

# 2018-03-19 Eye & Head Movements

PSY 525.001 • Vision Science • 2018 Spring

Rick Gilmore

2018-03-19 13:50:35

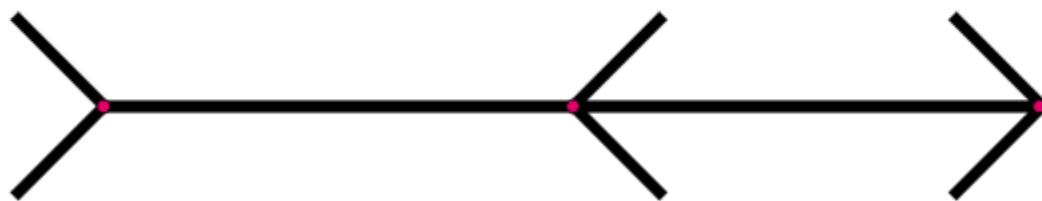
# Today's topics

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Eye and head movements

## DYNAMIC MULLER-LYER ILLUSION

The red dots are equidistant, though the extremities of the line seem to alternately stretch and shrink like a rubber band.



*Concept & Realisation: Gianni A. Sarcone*  
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Sarcone, Gianni A. "Dynamic Müller-Lyer Illusion." From Sarcone's Studio -- A Sarcone & Waeber Web Resource.

[http://giannisarcone.com/Muller\\_lyer\\_illusion.html](http://giannisarcone.com/Muller_lyer_illusion.html). Copyright © G. Sarcone

Why move the eyes?

# Why move the eyes?

## Fixation

# Why move the eyes?

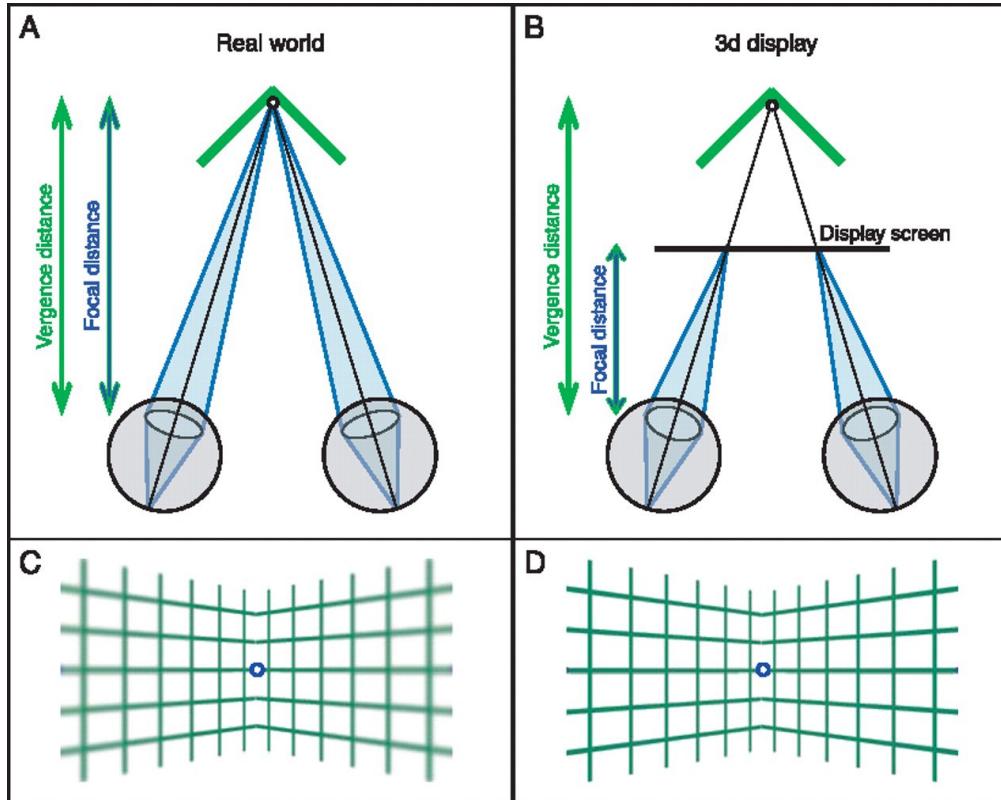
Fixation

Tracking

Types	Description	Comments
Nystagmus	small, rapid, oscillatory	keep things visible
Saccades	ballistic, fast	spatial frame of ref
(Smooth) Pursuit	track moving target	speed dependent
Vergence	Con/Diverge; disconjugate	cue to depth
Vestibular Ocular Response (VOR)	Stabilize eyes in head	stabilize in 3D
Optokinetic	stabilize moving field	size of motion field critical
Accommodation	Change in shape of lens	focus
Pupillary response	Change in lighting	



