

Air Mouse

ECE 4600 Group Design Project Proposal

Group 7

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Overview

The plan for this project is to make a user friendly glove that will allow the user to control a mouse pointer wirelessly in air. While optical/laser mice are readily available in the market today for this purpose, they still require a flat surface to properly operate and can prove to be an inconvenience in certain situations. The plan with our Wireless Air Mouse is to incorporate hand gestures that are intuitive and/or easy to remember for any user and can aid in the operating of computers to a degree of greater freedom.

The project has a variety of goals and milestones that our team will be diligently working towards throughout the year in order to make our air mouse as user-friendly, reliable and broadly appealing as possible. A general summary of our main goals are as such:

- The entirety of the air mouse must fit on standard unisex glove sizes ranging from XS to XL.
For our project purpose we will be using a medium sized right hand glove
- The air mouse must receive power from a portable power source that is estimated to be about the size of a quarter dollar, lightweight and meets the battery life specifications in order to ensure ease of use and comfort.
- The mouse should be ergonomic and should not add strain to the user's hands.
- The sensitivity of the sensors used for making the mouse clicking operations must be at least 90% reliable, assuring the air mouse will not miss a click or over-click.
- The user of the air mouse should be able to toggle its functionality off with the help of a switch.
- When the user is using the mouse hand for non-mouse actions and wishes to reduce power consumption, they may choose to switch to a standby mode that terminates the Bluetooth data transmission.
- The implementation of an indicator for the battery state of charge on the device, notifying the user the battery is low and will need to be recharged in the near future.
- The utilization of haptic feedback on mouse clicks, ensuring the user that functions such as mouse clicks were correctly performed.
- The use of hand gestures as a way to enable features such as a laser pointing aid in the use of presentations.
- *Optional: The use of the air mouse in a 3-Dimensional setting, possibly as a way of better exhibiting 3-D models in presentations or in the use of virtual reality applications.*

The completion of the core goals will lead to a successful project and will signal the end of an enriching group design project.

Performance Metrics

<u>ID</u>	<u>FEATURE</u>	<u>RANGE</u>
1	All components must fit on all standard glove sizes (XS-XL)	Yes/No
2	Design is able to send/receive information using the Bluetooth LE standard	Yes/No
3	Design can move mouse cursor on a computer using hand movements	Yes/No
4	Design can perform mouse clicks on a computer using hand movements	Yes/No
5	Design can scroll/pan on a computer using hand movements	Yes/No
6	Design is able to be used in a 3D axis application	Yes/No
7	Design is powered by a portable power source	Yes/No
8	User is able to turn on/off device to reduce power consumption	Yes/No
9	Battery Life Specifications	> 2 hours
10	Battery State of Charge Indicator	Percentage, or Segments/Low Warning
11	Haptic feedback on mouse clicks	Yes/No
12	Hand gestures to enable laser pointer aid for presentations	Yes/No

