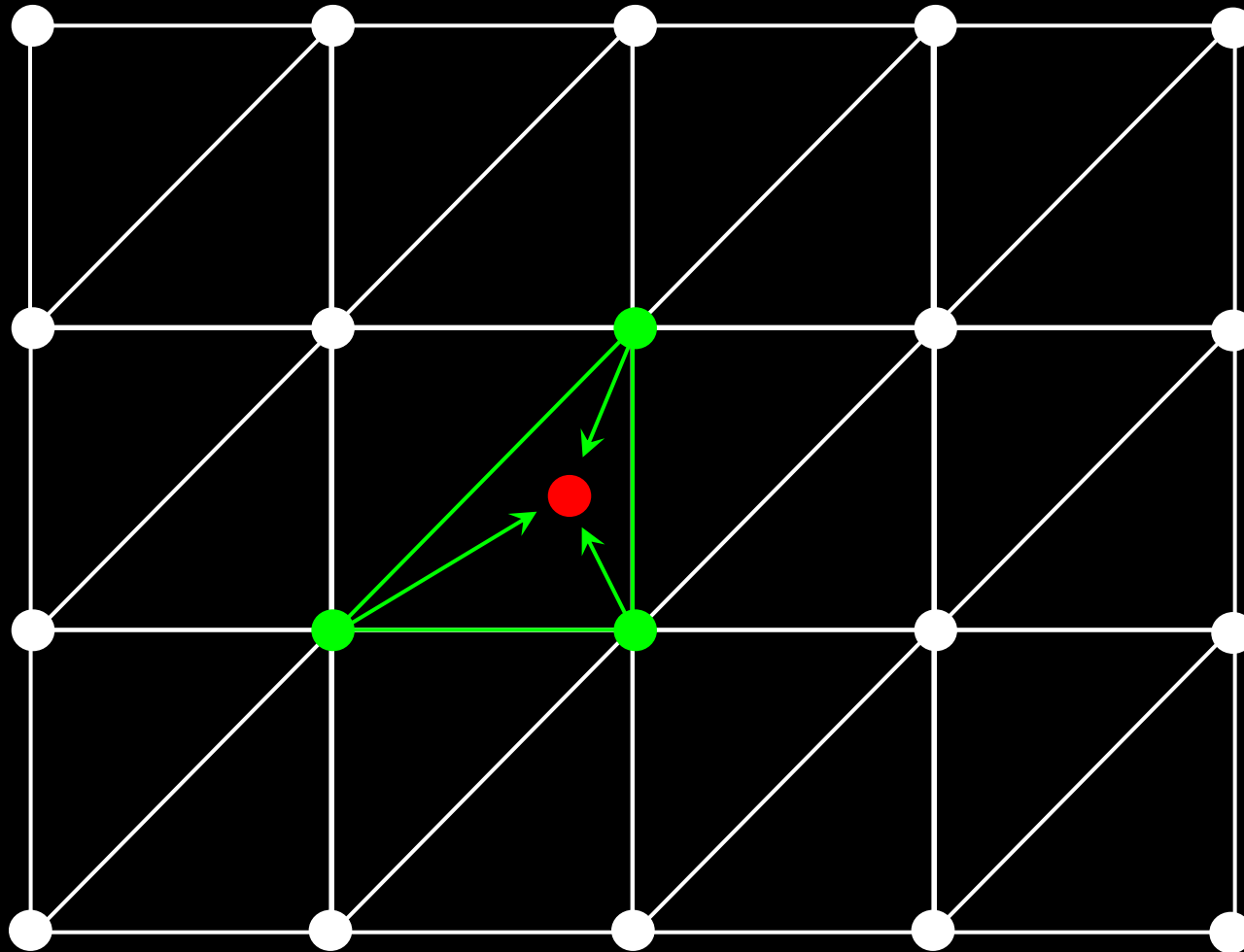






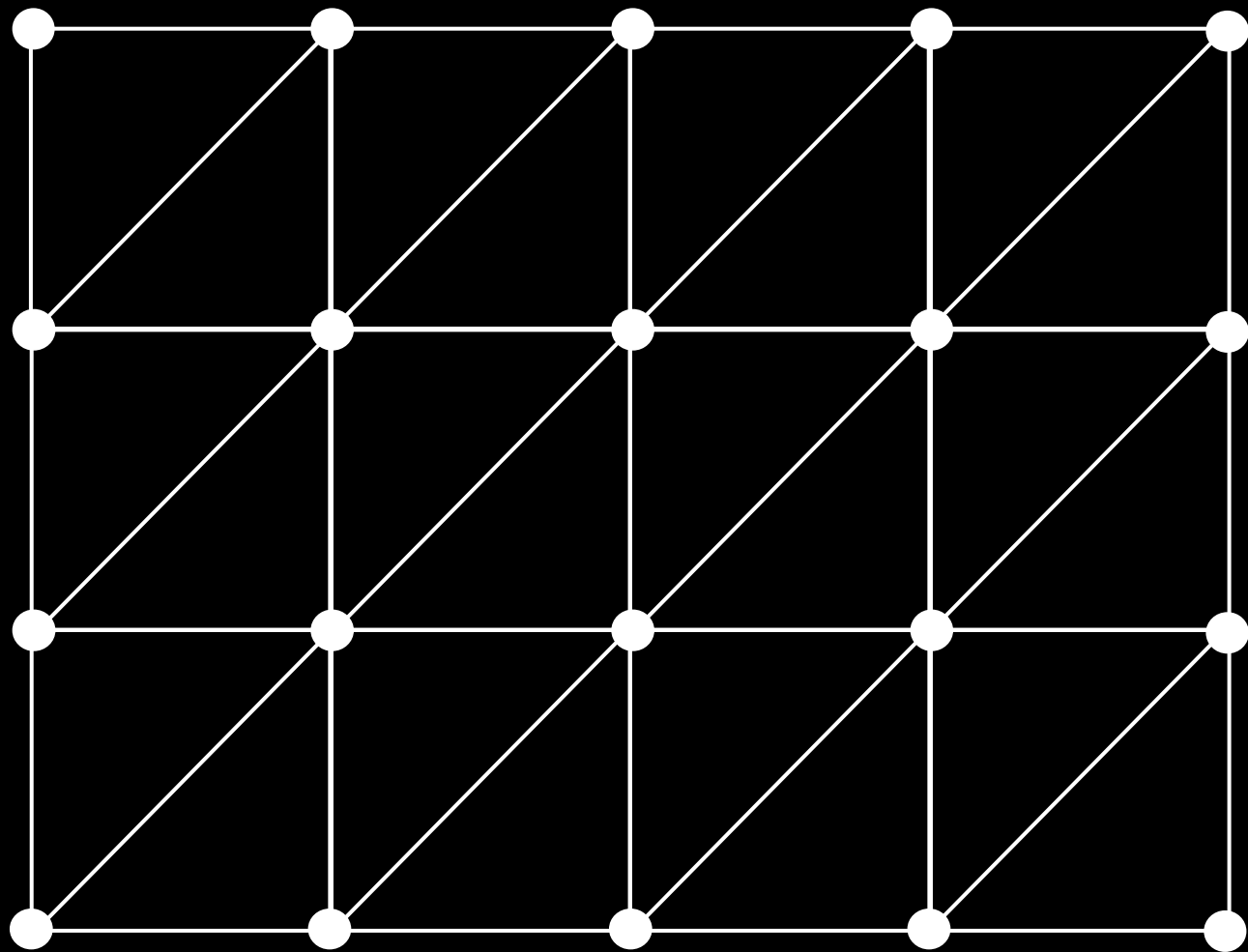