# Vergence



Vergence/accommodation conflict complicates virtual reality (VR) displays



# Smooth pursuit



Vestibulo Ocular Reflex/Response (VOR) stabilizes  
gaze

Demo: VOR permits reading/texting while walking

But: <https://youtu.be/wl0JojWH1rQ>



# Optokinetic nystagmus (OKN)



# How eye trackers work

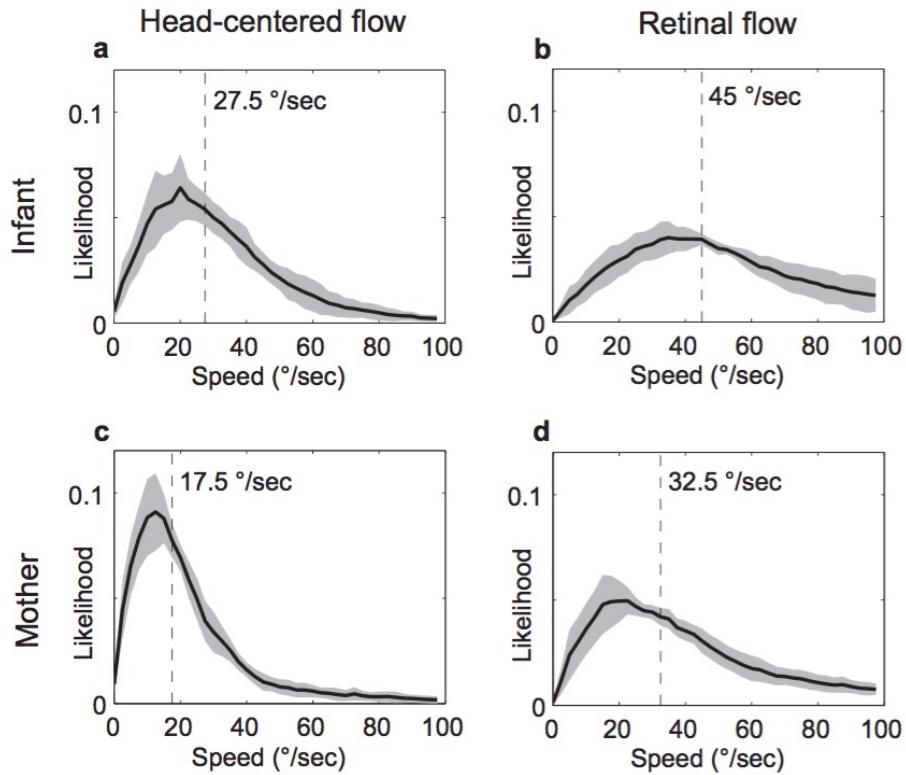
<https://webgazer.cs.brown.edu/>

Using a web cam!





Gilmore, R.O., Raudies, F., Franchak, J. & Adolph, K. (2015). Understanding the development of motion processing by characterizing optic flow experienced by infants and their mothers. *Databrary*. Retrieved March 16, 2018 from  
<http://doi.org/10.17910/B7.116>



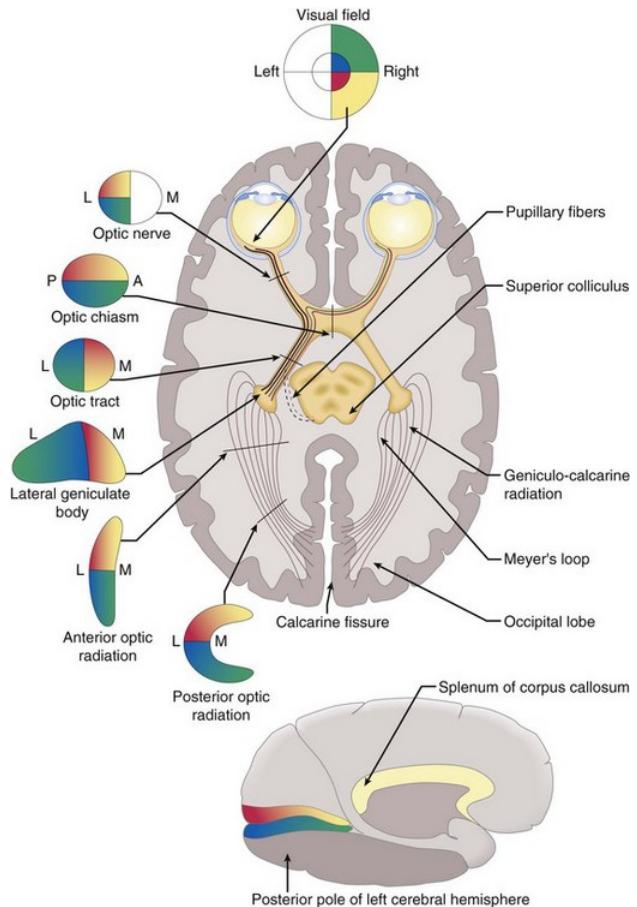
Raudies, F. & Gilmore, R.O. (2014). Visual motion priors differ for infants and mothers. *Neural Computation*, 26(11), 2652-2668. doi:10.1162/NECO\_a\_00645