Table of Responsibilities

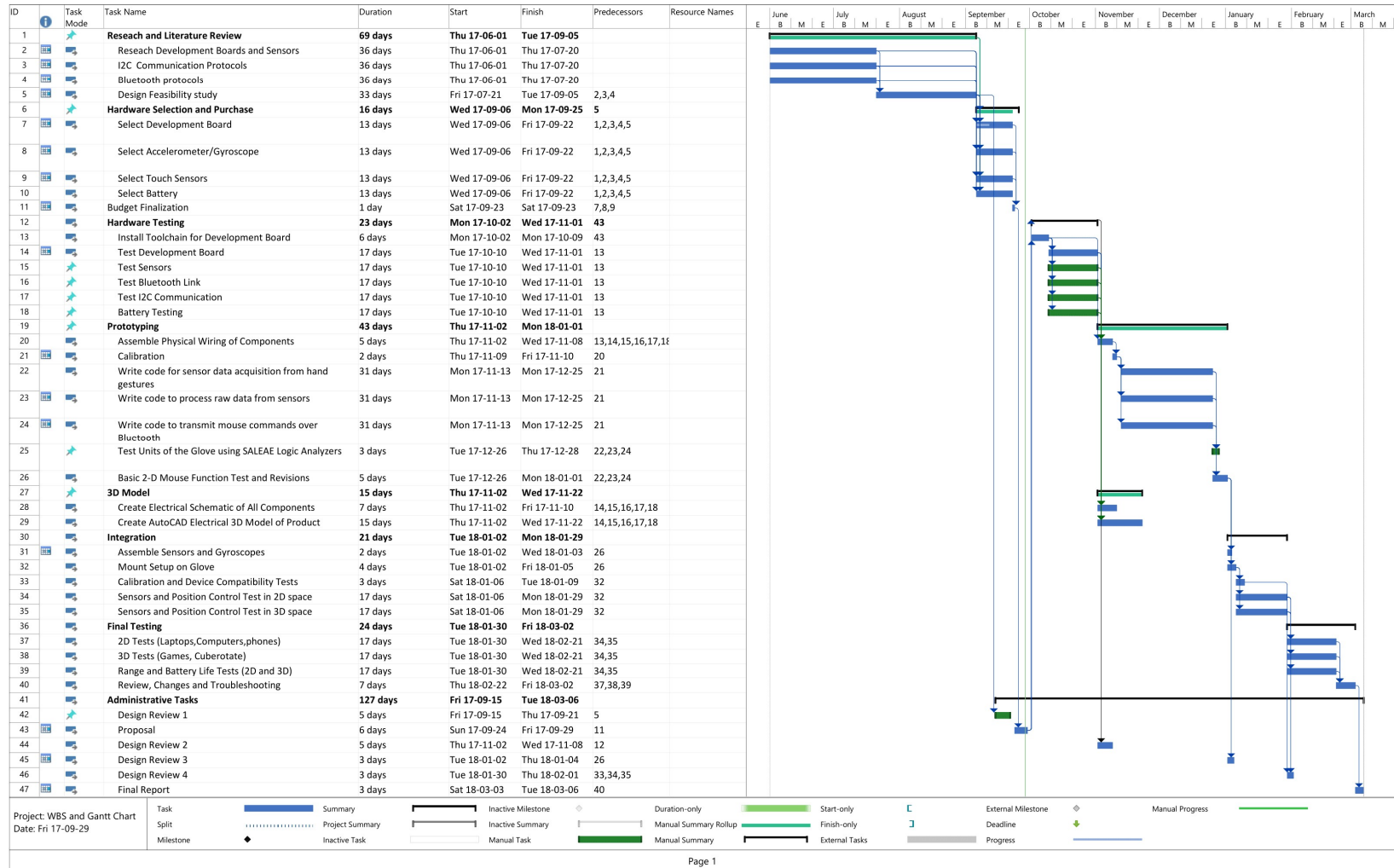
Task Name	Individual(s) in charge
Hardware Selection	
Select Development Board	John
Select Accelerometer and Magnetometer	Wania, Ibrahim
Select Flex sensors	Hammed, Nick
Select Battery and touch sensors	Simran
Hardware Testing	
Install Toolchain for Development Board	Group
Test Development Board	Group
Test Accelerometer and Magnetometer	Wania, Ibrahim
Test Touch Sensors and Mini Joystick	Simran
Test Flex sensors	Hammed, Nick
Test Bluetooth Link	John, Wania
Test I2C Communication	Group
Test compatible software for 3d processing	John
Battery Testing and LED display	Simran
Prototyping	
Assemble Physical Wiring of Components	Simran
Calibration	John, Wania
Write code for sensor data acquisition	Hammed, Ibrahim, Simran
Write code to process raw data from sensors	Nick, Wania, Simran
Write code to transmit mouse commands over Bluetooth	Wania, Ibrahim
Write code to transmit 3d commands over bluetooth	John, Nick
Test using Logic Analyzers	Ibrahim
Basic 2-D Mouse Function Test and Revisions	Simran
Modelling	
Create Electrical Schematic of All Components	Wania
Create AutoCAD Electrical 3D Model of Product	Hammed
Integration	
Assemble Sensors and Microcontroller	Nick
Mount Setup on Glove	Wania
Calibration and Device Compatibility Tests	John, Simran
Sensors and Position Control Test in 2D space	Wania, Ibrahim
Sensors and Position Control Test in 3D space	John
Final Testing	
2D Tests (Laptops, Computers and Phones)	Wania, Nick
3D Tests (Demonstrate 3D game application)	John, Ibrahim, Hammed
Range and Battery Life Tests (2D and 3D)	Simran
Review, Changes and Troubleshooting	Group

