INTRODUCTION

- Previous research has found the combination of visual and haptic cues for 3D shapes and slants to be statistically optimal according to a maximum-likelihood estimation (MLE) model.
- However, cues from different senses such as vision and haptics have trouble combining in cases where the stimuli are noisy and unreliable.
- In this study, we looked at the combination of vision and haptic cues under noisy and non-noisy conditions for slanted surfaces.

METHODS

Haptic Stimulus: Two plexiglass boards, with a block of foam on the other side. They are separated by pink blocks, one of which connects to the rotating motor. Subjects interacted with the stimulus with a two-/finger grasp.

Visual Stimulus: A random dot stereogram constrained by a square aperture. The 2D diagonal line probe is depicted to the left. Shown image is a simulation, not the actual stimulus used.

Subjects looked at or felt 3D slanted surfaces. After being cued to "Look" or "Touch" through an audio cue, subjects matched the slant angle they saw and/or felt using a 2D diagonal line probe. The angle of the probe was gathered as a measure of the perception of slant.

CONCLUSIONS

- Cue combination of visual and haptic cues was not shown during this study, across both noisy and non-noisy visual and haptic cues.
- Combined cue estimates were shown to be a weighted average of the single-cue estimates weighted by their variances.
- The calculated combined cue variances were higher than predicted by the MLE model.
- The haptic cue may have been too unreliable, as visual capture was observed occurring over the course of experimental sessions. This suggests that the two-finger grasp used to estimate haptic slant was not a reliable method to measure slant.
- The values of noise used in this experiment may not have produced large changes in the variance of cues.

FUTURE DIRECTIONS

- To prove or disprove the MLE model's predictions for this study, a two-interval forced choice (2IFC) task must be performed to get the reliability and theoretical variance of each cue in the form of a just-noticable difference (JND) of slant discrimination.
- Adjustment of the haptic stimulus and the noise conditions would need to be performed to improve the haptic reliability and produce stronger noise conditions.

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