Infants experience *faster* speeds than mothers



# Simulating the effects of saccades on vision with the EyeSeeCam

# Physiology and anatomy of eye movements



<https://entokey.com/neuro-ophthalmology-3/>

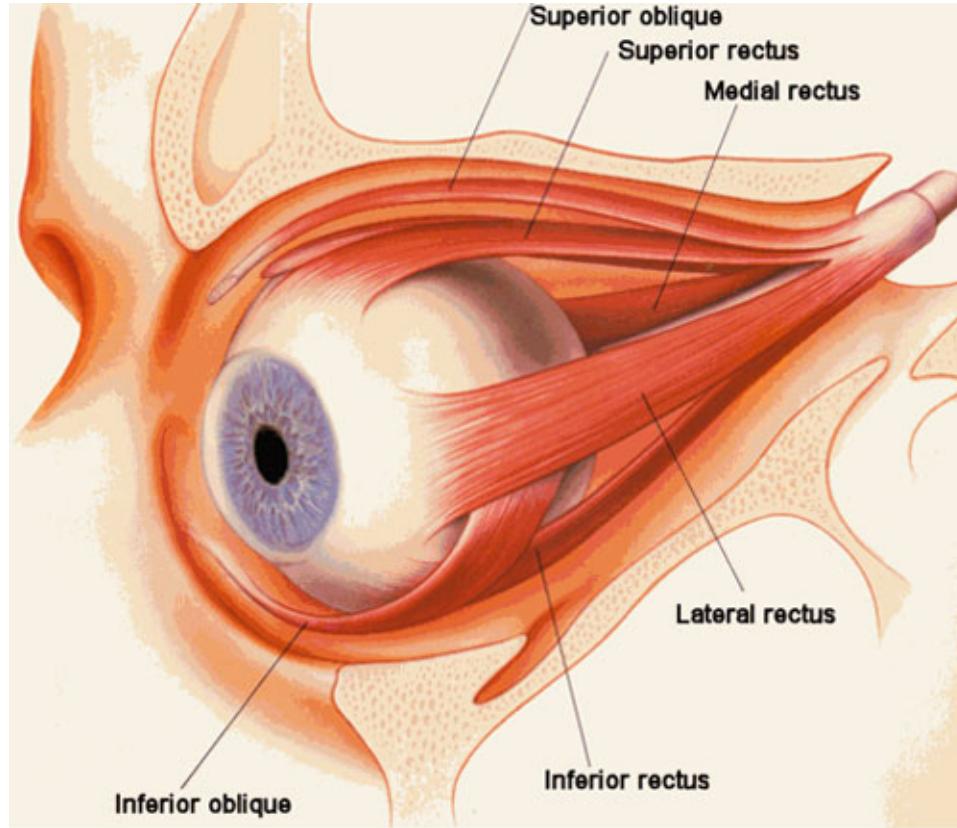
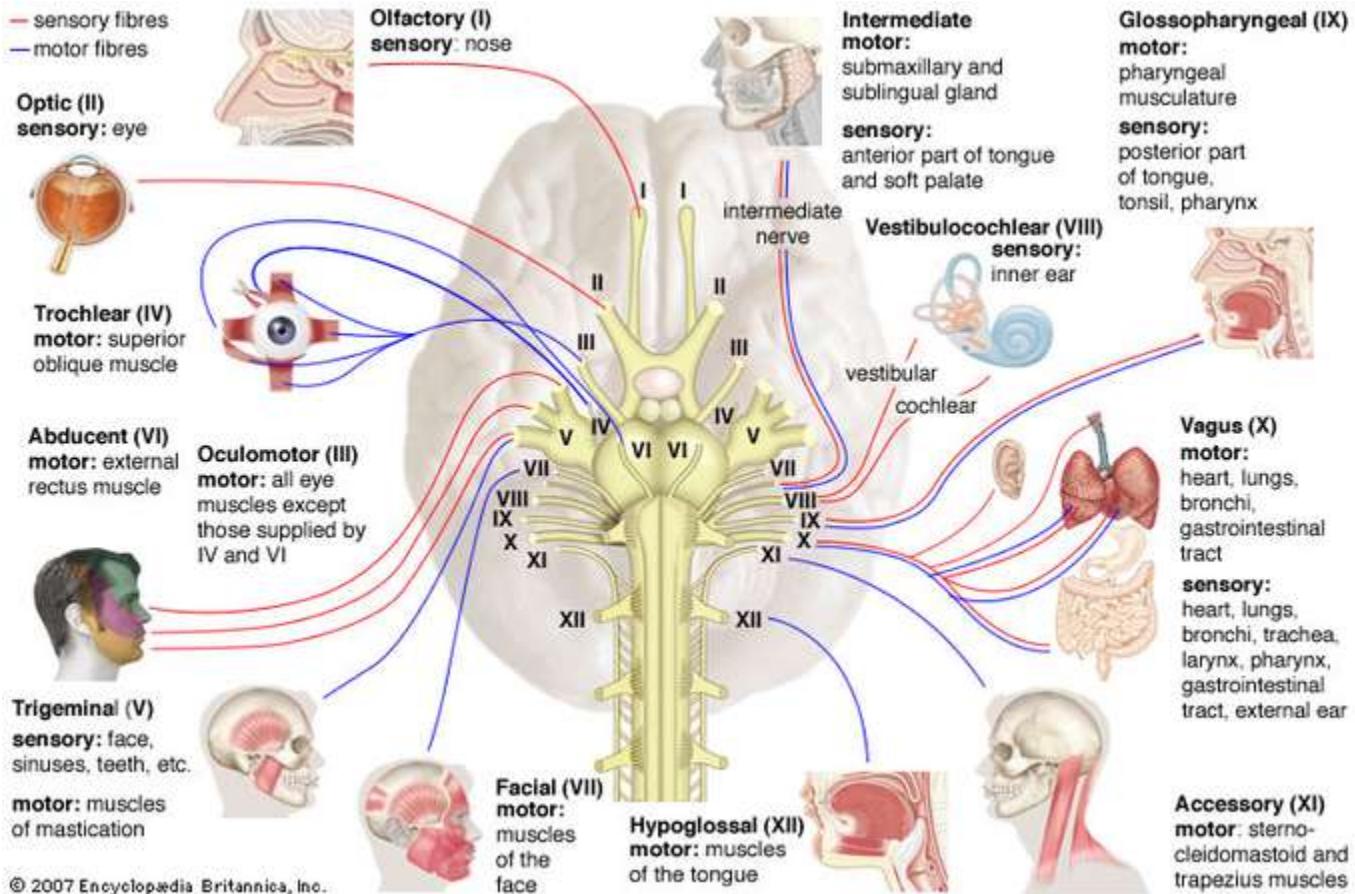
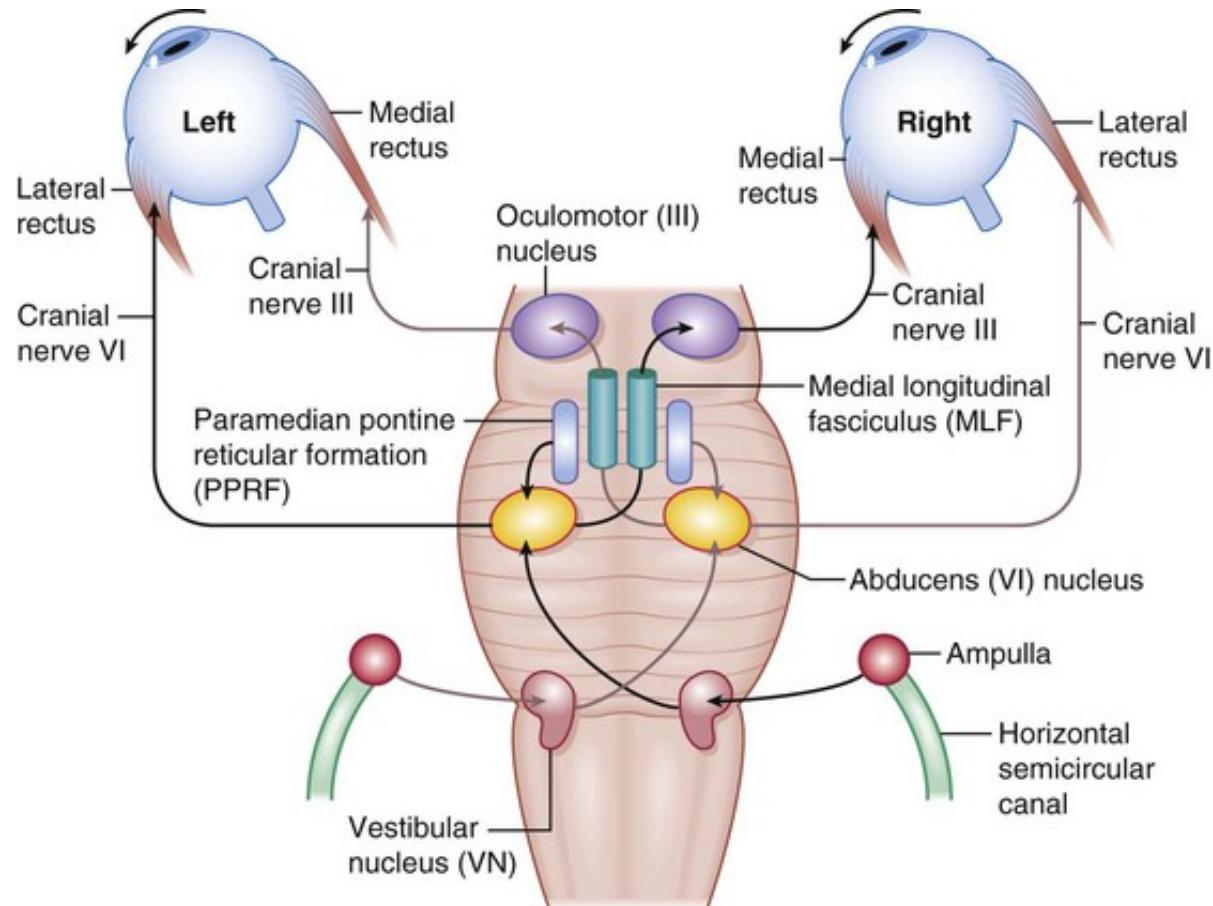


