



# Comparing Response Threshold of Contoured versus Non-Contoured Stereograms

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## Introduction

- Previous studies indicate that spatial frequency affects stereo acuity. A study conducted by Schor and Wood in 1983 used psychometric functions to measure the effects of spatial frequency on stereo acuity using differences of Gaussians as stimuli.
- This experiment measures the effects of spatial frequency on stereo acuity through signal detection theory using filtered random dot stereograms as stimuli. We also introduced stereo masks that were spatially filtered.
- The application of this research is to demonstrate the comparison of the Gaussian curve and the random dot stereogram methods, as well as to further understand situations where subjects perform differently.

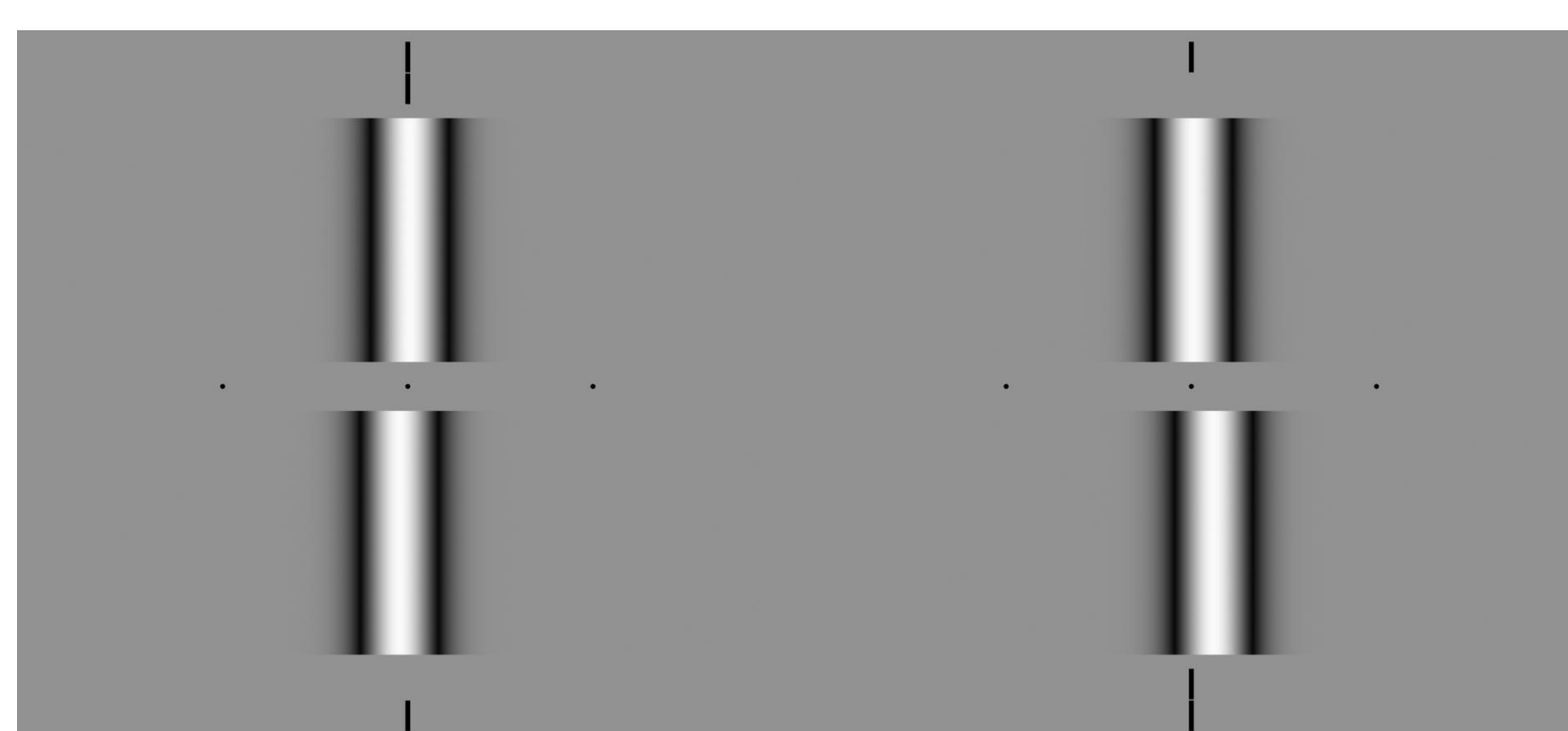
## Definitions

- **Stereopsis:** Depth perception that arises from a disparity between the images presented to the two eyes.
- **Stereo Acuity:** The minimum disparity that a person can identify under a set condition — how much brightness change across the space.
