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Portable Ergonomic Mirroring Device Documentation

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This project is meant to provide an easy way for users to do various desk activities in a more ergonomic position, preventing future health problems such as neck and back pain.

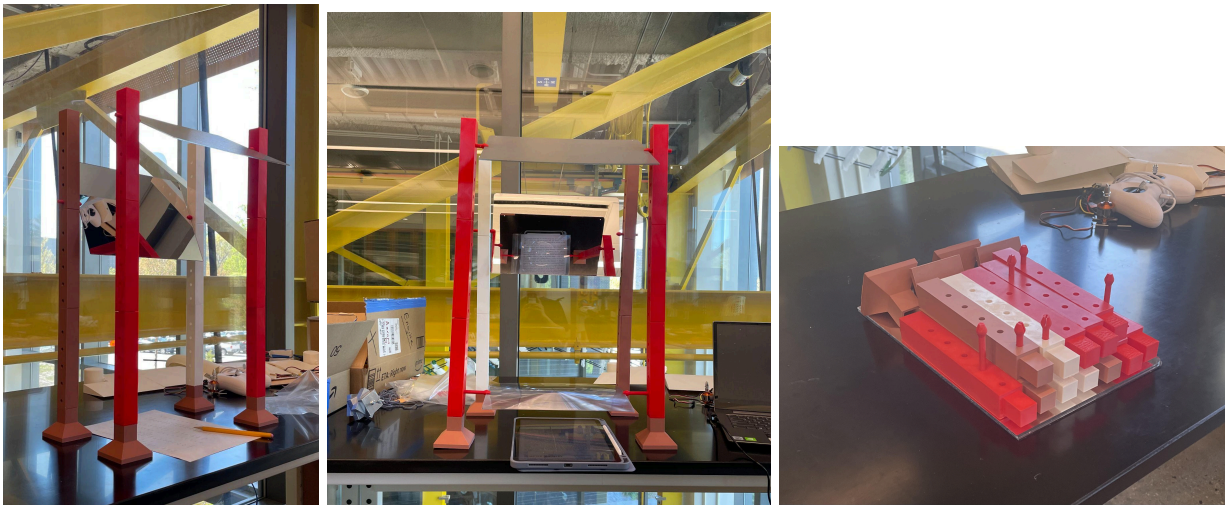
Current alternatives include lazy glasses, but these are usually too heavy and cause neck strain by themselves if used in a seated position, and projection software which project the desk view to a screen.

Main Goals of Project:

1. Device allows the user to maintain ergonomic posture and look forward while viewing the desk below them.
2. Device is structurally stable and can withstand sufficient unplanned stresses.
3. Device is portable.

Current Design:

The current design uses four base square pyramid pieces that each attach to modular support pieces that make up the bulk of the design. Each base has 3 corresponding modular support pieces to reach the desired height. These pieces easily slide in and out of each other with a press fit connection. Once the supports are assembled, the “pinchers” can be placed in any of the holes in the supports based on the ergonomics of the individual who is using the device. Then, the mirrors and lens are attached in a manner such that the user can see under the lens.



Design without lens (left); design with lens (middle); design compacted to a 3.5 by 11 by 8.5 inch volume (right).

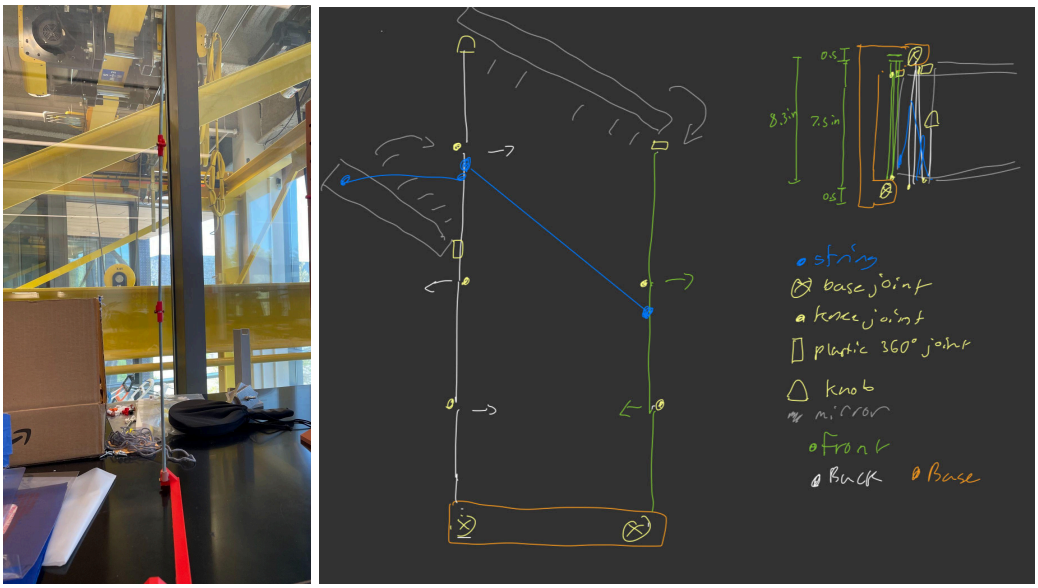
Comparing the Design to the Goals:

The device allows the user to see the desk in front of them while maintaining ergonomic posture (see the middle picture above where the iPad can be viewed through the mirror). It is also structurally stable compared to stray gusts of air and slight knocks. It can also be deconstructed and reconstructed in less than a minute. Thus, it satisfies the main goals of the project. However, there are a few key parameters that could still be addressed:

1. The current lens has to be placed low enough so that the light focuses properly, but this prevents the user from using a pencil longer than ~5in while using the device.
2. Attaching the pinchers to the mirrors and lens is not very easy, and having a better and more secure method of attachment would be preferred.
3. The stands will still fall over if hit accidentally with mild force.
4. The space between the pillars is too small to read a large textbook or other tasks that require a larger working area.

The Original Design:

The first design that was assembled was much more portable and convenient for the user; it was also much more complex. It folded down and used custom magnetic joints that had more than 10 iterations of designs. However, it was too structurally unstable and thus, unusable. The current design is more of a proof of concept than an end product. An end product would hopefully be closer to matching the portability of the original design while also solving the four aforementioned issues.



One pillar of original design pictured on the left, drawing of the design on the right.

A future iteration of this project would do well to incorporate some ideas from the first and proof of concept designs as well as their own ideas. Perhaps if a significantly wider diameter metal and/or additional structural supports were used in the first design, stability would not be an issue, but perhaps other issues would arise.

Conclusion:

This project is at a point where a user could use the current design to read a small book or do homework with a small pencil. With a few significant improvements, this project could produce a usable product.

Appendix A: Manufacturing the Design

Print the fusion files in the shared folder with the printing parameters below.

- Prints needed:
  - 12 supports, usually done in 4 print batches of 3
  - 4 mirror pinchers and 2 lens pinchers (can be printed together)
  - 4 bases (can be printed together)

Printing parameters (PLA):

- Mirror pinchers
    - 60% infill, brim
- Lens pinchers
    - 60% infill, brim
- Base
    - 20% infill, brim
- Supports
    - 3% infill, brim, cubic

Appendix B: Other Possibly Useful Notes from the Design Process

There were four main types of designs that were considered. The inverting lens option is much more compact and simpler than the current design, but we could not find such a large lightweight inverting lens. The first mirror option only allows for computer usage, and the last option, using a software to flip your screen, requires the least amount of physical parts, but that design does not allow users to use the device for books or other things besides their device with software on it.