

Groovy Self-Cleaning Glasses

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Problem Statement

- Some individuals who wear glasses and are on the autism spectrum, including Client X, experience difficulties in caring for their glasses. These include:
 - Forgetting to clean one's glasses (*Autism and Poor Hygiene, 2023*)
 - A lack of fine motor skills
- Infrequent cleaning of lenses coupled with frequently touching the lenses leads to the build-up of oils and debris on the lenses.
- Dirty lenses negatively effect and significantly decrease the vision, autonomy, and health of these glasses wearing individuals (Fritz et al., 2018).

Background

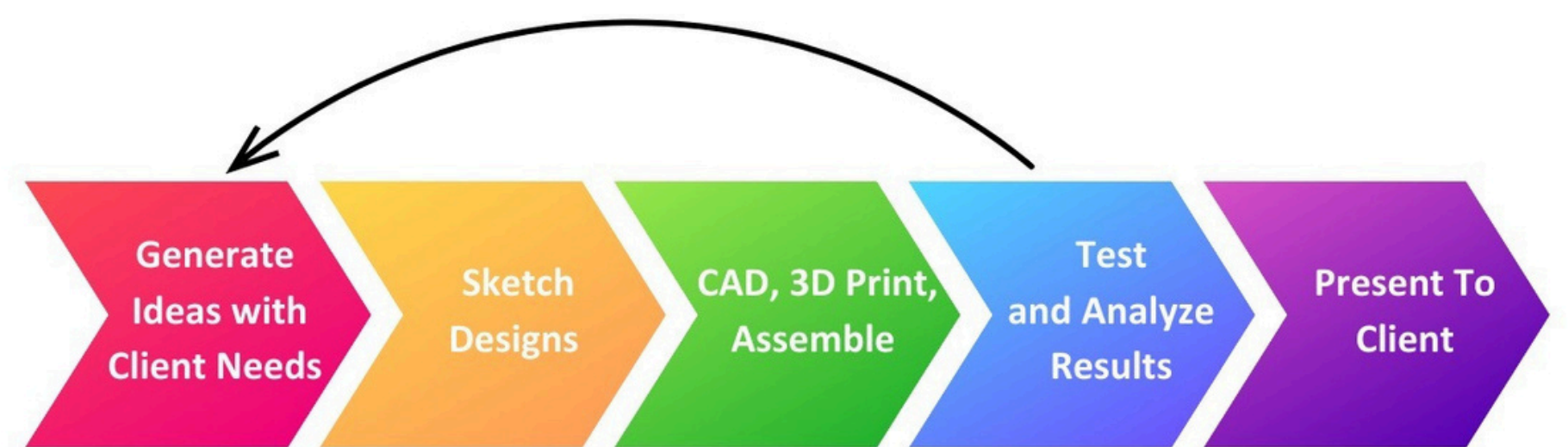
- Individuals with Autism Spectrum Disorder may experience difficulties in performing nonroutine tasks such as cleaning one's glasses
- The client requires glasses for their autonomy due to nearsightedness stemming from Retinopathy of Prematurity
- Dirty lenses can cause eye strain and bacterial contamination (Cleveland Clinic, 2023) (Fritz et al., 2018)
- Competitors either require user to initiate cleaning process or do not properly sanitize the glasses



Design 4: Final Product

- Added the sponge and microfiber cloth to bar
- Added croaky for extra support and to stabilize glasses on user's face
- Increased spacing of hinge to allow pins to fold
- Attached hinges to legs and thickened legs to reinforce them
- Improved method of application of copper for a smoother finish

Methods



Level 1 Requirements

- The device shall **remove dirt and smudges** caused by finger oils on **both sides** of each lens.
- The device shall **sit securely** on the user's face
- The device shall **clean itself** without being prompted by the user.
- The device shall be constructed so that all nonpermanent materials may be **replaced without deconstructing** the entire device.
- The **user shall put down and pick up** the glasses in the orientation as described in the user manual.