- **Spatial Frequency:** How far apart repeating patterns appear to be, expressed in terms of cycles per degree of visual angle.
- **Difference of Gaussians:** A mathematical profile in which a broad Gaussian is subtracted from a narrow one such that the resulting difference will create an overall luminance that matches the background luminance.
- **Random Dot Stereogram:** Pair of images composed of an array of random dots in which parts of one is shifted relative to the other, resulting in the perception of depth in that area when the images are presented to the two eyes.

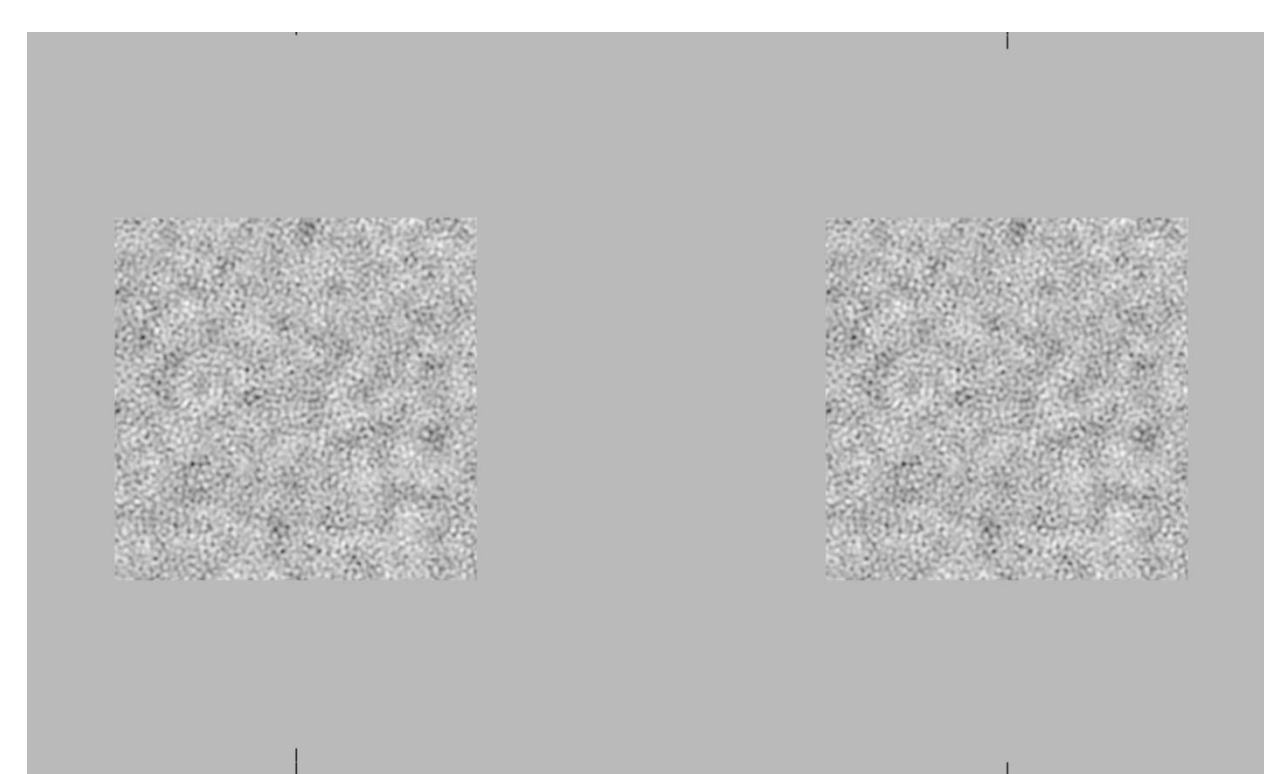
## Methods

- Random dot stereograms of five different crossed and five different uncrossed disparities were used to test each subjects' stereo acuity across a range of spatial frequencies. We then presented the same targets with spatial frequency masks.
- Images created on *Matlab* were presented on an Apple Macintosh desktop computer through a Maxwellian view system. A two-alternative forced choice method was utilized, with choices of depth vs no depth.

