

A decorative graphic on the left side of the slide consisting of two overlapping parallelograms. The front one is blue and the back one is a light green. They are positioned diagonally, with the blue one partially covering the green one.


Input-Corrective Drawing Pad

Jesse Jensen



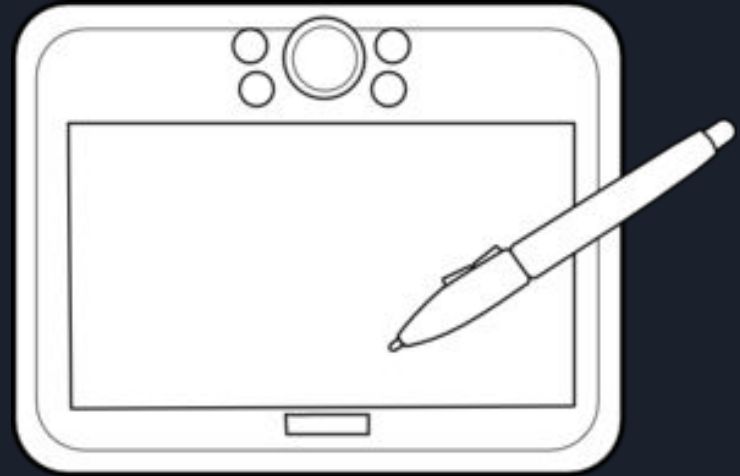
Overview

- Introduction
- Design details
 - System overview
- Project Management
 - Schedule
 - Budget
- Conclusion
- Questions



The Input-Corrective Drawing Pad is a touch pad with four main features.

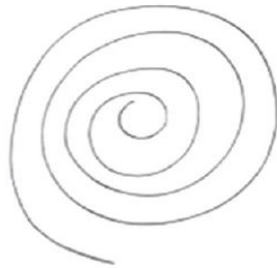
- Pressure sensitive input
- Learns user intentions
- Corrects shaky input
- Connects via USB



Many cannot write or draw due to fine motor impairment

Difficulties include

- Shaky hands
- Inability to draw a straight line
- Inability to draw a consistent curve