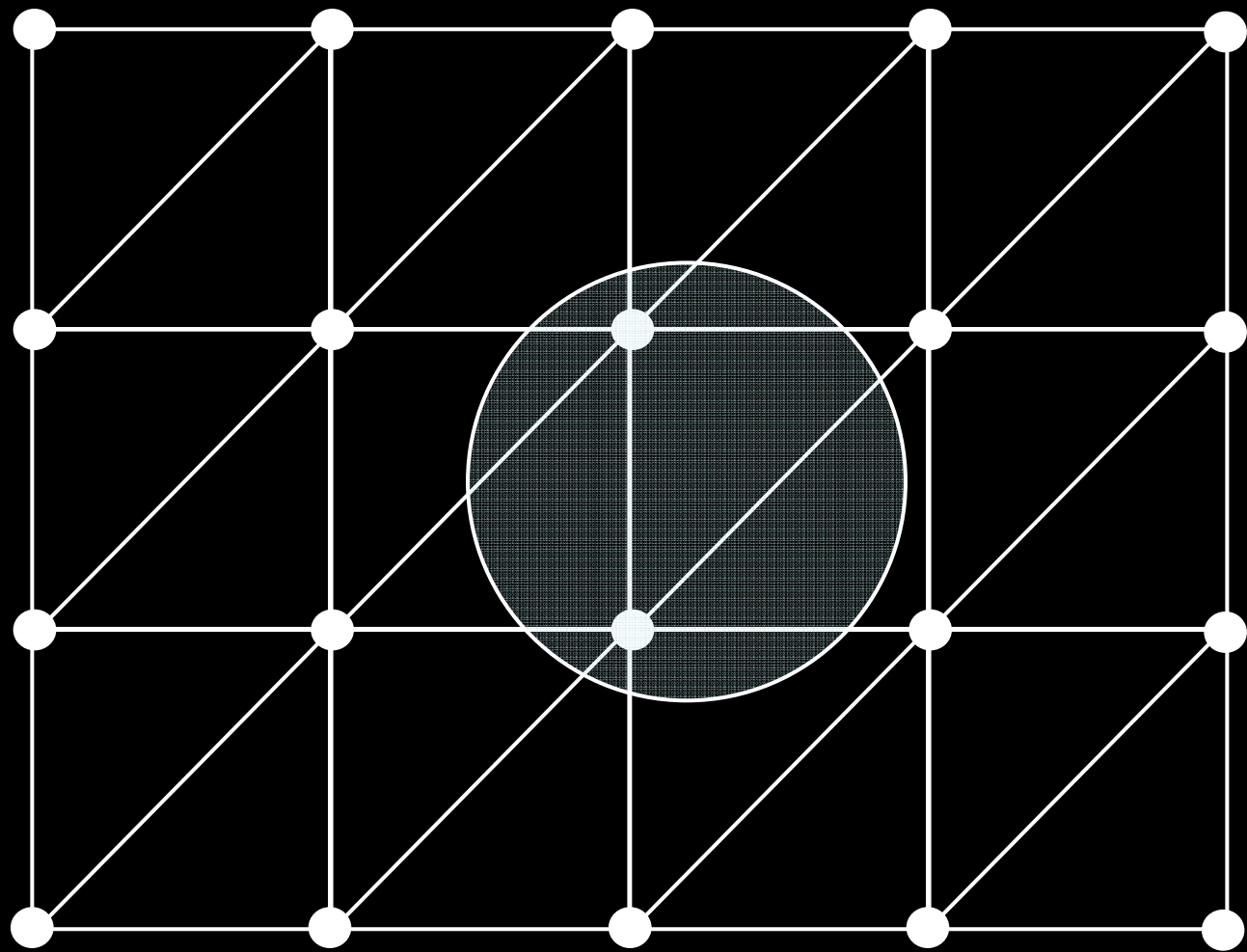
Tri-view interpolation