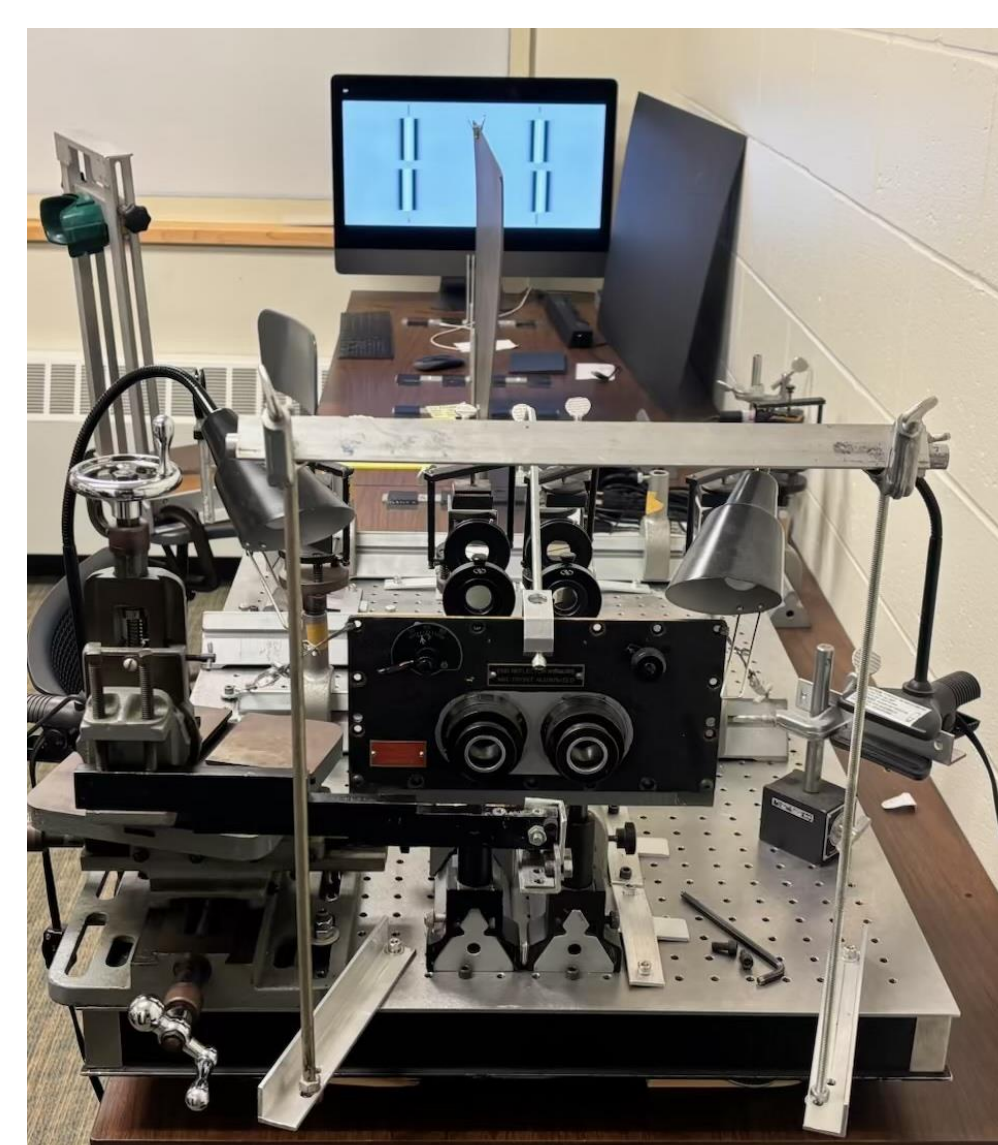
## Apparatus



Example Gaussian Stimuli

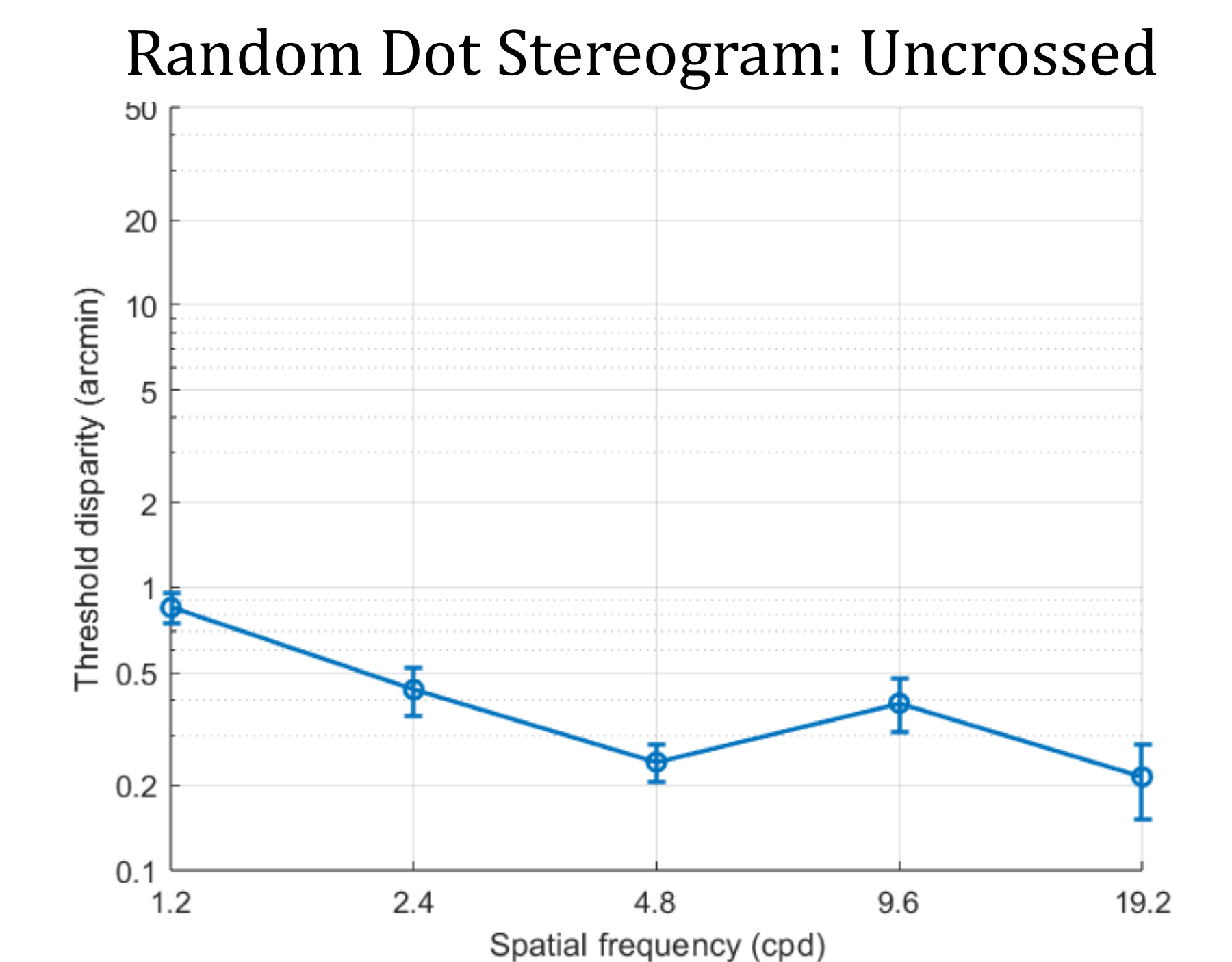
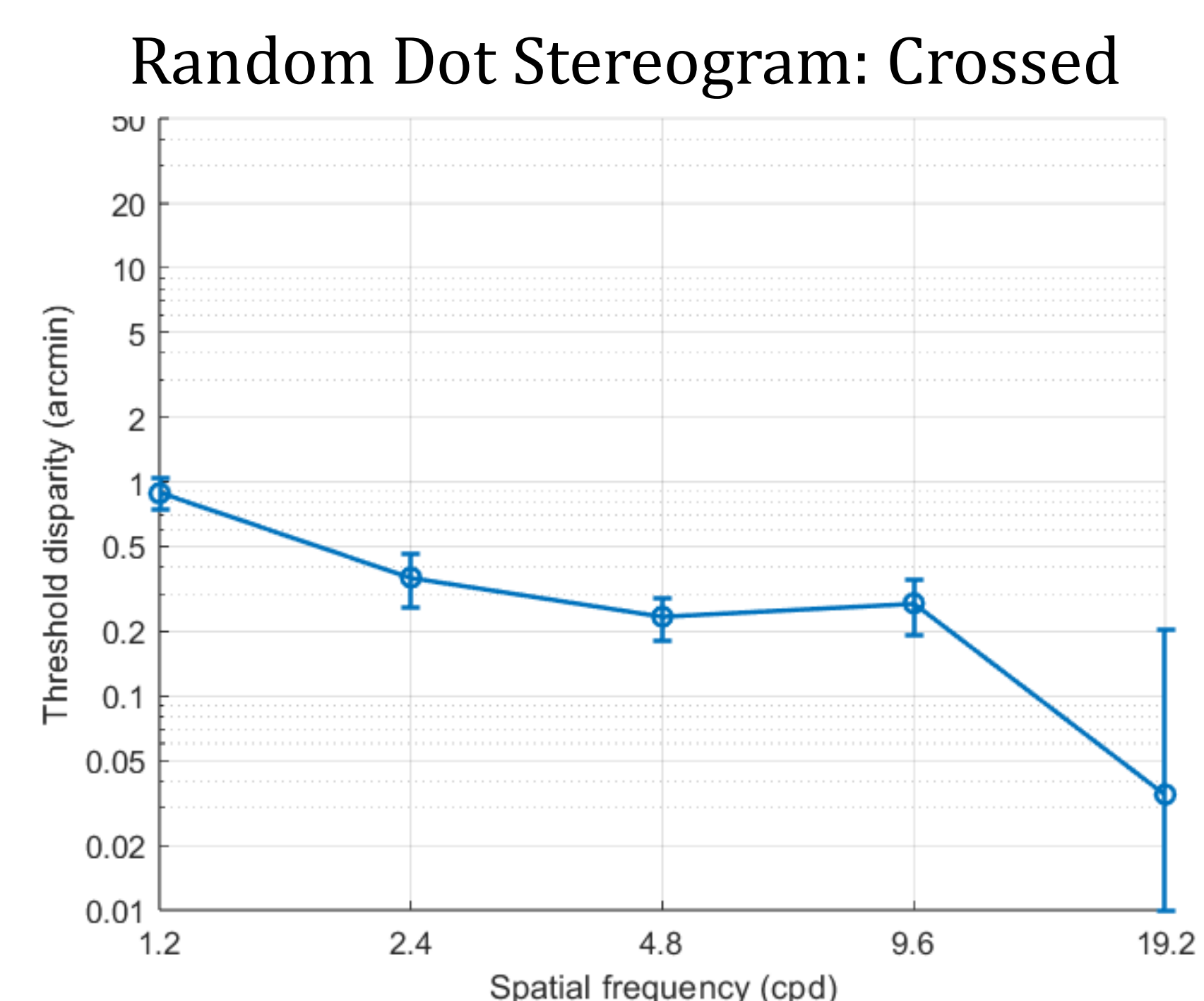
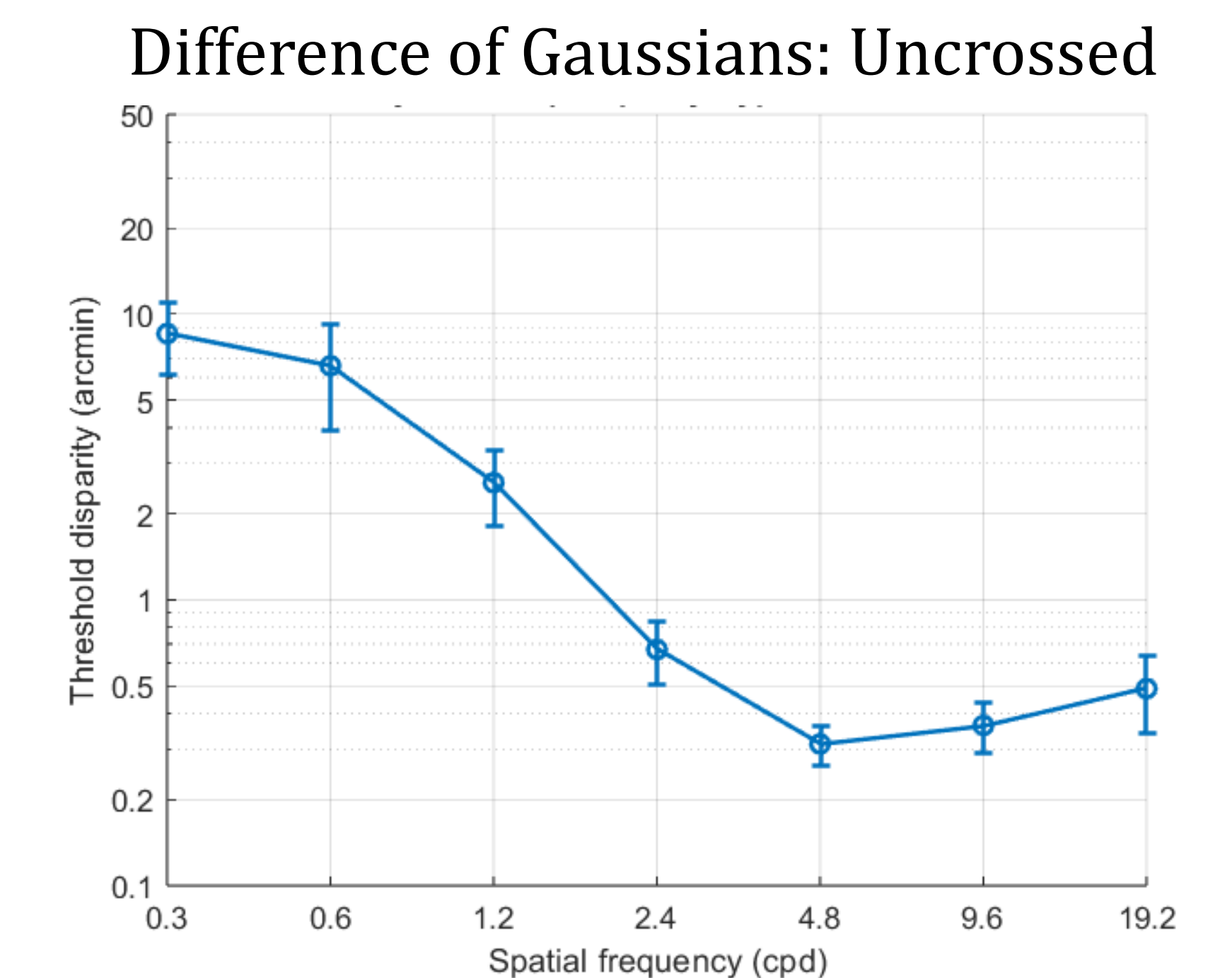