Normal




Parkinson's disease



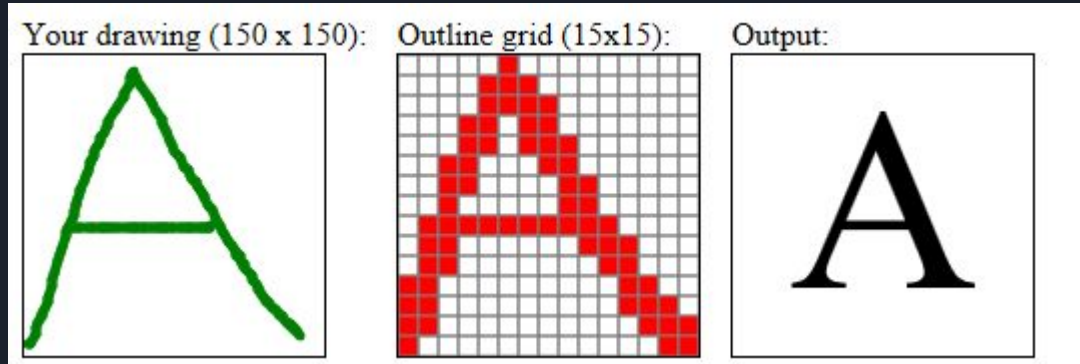
Essential tremor



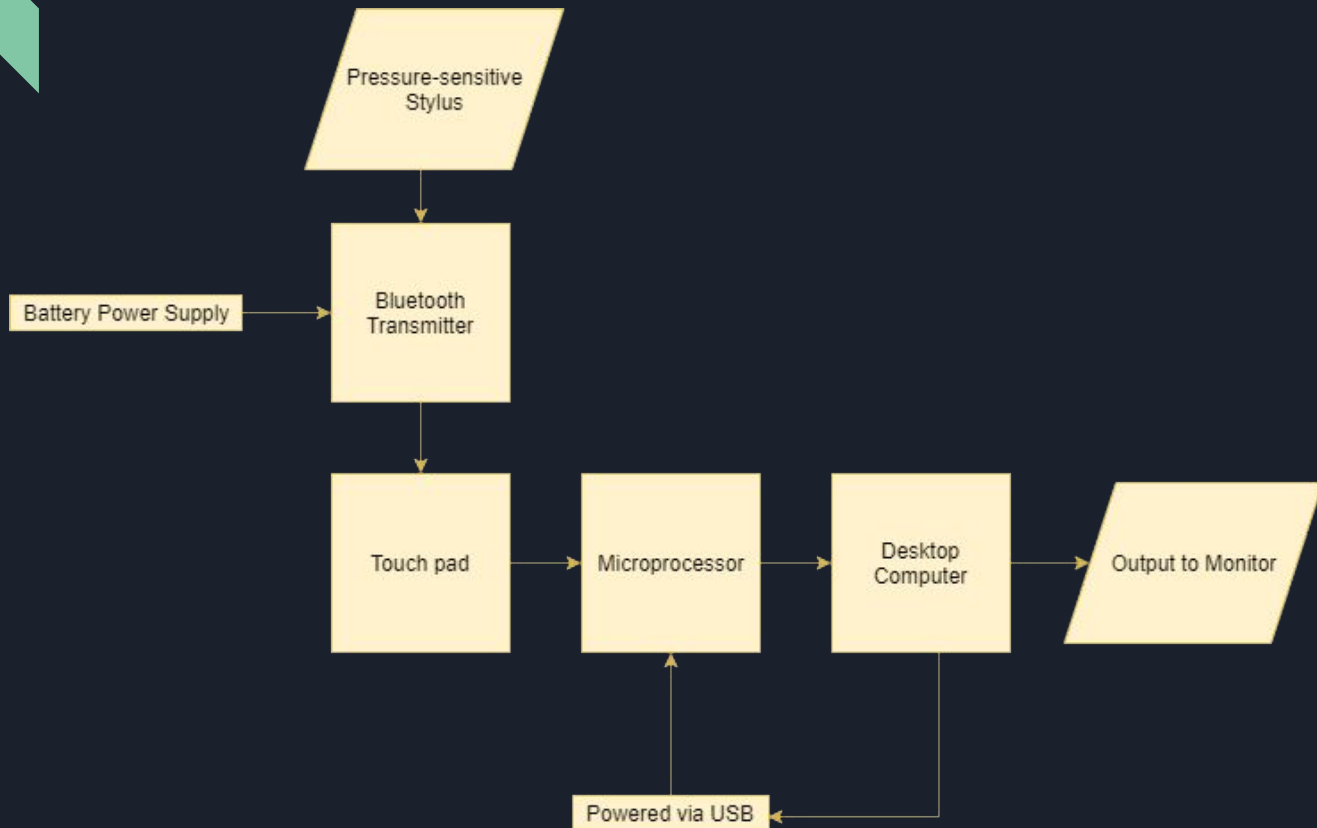
Dystonic tremor



The Input-Corrective Drawing Pad learns intended writing/drawing and outputs corrected data to a desktop computer.



System Overview



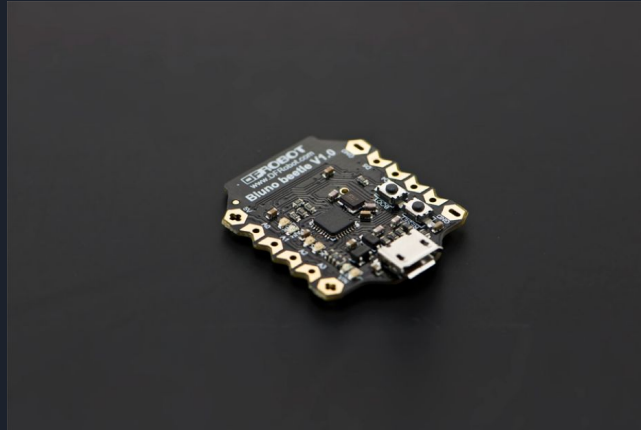
The stylus input module will send measured force to microprocessor via bluetooth.



Force sensitive resistor -
SEN-09673

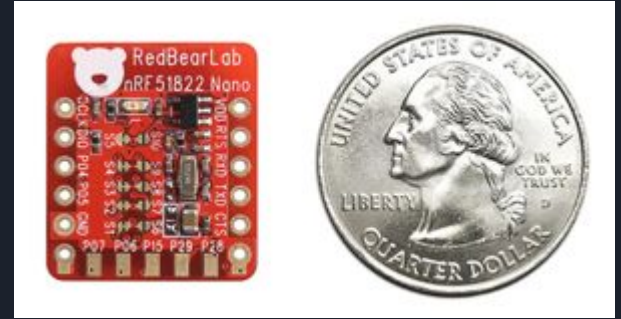


3.7V
Rechargeable
Li ion battery



BLE microcontroller

Bluetooth microcontroller




Microcontroller	Size	DC Supply Voltage	Cost
Beetle BLE	28.8mm X 33.1mm	3.7V	14.95
Bluno Nano	53x19x12mm	7V	33.35
RedBearLab BLE Nano	18.5mm x 21.0mm	3.3V	18.75