Fig. 1 Extraocular Muscle Anatomy

6 muscles/eye (superior/inferior and medial/lateral rectus + superior/inferior oblique)

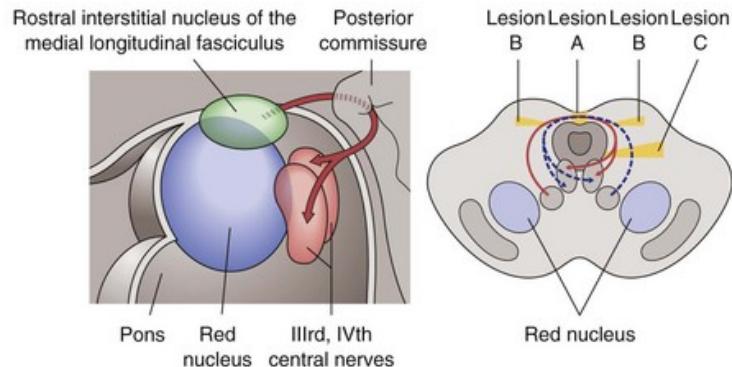


# 3 cranial nerves: III (oculomotor); IV (trochlear); & VII (abducens)

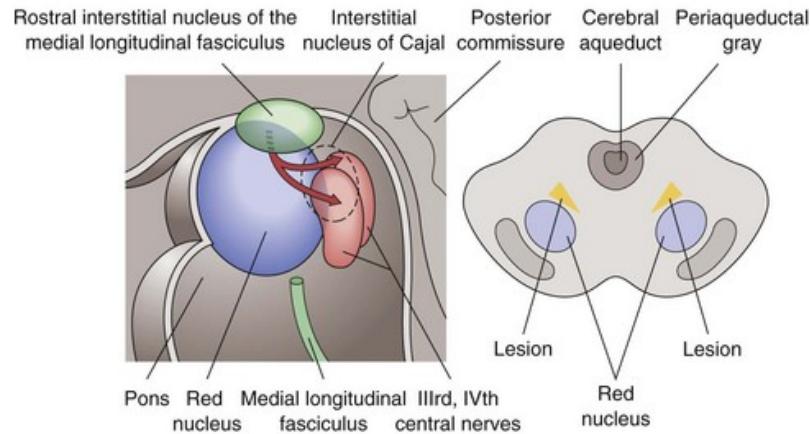


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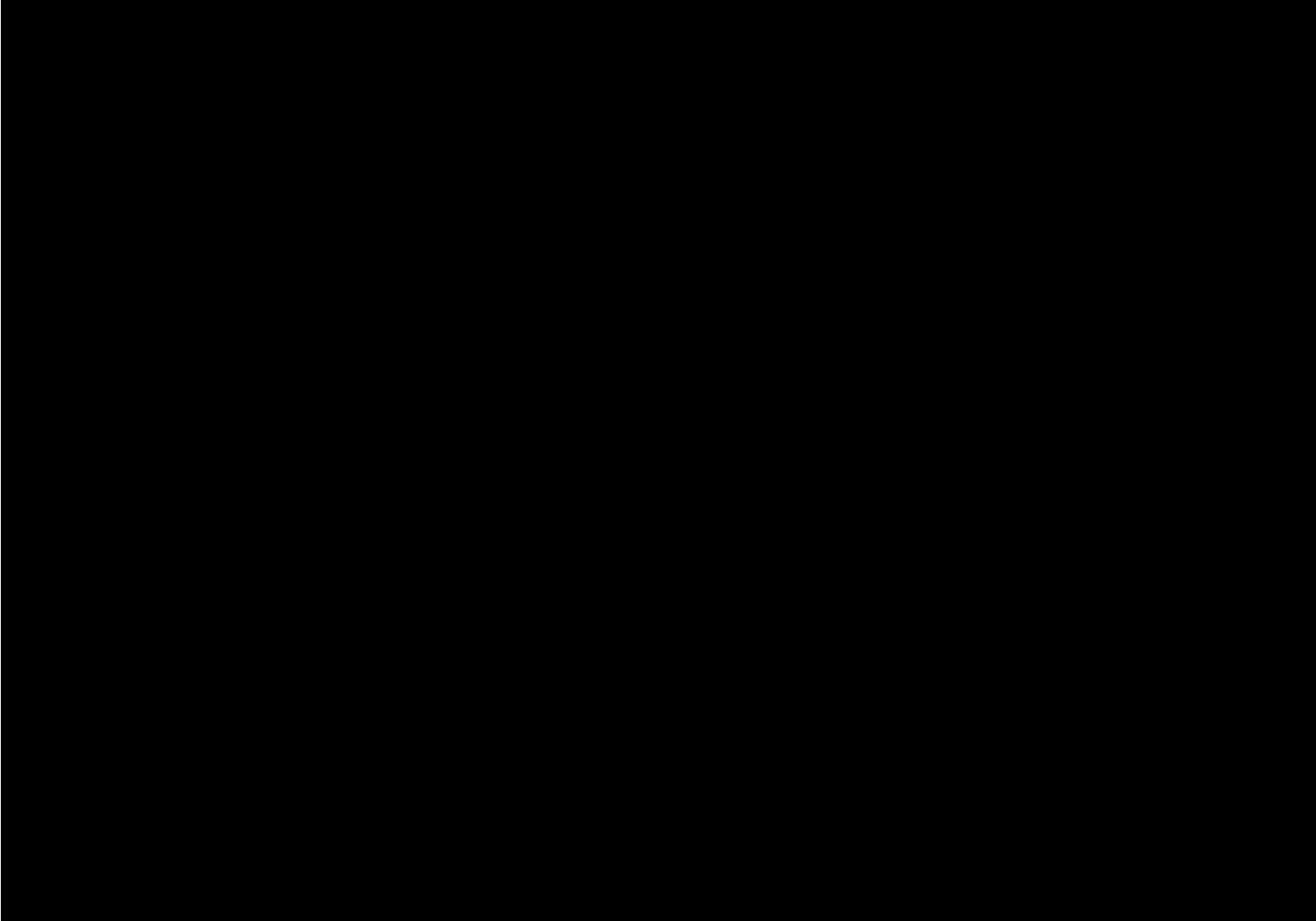
### Upgaze