Budget and Resources

<u>Item</u>	<u>Vendor</u>	<u>URL (if available)</u>	<u>Price (CAD)</u>	<u>Qty</u>	<u>Description</u>
FEATHER NRF52 BLUEFRUIT LE	Digikey Canada	https://www.digikey.ca/products/en?mpart=3406&v=1528	\$33.72	2	MCU
USB 2.0 A MALE TO USB 2.0 MICRO	Digikey Canada	https://www.digikey.ca/product-detail/en/qualtek/3025030-03/Q966-ND/6188812	\$5.23	3	
THREAD 316L THIN COND 3PLY 60'	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/641/1528-1268-ND/5356753	\$10.00	1	
CONN HEADER .100" SNGL STR 40POS	Digikey Canada	https://www.digikey.ca/products/en?mpart=PRP C040SFAN-RC&v=35	\$1.14	2	
CONN HEADER .100" SNGL R/A 40POS	Digikey Canada	https://www.digikey.ca/products/en?mpart=PRP C040SBAN-M71RC&v=35	\$1.24	2	
FLORA ACCEL/GYRO/MAGN 9-DOF	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/2020/1528-1335-ND/5356820	\$26.96	1	
LiPo Battery Cell - 3.7V 110mAh	Robotshop Canada	http://www.robotshop.com/ca/en/lipo-battery-cell-37v-110mah.html	\$6.35	1	
Pressure-Sensitive Conductive Sheet	Robotshop Canada	http://www.robotshop.com/ca/en/pressure-sensitive-conductive-sheet-velostat-lingstat.html	\$5.06	1	
FLORA PLATFORM RGB NEOPXL V2 4PK	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/1260/1528-1310-ND/5356795	\$10.74	1	
Woven Silver Conductive Fabric 400cm²	Robotshop Canada	http://www.robotshop.com/ca/en/woven-silver-conductive-fabric-400cm.html	\$6.35	1	
MOD FLORA WEARABLE BLUEFRUIT LE	Digikey Canada	https://www.digikey.ca/products/en?mpart=2487&v=1528	\$23.65	1	
FLORA ELECTRONIC PLATFORM V2	Digikey Canada	https://www.digikey.ca/products/en?mpart=659&v=1528	\$20.21	1	MCU
LEAD SET 10 MINI-ALLIGATOR 22AWG	Digikey Canada	https://www.digikey.ca/products/en?mpart=BU-00285&v=314	\$9.41	2	
SWITCH SLIDE SPDT 300MA 6V	Digikey Canada	https://www.digikey.ca/product-detail/en/apem-inc/MHSS1105/679-1849-ND/1949465	\$0.73	5	
VIBRATION MOTOR 3VDC	Digikey Canada	https://www.digikey.ca/products/en?mpart=316040001&v=1597	\$1.76	1	
BREADBOARD PERMA-PROTO PCB SGL	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/1606/1528-1100-ND/5154675	\$9.39	1	
JUMPER WIRE M/M 40X6" 150MM	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/758/1528-1154-ND/5353614	\$5.34	1	
FEMALE/FEMALE JUMPER WIRES 40X6	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/266/1528-1379-ND/5629427	\$5.34	1	
JUMPER WIRE F/M 40X6" 150MM	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/826/1528-1162-ND/5353622	\$5.34	1	
LASER DIODE - 5MW 650NM RED	Digikey Canada	https://www.digikey.ca/product-detail/en/adafruit-industries-llc/1054/1528-1391-ND/5629439	\$8.04	1	
ANALOG 2-AXIS THUMB JOYSTICK WIT	Digikey Canada	https://www.digikey.ca/products/en?mpart=512&v=1528	\$8.56	1	
2.2" 10K Flexible Sensor	Robotshop Canada	http://www.robotshop.com/ca/en/22-10k-flexible-sensor.html	\$9.99	10	
BNO055 9 DOF Absolute Orientation IMU Fusion Breakout Board	Robotshop Canada	http://www.robotshop.com/ca/en/bno055-9-dof-absolute-orientation-imu-fusion-breakout-board.html	\$44.81	1	
3M 35-WHITE-1/2 Electrical Tape	Digikey Canada	https://www.digikey.ca/product-detail/en/3m/35-WHITE-1-2/3M15557-ND/1818756	\$3.60	1	
Cotton Glove	We don't know yet	?	\$10.00	1	

Budget (CAD)	\$600.00
Total Spent (CAD)	\$421.76
Remaining (CAD)	\$178.24

Gantt Chart



References

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- [2] G. Welch and E. Foxlin, "Motion tracking: no silver bullet, but a respectable arsenal," IEEE Computer Graphics and Applications, vol. 22, no. 6, pp. 24–38, 2002.
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- [4] D. Titterton and J. Weston, Strapdown Inertial Navigation Technology, 2nd ed. Institution of Engineering and Technology, Oct. 2004.
- [5] S. M. LaValle, Sensing and Filtering: A Fresh Perspective Based on Preimages and Information Spaces, ser. Foundations and Trends in Robotics Series. Delft, The Netherlands: Now Publishers, 2012, vol. 1: 4.
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- [7] Nordic Semiconductor, nordic-ble-sdk-examples/ble_HID_template/ble_HID_template.ino, 2013.
- [8] Cheng-Ta Chuang, Tom Chang, Pei-Hung Jau, Fan-Ren Chang,(2014) "Touchless positioning system using infrared LED sensors", System Science and Engineering (ICSSE) IEEE International Conference on pp 261 – 266, 2014 ISSN 2325 – 0925.
- [9] S. Ovaska and S. Valiviita, "Angular acceleration measurement: a review," IEEE Transactions on Instrumentation and Measurement, vol. 47, no. 5, pp. 1211–1217, 1998.