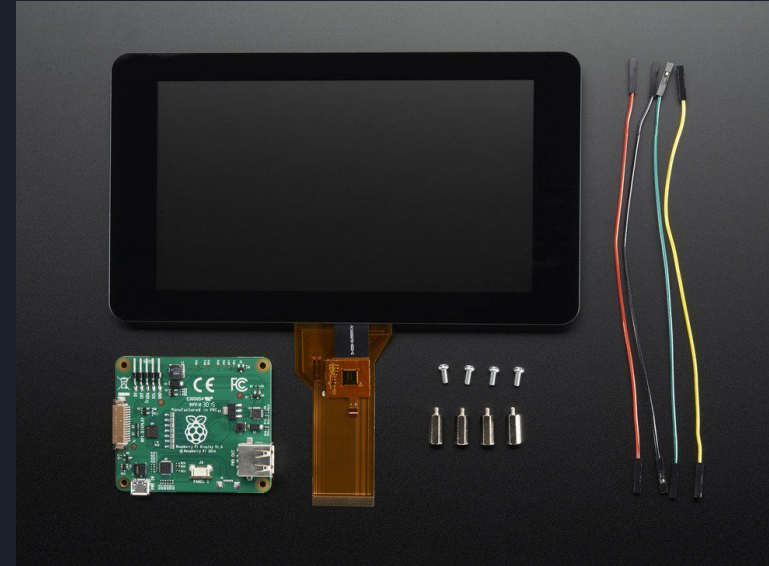
Touchpad input module

- Receives accurate readings from stylus
- Sends data to microprocessor
- Powered from microcontroller (through driver board)
- Screen size of at least 7 x 15 cm



Several capacitive touch pads are under consideration for the input device.


Touchpad	Cost	Resolution	Screen size	Input Data	Input Power
Adafruit Pi Foundation (w/ driver board)	\$79	800 x 480 pixels	155mm x 86mm	DSI	Driver Board via Pi GPIO (5V)
Sainsmart	\$46	800x480 pixels	164 X 100mm	HDMI	4.5-7V
Seed	\$60	1024 x 600 pixels	210mm x 150mm	HDMI	5V (2 A), 9V (1.5 A)





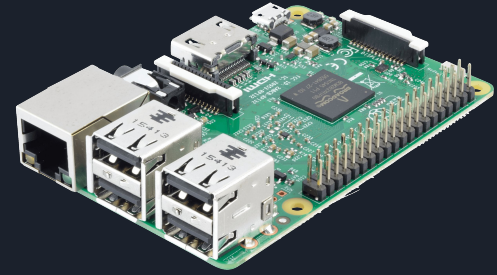
Processor Module


- Processes input and delivers an output to a desktop computer
- Processes input within 0.25 seconds
- Corrects shaky data
- Implements neural network to learn intended inputs
- Powered through desktop via USB



The Qualcomm Snapdragon 410c and Raspberry Pi 3 are under consideration to act as the processing module.

Microcontroller	CPU	Memory	Price	Architecture
Raspberry Pi 3	QuadCore ARM53(v8) 1.2GHz	1 GB	\$35	32-bit
SnapDragon 410C	QuadCore ARM53(v8) 1.2GHz	1 GB	\$85	64-bit





Benchmark tests using Python Performance Benchmark Suite show that the Qualcomm processor had better performance running Python code.