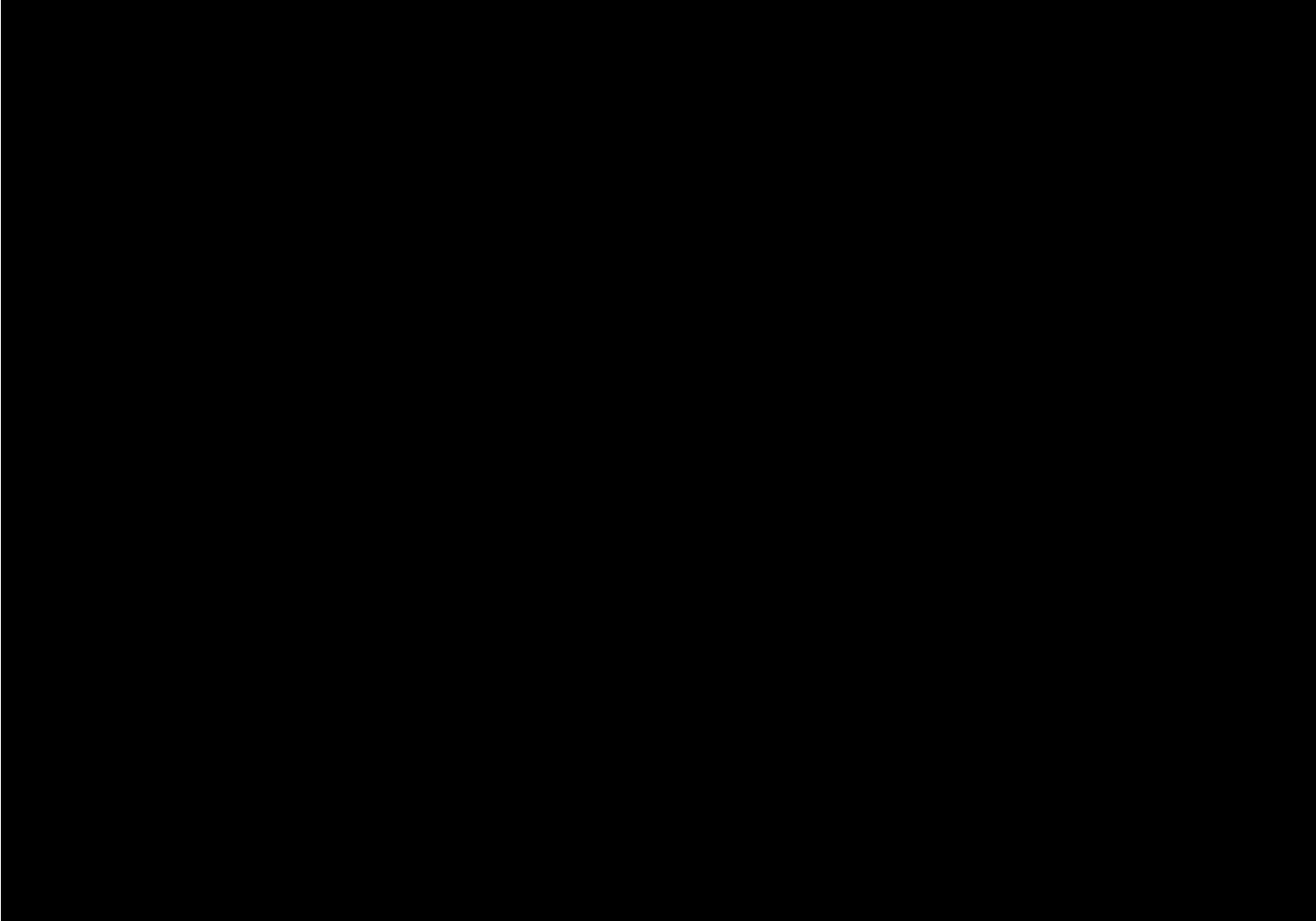
### Downgaze



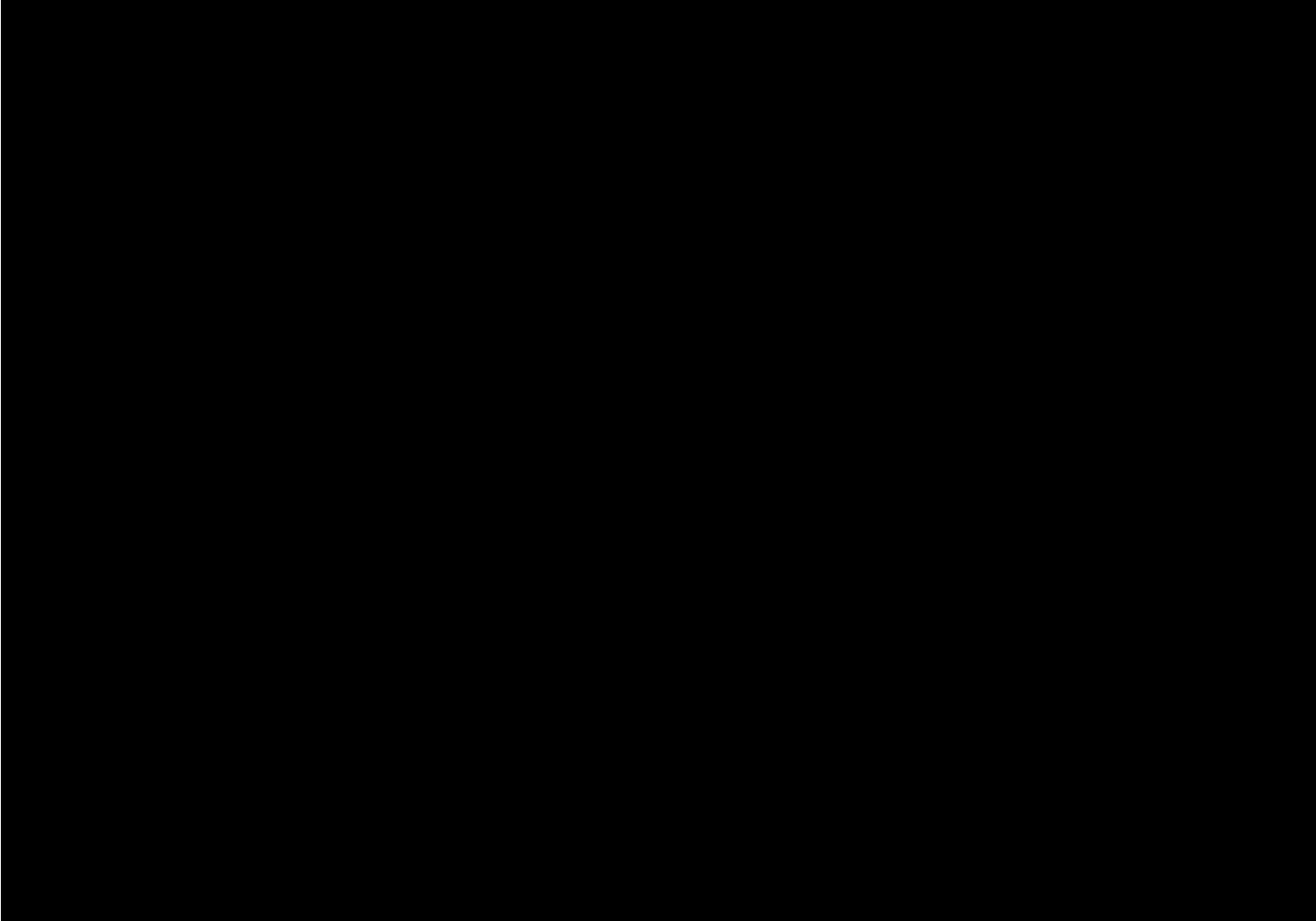
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Wilkinson, K. (2014). Preliminary investigation of visual attention to human figures in photographs: Potential considerations for the design of aided AAC