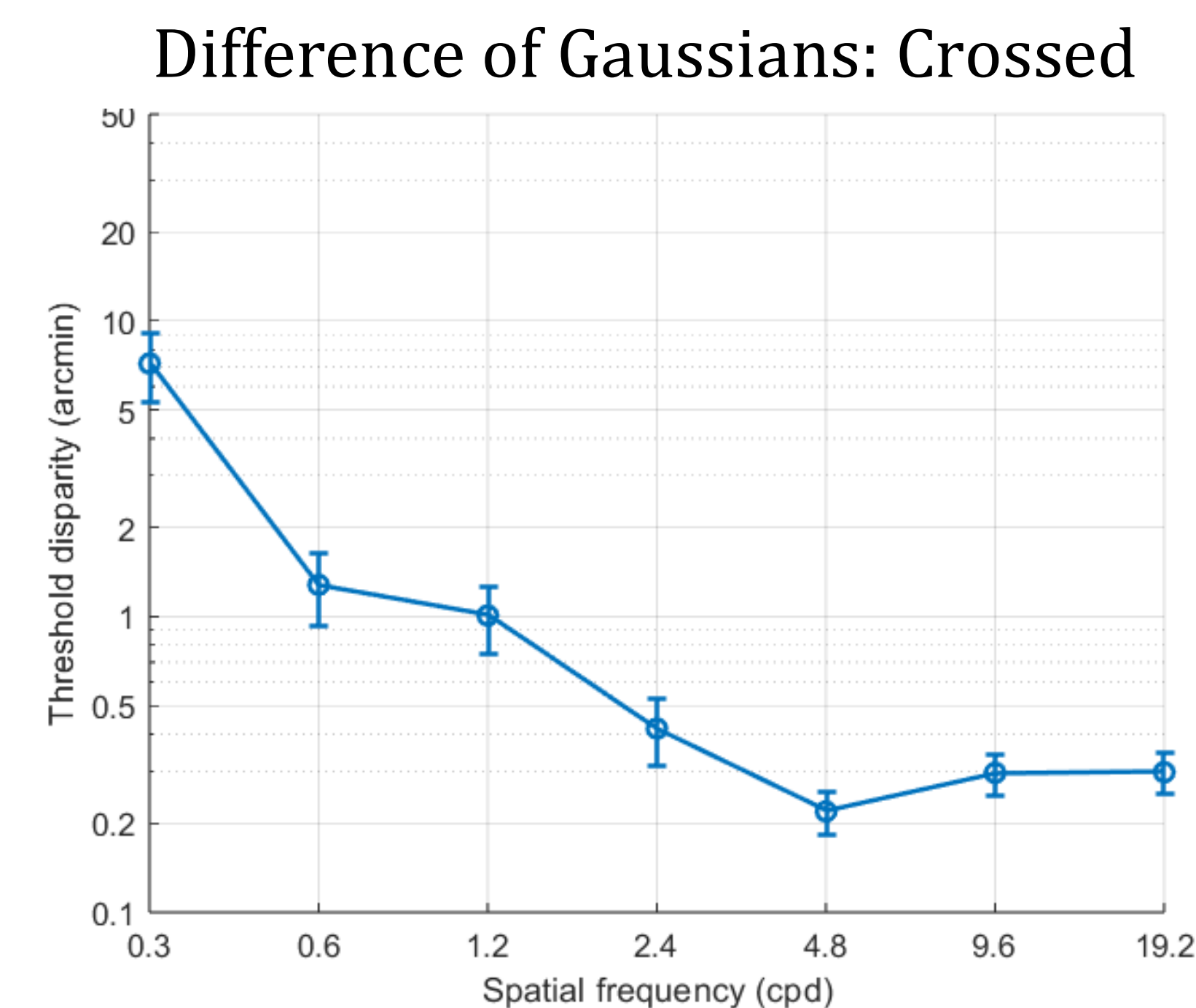


Example Random Dot Stereogram Stimuli



Stereoscope Setup

## Results



## Discussion

- Results demonstrate leveling out at 2.4-4.8 cpd, with lower spatial frequencies exhibiting exponential decline
- Provide evidence towards random dot stereograms being compared to gaussian curves as an alternative method to examine disparity
- Next steps are to increase the lower range of spatial frequencies for random dot stereograms for better comparison.
- Amending the computer analysis to reduce error cause by software to achieve better results.

## References

Schor, C., & Wood, I. "Disparity Range for Local Stereopsis as a Function of Luminance Spatial Frequency." *Vision Research* 23.12 (1983): 1649-654