Depth estimates in half occluded regions of natural scenes

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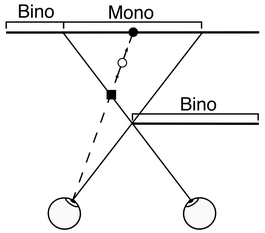
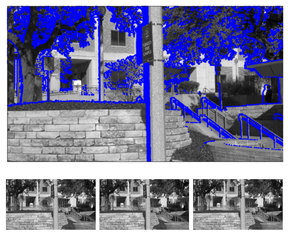
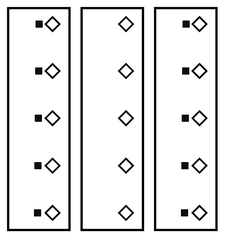
Background

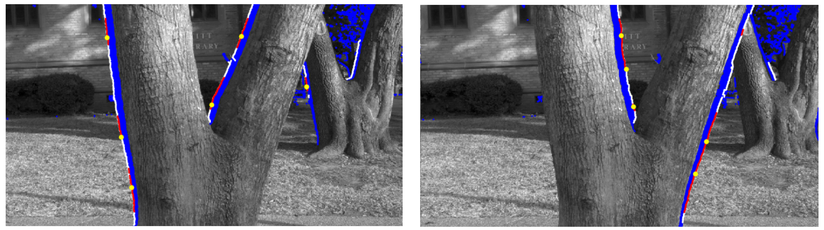
- Binocular disparity: an important cue in depth-estimation, eye-fixation, 3D-movie viewing
- Binocular cues not available in half-occluded regions. ~10% of points in natural scenes
- How well do humans estimate depth in half-occluded regions in natural scenes?



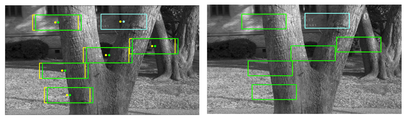


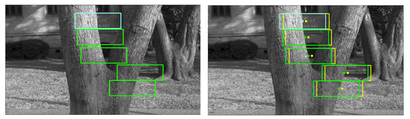


Stimulus Generation

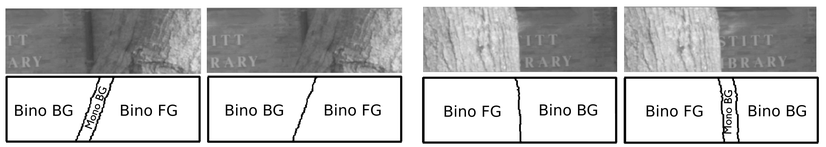


- No overlap between patches
- Half-occlusion zone width (12 - 30arcmin)
- Half-occlusion zone height (80% of patch height)



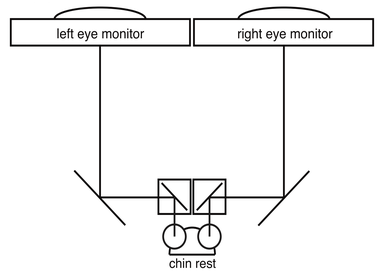


- 700 patches with contiguous half-occluded regions
- Fixed contrast and mean luminance
- Patches partitioned into regions by visibility

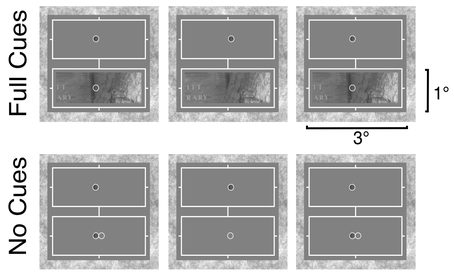


Methods

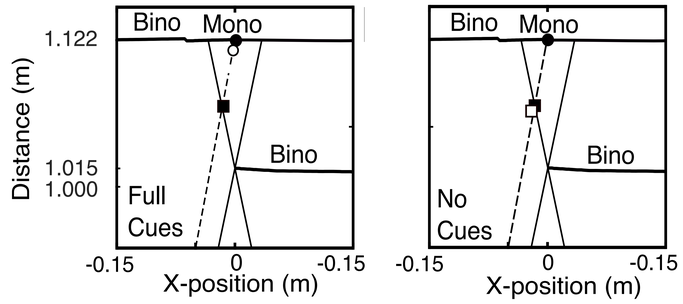
Apparatus



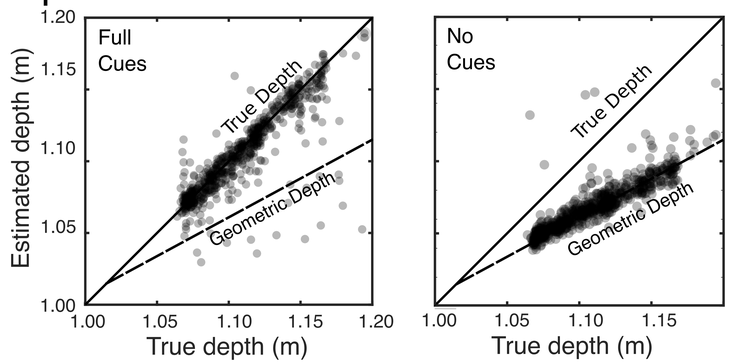
Stimuli

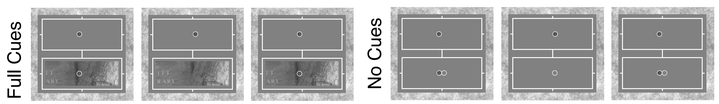


Procedure



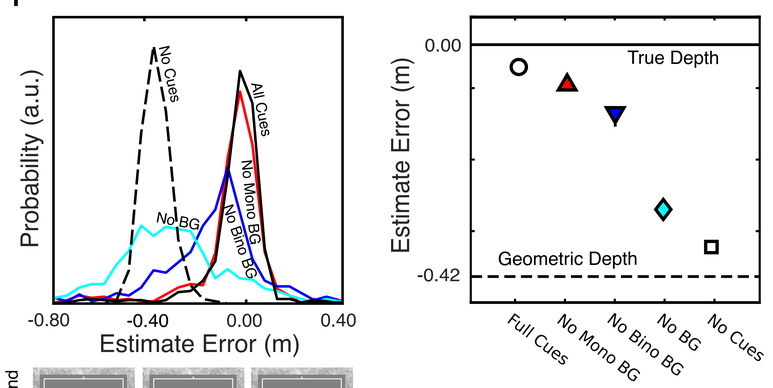
Experiment 1

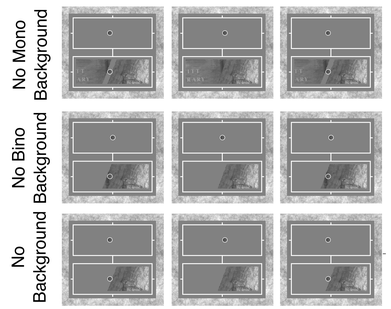




- Humans make accurate estimates of depth in half-occluded regions of natural scenes when full cues are present
- In impoverished conditions, estimates adhere to constraints specified by stereo-geometry, consistent with previous work.

Experiment 2





- In natural half-occluded regions, human depth estimates rely on cues from foreground and both background regions
- Systematic decrease in accuracy as background image cues are removed

Conclusions

- Humans make accurate estimates of depth in half-occluded regions of natural scenes when full image cues are available
- Performance deteriorates systematically as different image regions are removed
- Future work: Measure perceived 3D depth structure in half occluded regions