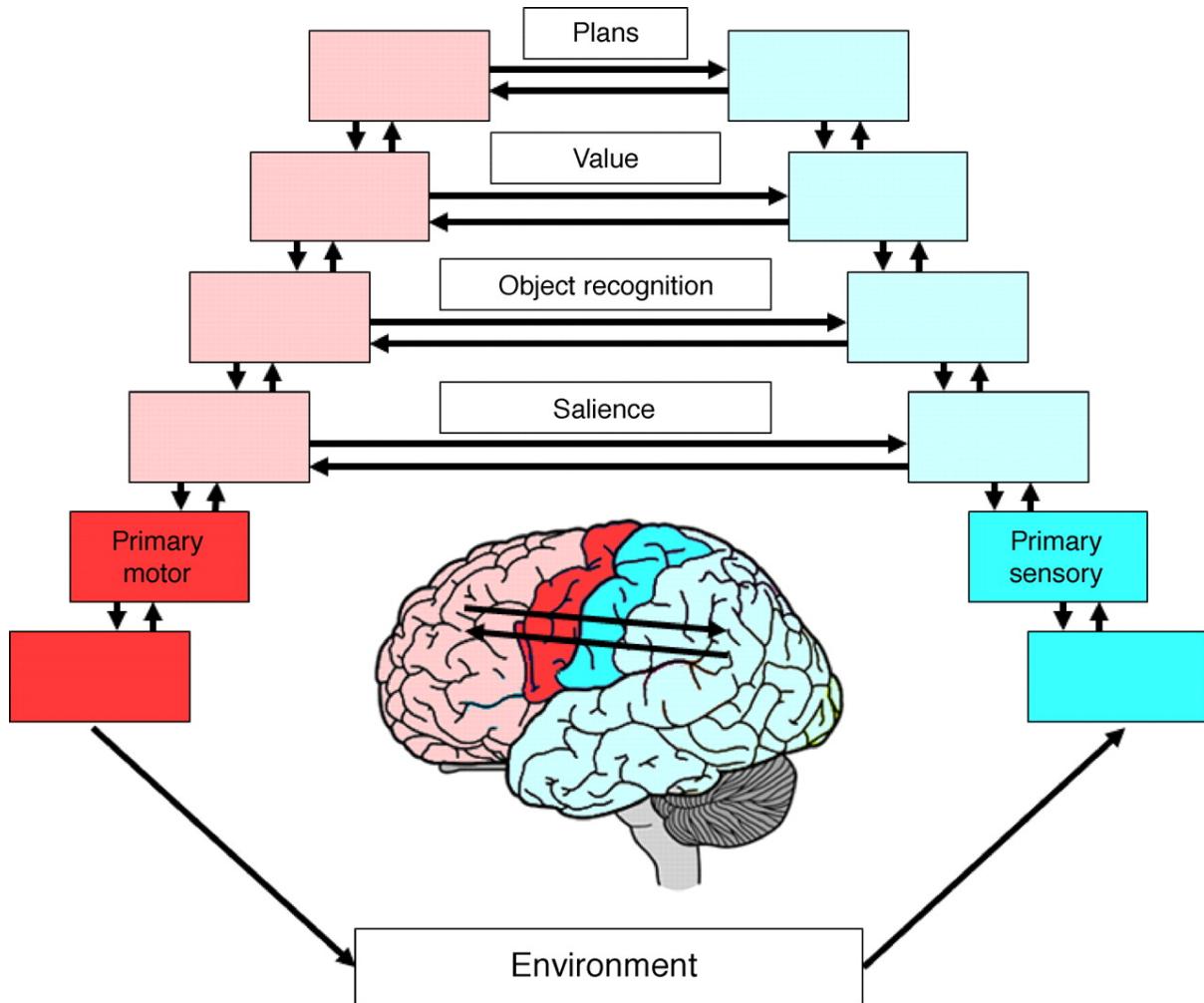
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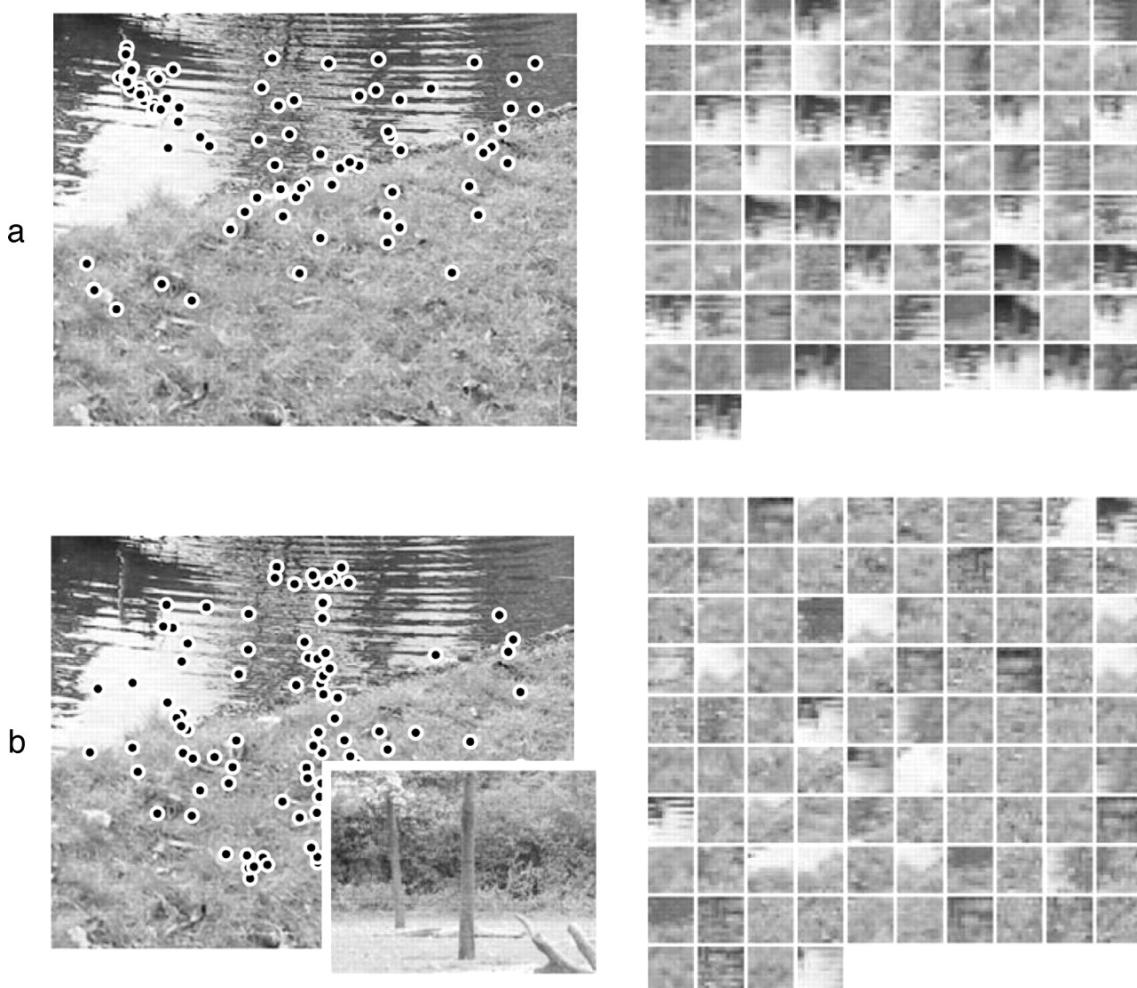
Wilkinson, K. (2014). Preliminary investigation of visual attention to human figures in photographs: Potential considerations for the design of aided AAC