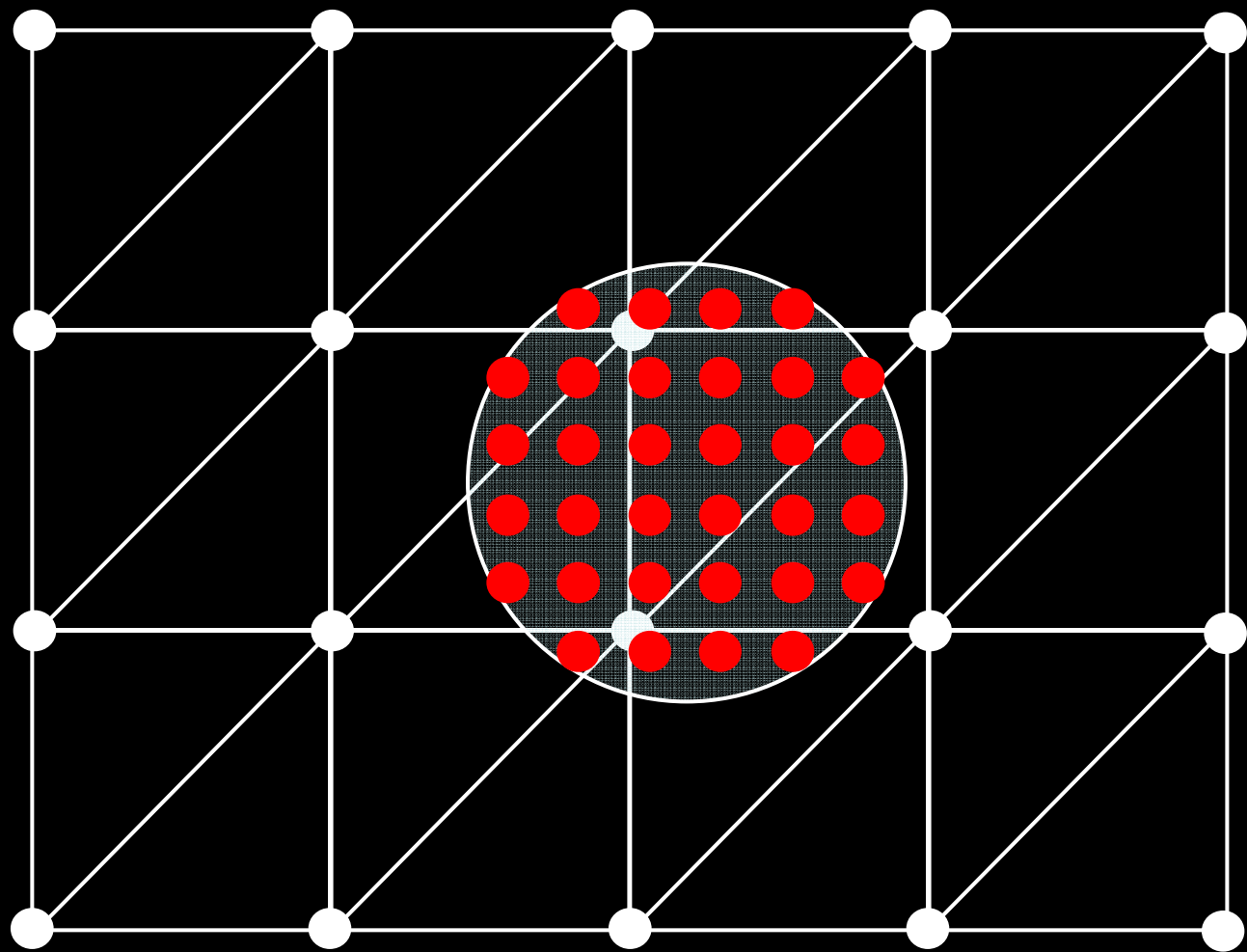


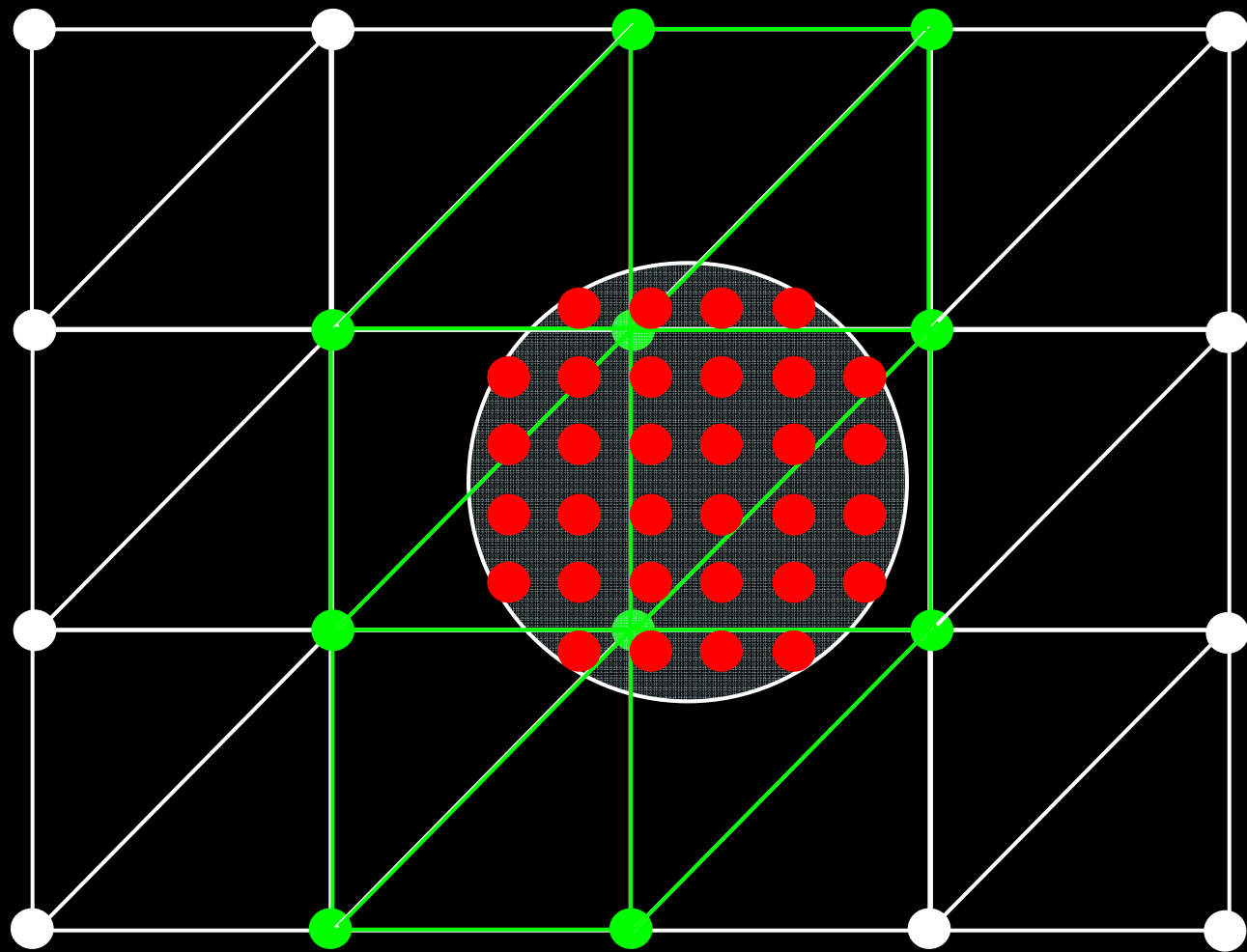
Approach based on [Zitnick *et al.* '04] [Zitnick *et al.* '05]



















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

