CSE 493V Final Project

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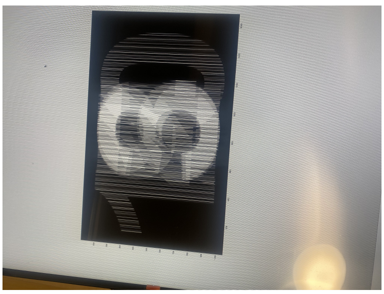

1 INTRODUCTION

For this project, I attempted to build a glasses-free 3D display. In my project proposal, I stated that I wanted to create a 3D display that could support multiple viewing angles to allow several people to view it simultaneously. While this is theoretically possible, I soon realized that the challenge was not just software-related; the ability to support multiple viewing angles heavily depended on the specific type of lenticular sheet used.

Lenticular sheets work by directing specific images toward each eye—typically with each image slightly offset to simulate depth. The key difference between single-angle and multi-angle 3D displays lies in the lens density and optical properties of these sheets. The lenticular sheet I used for this project was 17"x13" with a density of 90 LPI (lenses per inch), which influenced how effectively the image could be directed to the viewer's eyes.

2 RESULTS

By interlacing an image using Python and MATLAB, I was able to combine the lenticular sheet with my processed image to produce a visible 3D effect. This worked particularly well using the MATLAB code I was provided, which served as a reference for the interlacing logic. However, when attempting to replicate the same functionality in Python, I encountered several issues and was unable to generate a properly formatted image. Despite these setbacks, I successfully assembled the 3D display and used the provided MATLAB code to achieve a working 3D visualization.

2.1 Challenges

One of the most significant challenges in this project was learning how to interlace an image for lenticular display. This was a completely new concept for me, and I had to independently research and experiment with it. Although my Python implementation did not fully succeed, the experience gave me valuable insight into both image processing and display calibration.

Another challenge was translating the existing MATLAB code into Python while using different tools and materials from those in the original project. These differences made it difficult to replicate measurements precisely and achieve consistent results. Below is an example output generated by my Python code:

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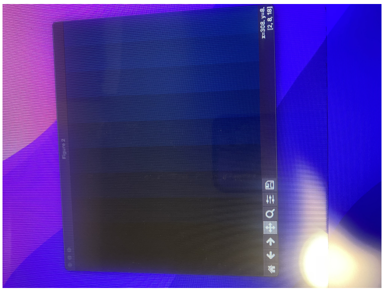

3 QUESTIONS

After completing the core of this project, one question I had relates to the acetate diffuser I requested. This diffuser was intended to work in tandem with the lenticular sheet to improve the display's quality. However, after testing with and without the acetate layer, I noticed no significant difference in the effectiveness of the 3D visualization. Interestingly, moving the lenticular and diffuser sheets across the screen did produce subtle variations in depth perception, including a dimming and flattening effect that I do not yet fully understand.

4 CONCLUSION

This project gave me valuable hands-on experience with both hardware assembly and image processing for glasses-free 3D displays. Although my Python implementation did not function as expected, I gained a strong conceptual foundation in interlacing, lenticular optics, and stereo image rendering. Moving forward, I hope to debug the code further and refine the calibration process to achieve a fully functioning multi-angle 3D display.

5 ACKNOWLEDGEMENTS

I would like to thank Professor Lanman for sparking my interest in glasses-free 3D display technologies and for taking the time to help me understand these concepts outside of class. This project was both a challenge and a joy to work on, and I look forward to continuing my exploration in this area.