# Break

Schütz, A. C., Braun, D. I., & Gegenfurtner, K. R. (2011). Eye movements and perception: a selective review. *Journal of Vision*, 11(5). Retrieved from  
<http://dx.doi.org/10.1167/11.5.9>

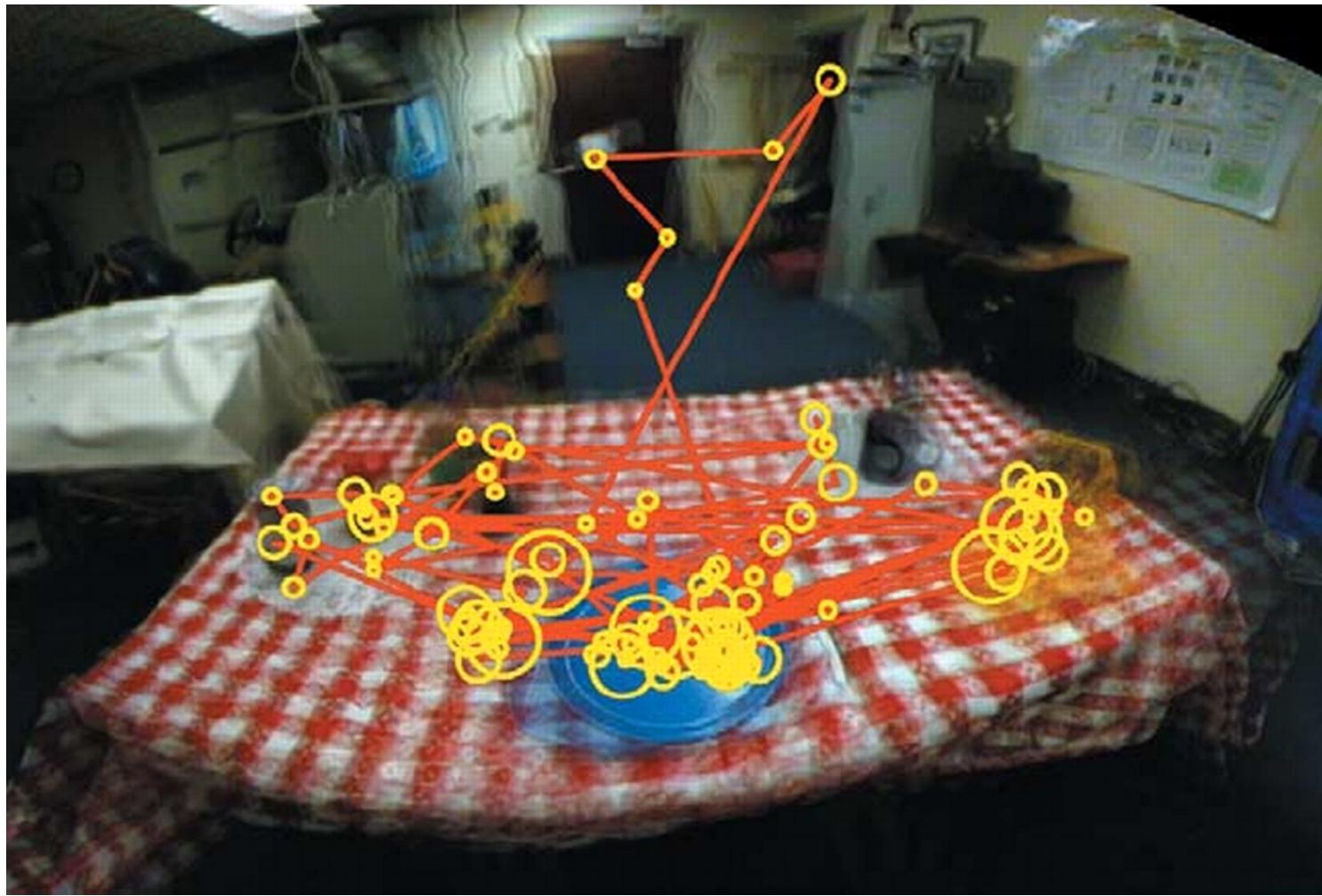


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