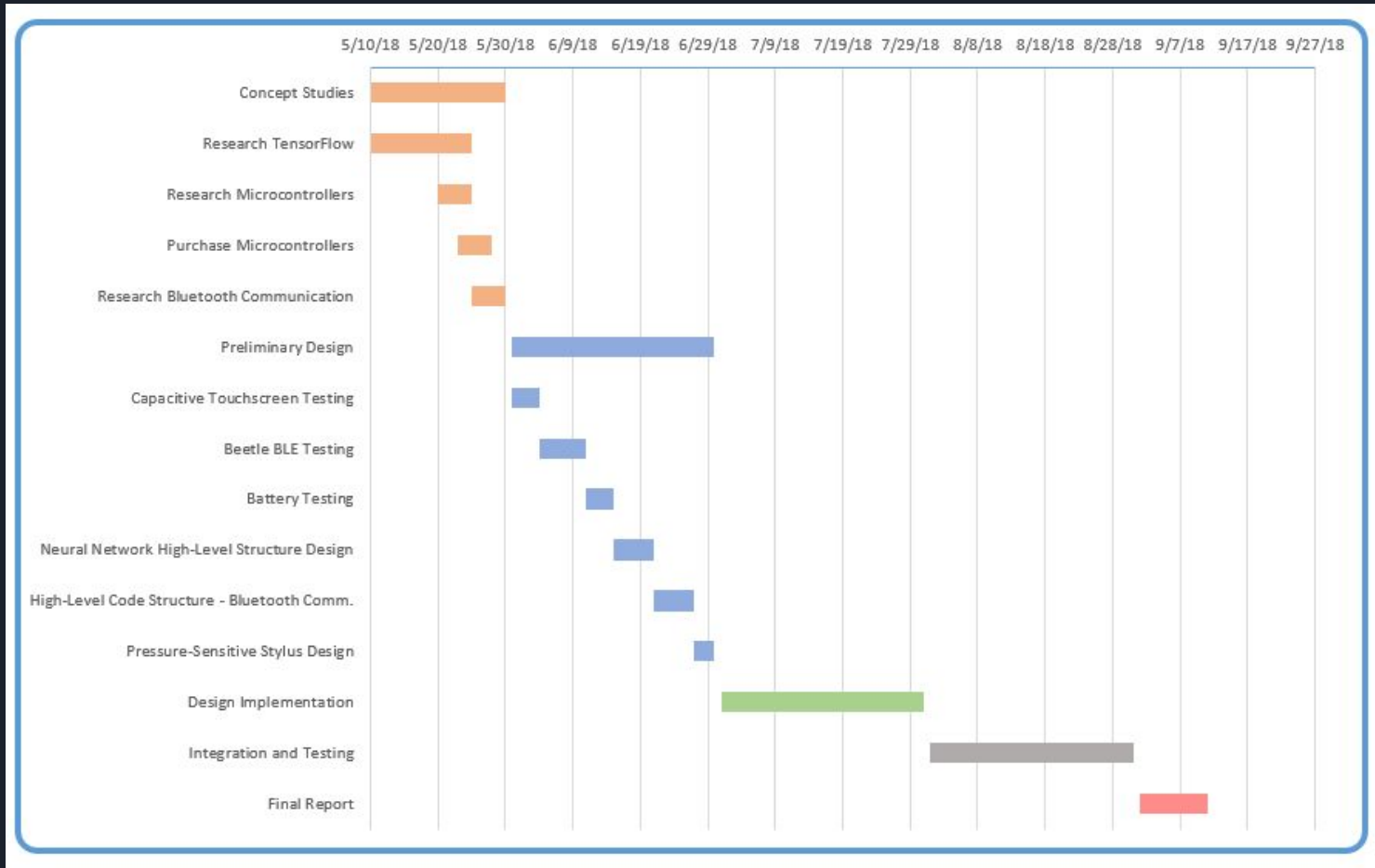
Test	Raspberry Pi3	DragonBoard 410c
cpu sysbench --test=cpu run	318.1229s	12.6500s
memory sysbench --test=memory --memory-total-size=2G run	7.5322s	3.0507s
threads sysbench --test=threads run	23.1469s	9.1600s
mutex sysbench --test=mutex run	0.0283s	0.0141s



Learning Software

- Programmed in the Python language
- Will first remove shakes
- Neural network trained with TensorFlow
- Training data taken from open source Quick Draw! Data sets
- Position and angle of drawing type will then be applied to data

Schedule





Budget

Item	Estimated Cost	Quantity	Total Cost
Touchpad	80.00	2	160.00
Microcontroller	50.00	2	140.00
Rechargeable Battery	15.00	2	30.00
Force Sensor	6.00	3	18.00
Beetle BLE Arduino	15.00	2	30.00
Case Enclosure	40.00	1	40.00
Total			418.00



Conclusion

Impact

- Limit amount of shake and error in drawing and writing
- Learn to adapt to user needs

Design

- Pressure-sensitive bluetooth stylus
- Capacitive touchpad
- Compact Processor



Questions



References

<https://www.mouser.com/ProductDetail/DFRobot/DFR0339?qs=Zcin8yvlhnNH0fWhvo%2Fcpg%3D%3D>

<https://www.dfrobot.com/product-1259.html>

<https://towardsdatascience.com/rpi3-vs-dragonboard-f4dd877b7da9>

<https://www.adafruit.com/product/2718>

<https://www.sparkfun.com/products/9673>