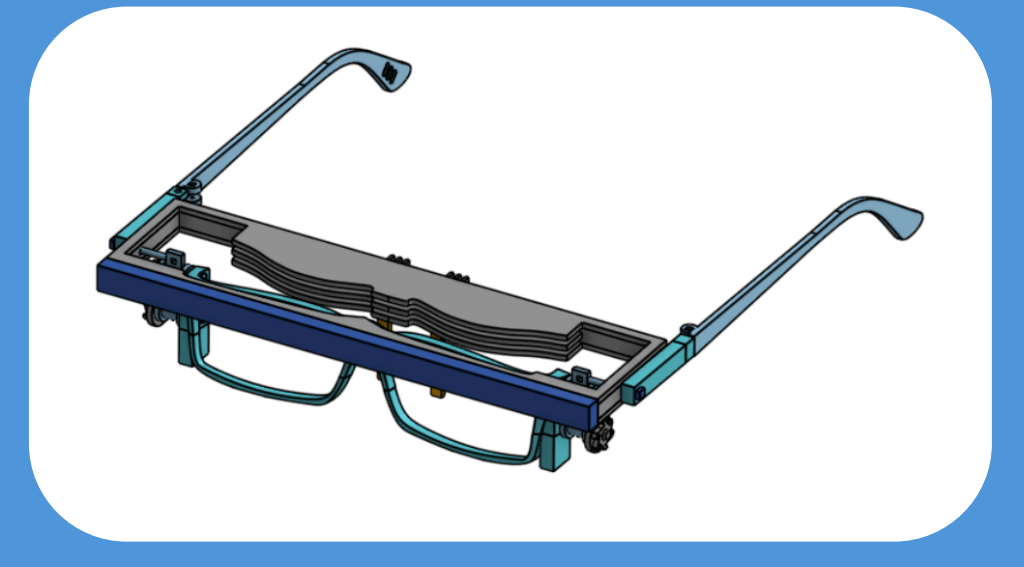
Design 1: Initial CAD and 3D Print

- Proof of concept
- Identified main issues: supports in critical areas, ridged legs, bar in line of sight



Design 2: 2x Scaling

- Identified issues with ratchet-junction system
- Split bar and ratchet for improved printing
- Added material to support weak points



Design 3: Fine Tuned Adjustments

- Contoured bar and frame to client's lenses
- Extend nose pins to lift bar out of vision field
- Improved sizing of pins

Design Study 1: Absorbance

Purpose: Determine which material is more effective at absorbing lens cleaning fluid.

Criteria: A minimal volume of fluid drips into a container below when a controlled volume of fluid is pipetted onto the compartment of the glasses containing the material.

Result: Sponges retain more fluid than alcohol-based lens cleaning wipes.

Design Study 2:

Purpose: Determine the ideal amount of sanitization fluid for removing finger oil smudges on lenses.

Criteria: The material must consistently remove the smudges caused by finger oils on both sides of the lenses in a minimal number of bar passes.

Result: Sponge components should be saturated to 90% of their max saturation. For the back (large) and front (small), this is 5.4 mL and 4.13 mL respectively.

Design Study 3:

Purpose: Determine if the glasses sit securely on the user's face.

Criteria: The product must stay secured on the user's face during normal use. The user must not adjust the product significantly more than the control glasses in a 3-minute period.

Results: The Groovy Self-Cleaning Glasses sit securely on the user's face and are not significantly more uncomfortable to wear than standard glasses.

Conclusion

- The presented design can be used to improve the vision, autonomy, and health of individuals with Autism Spectrum Disorder (ASD) who wear glasses.
- All level 1 and 2 criteria were fulfilled
- With a few modifications to tailor the prototype to specific hypersensitivities, this device could improve the quality of life for our client and many more like him.

Future Improvements

- Improve the aesthetic appeal of the device
- More iterations of Design Study 3 with the client
- Determine precisely how long the sponge stays saturated with fluid under normal use