Eye-Gaze Camera Cover

Group C31

Anh Quan Tran Jeremy Leung Amanda Beraldo Brandao de Souza Liam Reynolds Isabella Rudolf-Ferreira Cam McGregor

What is the Problem?

- Our client is a occupational therapist named Amita
- Oliver is a 12/13 year old boy
- He has limited motor control of arms and legs
- Uses buttons near his head to control his Power Chair
- Oliver uses a Tobii I12 + for verbal communication
- He uses head gesture apps for electronic communication
- The eye-gaze camera interferes with his other devices
- Needs a way to remotely cover the cameras when using his other devices



Problem Statement

A 12/13 year old boy with limited motor control needs a remote operated device to easily cover the eye tracking camera lights of his Tobii using his head.

Customer Needs

The needs that the client expressed at the first client meeting:

- The client would prefer if the product were wireless.
- Switches should have an adjustable arm.
- Switches do not need to detach from the wheelchair.
- Switch activation is done with the side/back of the head.
- Preference for hard plastic and oval-shaped switch.
- Does not need to be water resistant.
- Switches should be reasonably durable.
- Clicky switches are preferred.
- The interference did not stop when the angle of the camera was changed.
- The interference only stops when the lights are completely covered.

Interpreted and Prioritized Needs:

The customer needs were then prioritized with 5 being highest priority and 1 being lowest:



- The switch is big enough for easy use
- The cover fully blocks the lights
- Low energy consumption



- Button position is adjustable
- Button mount is rigid
- The connection between the switch and the cover is wireless



- The product is durable
- The product emits an auditory cue



- The cover is fast to activate
- Button can be activated under low force
- The water-resistant
- The button is oval-shaped
- The button has some padding

Benchmarking

Adjustable arm

Specs / Existing Products	<u>Noga NogaFlex</u> <u>Holder - Model:</u> <u>NF1022</u>	<u>HFS Pro</u>
Cost	\$86.63	23.99
Weight (g)	226.8	453.99
Dimensions (cm)	10.16 x 15.24 x 10.16	Fixed arm height: 17.526; Extension arm length: 19.05; Magnetic Base dimension: 5.842 L x 5.02 W x 5.53 H
Adjustability	Ball joints	Rotary joints

Buttons/switches

Specs / Existing Products	<u>Buddy Button</u> <u>Switch</u>	<u>Switch It Up!</u> <u>Switch</u>	<u>Gumball</u> <u>Switches</u>
Cost	\$65	\$29.36	\$53.95
Size (diameter)	6.35 cm	6.99 cm	6.35 cm
Activation weight	99.22 g	255.15 g	25 g
Audible feedback	yes	yes	yes
Bluetooth/wireless	no	no	no
Material	plastic	plastic	plastic

Benchmarking

Eye tracker

Specs / Existing Products	Tobii I-12
Dimensions	30,7 x 27,4 x 10,5 cm
Battery Capacity	62.65 W*h

Camera Covers

Specs /Existing Products	<u>Moko sliding webcam</u> <u>cover</u>	Cardboard rectangle	<u>HUYUN webcam</u> <u>shutter</u>	<u>Silent pocket</u> privacy stickers
Cost	\$ 11.99 (pack of 3)	Free	6.99	13.99 (pack of 25)
Dimensions	1.78 x 0.76 x 0.08 cm	Variable Dimensions	3.56 x 3.3 x 1.02 cm	Variable Dimensions
Type (automatic, manual)	Manual, slider	Manual	Manual, flip cover	Manual, tape-on
Remote controlled	no	no	no	no
Battery	N/A	N/A	N/A	N/A
Type of mount	Adhesive tape	Duct tape	Snaps on the edge of the laptop/webcam	Sticker
Opacity	Full (black)	Full (hard cardboard)	Full (black)	Full (Black)
Material	plastic	paper	plastic	paper

Target Specifications

	Metric	Units	Marginal Value	Ideal Value
1	Activation Time	seconds	<20	<5
2	Switch Size (Diameter)	cm	3-12	4-6
3	Cover Area	cm^2	31-22x6-1	27-23x4-2
4	Drop Height	m	>0.3	>1
5	Life Cycle	Number of clicks	30 000	50 000
6	Sound Coming off button	dB	30-60	30-40
7	Stiffness (of mount)	N/m	>2	>4
8	Power Consumption	mW	700(*)	280(*)
9	Volume coverage of mount	cm^3	>25	>50
10	Wireless connection	Yes/No	no	yes
11	Shape of button	Shape	Any shape	Oval/circle

Functional Decomposition



Generated Concepts

We decided to each make at least three concepts giving us a total of 26 potential topics that we could discuss upon.



Concepts Evaluation (Cover)



Concept Evaluation (Arm)

Concept 1







Concept Evaluation (Button)



Final Group Concept



Feasibility Study

Benefits:

- Servo sliding cover is easy to construct and program, made of low cost materials
- Requires small amount of power to operate
- Blocks the interference
- Arm is stable and easy to construct
- Wireless transmission is reliable and low cost
- Button is durable and effective

Drawbacks:

- Servo sliding motor has a large base
- Arm is made of higher quality materials that are more expensive
- Arm has little adjustability

Client meeting #2 (first updates)

- Client was pleased with our prototypes and concepts shown
- Cover must be completely removable from Tobi
- For further prototypes we asked the user to share the dimensions of his Tobi and wheelchair
- The client also told us that we could call or email Tobi to get that information we need which **we have done and are waiting on a response.**

Detailed Design and Prototype 1



Prototype 1 - 3D Printed Cover





Prototype 1 - Split Ring Clamp



Prototype 1 - Split Ring Clamp



Prototype 1 - Angle Clamp



Prototype 1 - Beam





Bill of Materials

#	Part name	Qty	Vendor	Description	Unit cost	Extended cost
2	<u>433 MHz</u> <u>transmitter/Recei</u> <u>ver 3 pack</u>	1	Amazon Online	A RF 433MHz transmitter/ receiver will be used. The 433MHz RF transmitter will send a signal to the receiver. The receiver is not able to communicate with the transmitter however in this project that is not necessary making this the best option price wise	11.99	11.99
3	<u>Simple Button</u>	1	Amazon Online	A simple button with an auditory click is used. This product reaches all the requirements needed.	13.99	13.99
5	ABS 3D printer filament	0.5	Amazon Online	The 3D printer filament is used in the 3D printer to make parts of the project (500g)	33.99	17.00
10	<u>Adafruit Trinket</u> <u>Microcontrollers</u> <u>(5V)</u>	2	BuyaPi In Person	These microcontrollers will be used to control the device. One is used to operate the transmitter and the other is for the receiver and the servo.	9.95	19.90

Bill of Materials-Totals

Dependant	92.53+tax
Independent	107.69+tax

Next Steps

- So far we have followed our project plan fairly well
- Going forward we will be doing more specific assignments of tasks
- We will be focusing on developing our next prototypes through research, benchmarking and client feedback.
- A more even spread of responsibilities will allow for a more efficient