GNG 2101 Project Report

Project Deliverable B: Needs, Problem Statement, Metrics, Benchmarking and Target Specifications

Submitted by

[GNG 2101 - Lab C 02, Group 2.4]

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Abstract

This deliverable is intended to describe the product's design criteria, with a particular focus on the client's interpretation requirements. These criteria will enable the design team to produce a solution that will enable individuals with high light sensitivity to reduce the number of tinted glasses they use to a single pair via the usage of a lightweight, self-adjusting wearable device. Furthermore, this deliverable necessitates doing a client need analysis, developing metrics, and conducting overall benchmarking versus competing products. In addition, a reflection on the client meeting and unidentified information is included at the conclusion to track improvements to our goods and teamwork.

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1. Client Statements

Client Statements
The client would like to eliminate the need to carry multiple pairs of glasses
Uses tinted contact lenses in addition to sunglasses
Enjoys her current sunglasses that wrap around her face
Current sunglasses are custom made with 80 - 95 % tint (really really dark)
In addition to custom tinted sunglasses, the client wears a brimmed hat when outside to further block the light.
Does not want to lose her peripheral vision.

Does not want designed glasses to be too heavy.
She expressed in interest in having user-adjustable tint
She expressed a preference for functionality over aesthetics

2. Client Needs

Client Statements	Client Needs
The client would like to eliminate the need to carry multiple pairs of glasses	The client wants one pair of glasses.
Uses tinted contact lenses in addition to sunglasses	The client needs two or more layers of tint or darkness.
Likes that her current sunglasses wrap/hug her face	The glasses need to shield the sides of her eyes.
Current sunglasses are custom made with 80 - 95 % tint (really really dark).	The new pair of glasses need to be 85 - 95 % tint.
In addition to custom tinted sunglasses, the client wears a brimmed hat when outside to further block the light.	The glasses cannot be in the way of a brimmed hat.
Does not want to lose her peripheral vision.	The glasses cannot block peripheral vision
Does not want designed glasses to be too heavy.	The glasses are light enough to not strain the user
She expressed in interest in having user-adjustable tint	The glasses allow manual user input
She expressed a preference for functionality over aesthetics	N/A

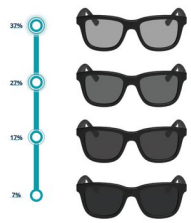
3. Problem Statement

A solution is required for people with extreme light sensitivity to reduce the number of tinted glasses that they carry to perform their daily activities with a wearable device that is lightweight and can automatically adjust to the ambient light.

4. List of Metrics

	Metrics Descriptor	**Units**
Constraint	Cost	Canadian Dollars (CAD)
Constraint	Weight of the glasses	Kilograms (g)
Non-functional	System response time	Seconds (s)
Functional	Visible Light Transmission (%)	*Unitless*
Non-functional	Battery Life	Days

5. Perceptions of Similar Products / Benchmarking

Specification	Cocoons Polarized	Polarized Photochromic Sunglasses UV400 Protection Sports Glasses Eyewear A590	Solar photochromic sunglasses	App-enabled electrochromic smart sunglasses with built-in audio
Image				

Description	These glasses are the one our client had mentioned. They maintain the user's peripheral vision, and they are polarized to eliminate blinding glare. The glasses use a sports frame, which can wrap the user's face.	SUGLSS uses photochromic lenses and UV400 but plastic frames. The lens changes color through different wavelengths in different environments, and the process is approximately 1 minute.	AIDIEN is a brand from China, the difference from other sunglasses is using a solar battery, which means unlimited endurance. The glasses also contain an internal holder to hold the user's own lenses.	This product can use an app to change the tint level of lenses, and it's also a Bluetooth headset. The glasses also have a built-in location finder, which the user can easily find.
Brand	Cocoons	SUGLSS	ADN	Ampere
Material (Frame/lenses)	neoprene/distortion-free, optical-grade lens material	plastic/TAC	TR90/liquid crystal	TR90/TAC
Price	CAD $79.95	CAD $89.00	CAD $58.00	CAD $375.00
Weight	light	21g	41g	26 g
Sport frame	yes	yes	yes	no
Peripheral Vision	yes	no	no	yes
Visible light transmission	13%	15%.	10%	4% - 38%
HEV(blue light)	90%	N/A	N/A	N/A
Photochromic lenses	no	yes	yes	yes
Response time	N/A	1min	0.1s	0.1 s
Battery Life	N/A	N/A	Solar	7 days
UV	UV410	UV400	UV400	N/A

6. Set of Target Specifications

Metrics ID Number	Metrics Descriptor	Units	Marginal Values	Ideal Values
1	Cost	CAD	< $375	< $100
2	Weight of the glasses	g	< 41g	< 26 g
3	System response time	s	< 60 s	< 0.1 s
4	Visible Light Transmission (%)	*Unitless*	5% - 15%	4% - 38%
5	Battery Life	days	> 12hrs	>7 days

Notes:

- Cost:
    - The most expensive product found during the benchmark was $375, so being able to produce a design under that cost would make it marginally successful
    - The other products compared in the benchmark were under $100. Ideally our design will be in a similar price range
- Weight
    - The heaviest glasses investigated during the benchmark were 41g
    - The other glasses were between 21-26g, so ideally our design would be lighter than that.
- Response Time
    - Typical photochromic glasses take around 1min to respond to a change in ambient light.
    - The electrochromic glasses by Ampere can adjust its tint in less than 0.1s. Ideally our design will have a similar or better response time.
- Visible Light Transmission (VLT)
    - Our client mentioned that her darkest glasses have a VLT of 5% and her lighter sunglasses are approximately 13% (Cocoon sunglasses), therefore the marginal VLT should range from approximately 5% - 15%.
    - The electrochromic glasses by Ampere have a VLT range from 4% to 38%, so our ideal design should have a similar VLT range.
- Battery Life:
    - Should our design use a battery source, the battery should be able to last the duration of the day.
    - Ideally, our design should have a similar battery life to the electrochromic glasses by Ampere, which is 7 days.

7. Reflection

The client meeting went well in general. The team gained a firm grasp on the idea of building a lightweight, self-adjusting wearable device for individuals with high light sensitivity during this meeting. There is no unknown information currently. During the client meeting, we asked enough questions since we prepared well previously. It was revealed that the extremely light-sensitivity was so burdensome, that regular replacement of sunglasses added complications to her everyday life. Thus, the objective of this course is not only to educate students how to design, but also to teach people how to create in a more comfortable manner, and to recognise that many people in our society still need these designs.

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8. PERSONAL ETHICS STATEMENT

a) *I participated in formulating the standards, roles, and procedures as stated in this contract.*
b) *I understand that I am obligated to abide by these terms and conditions.*
c) *I understand that if I do not abide by these terms and conditions, I will suffer the consequences as stated in this contract.*

Signatures - - - - - - - - - - Date: January 23 / 2022

Avery Lai: 	Kenneth Lorbetskie: 
Dongyu Wang: 	Zhema Wen: