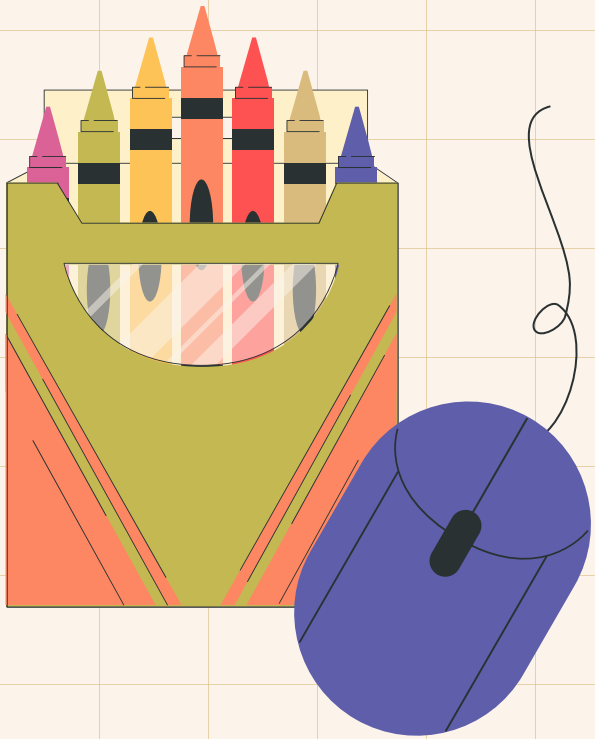


ES 117: World of Engineering

MechMinds

Conceptualization

Broad Problem Statement

Helping the differently-abled(mute or blind) people to navigate the world.

- Mute (dumb) people need external aid to navigate the world. They face challenges accessing and reading standard printed text.
- Facilitating effective two-way communication between mute and deaf individuals presents a significant societal challenge.

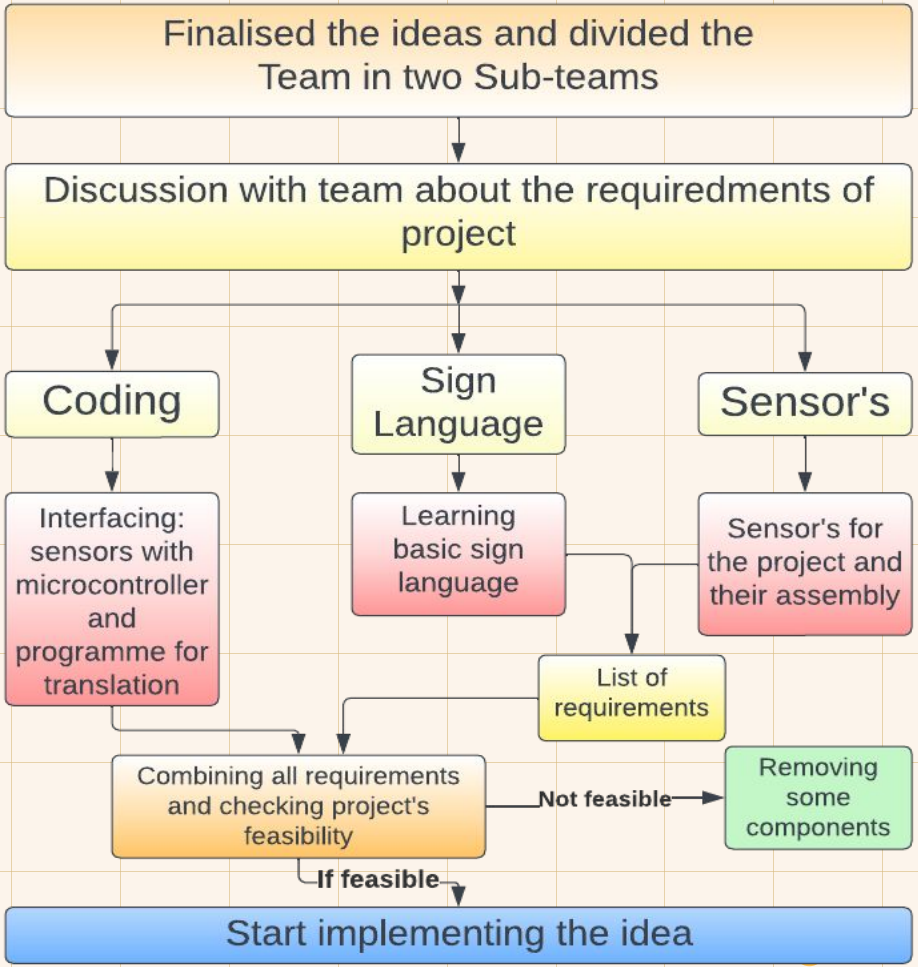
Specific Problem Statement

Ordinary people can’t understand Sign language used by mute(deaf) people, So there is a need to create technology which convert sign language into normal language

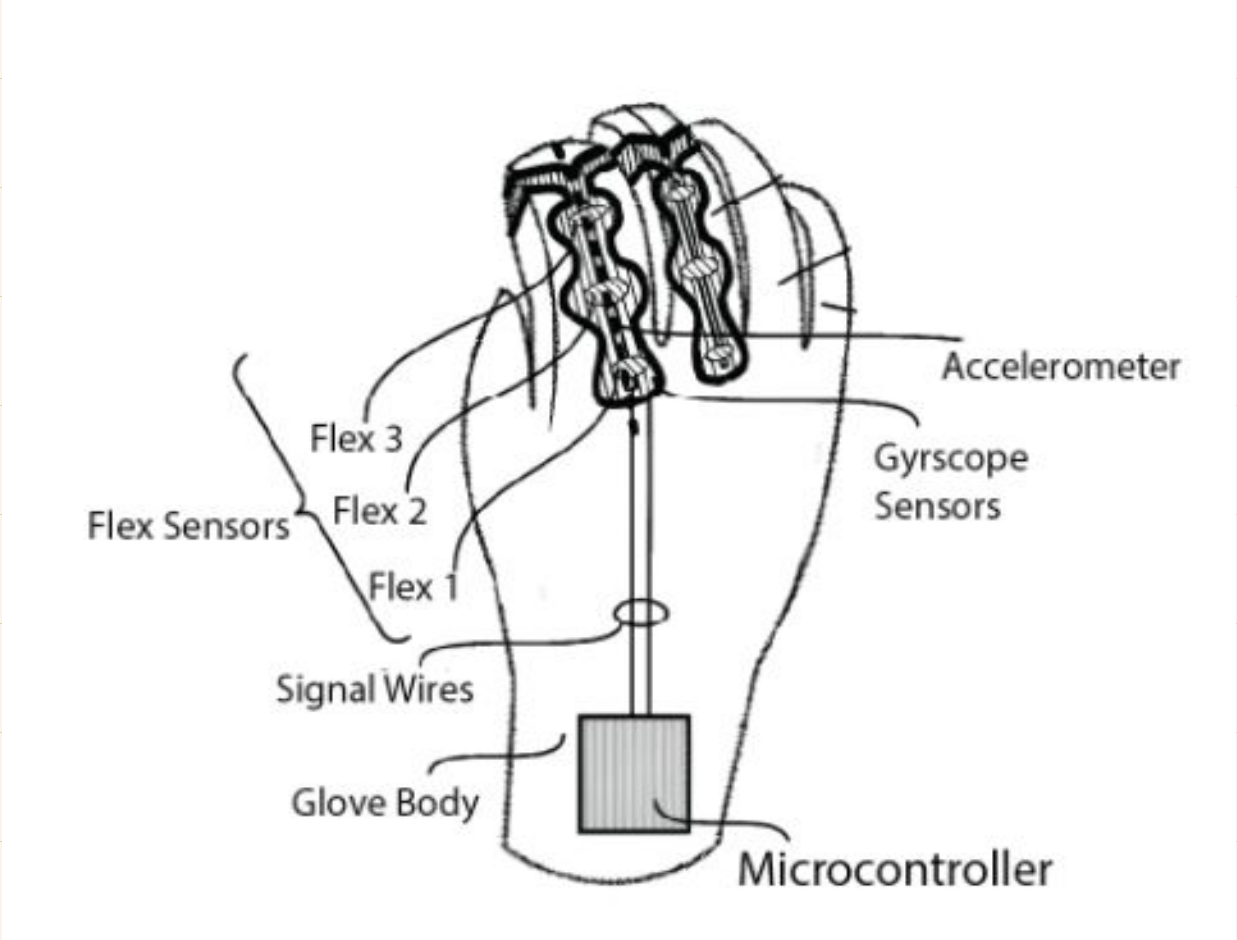
We need to make the device ergonomic for easy usage in everyday life.

We are making wearable glove which can translate sign language to normal language and helps the other people to understand them by the means of sound.

FlowChart of Workflow and Our Concept



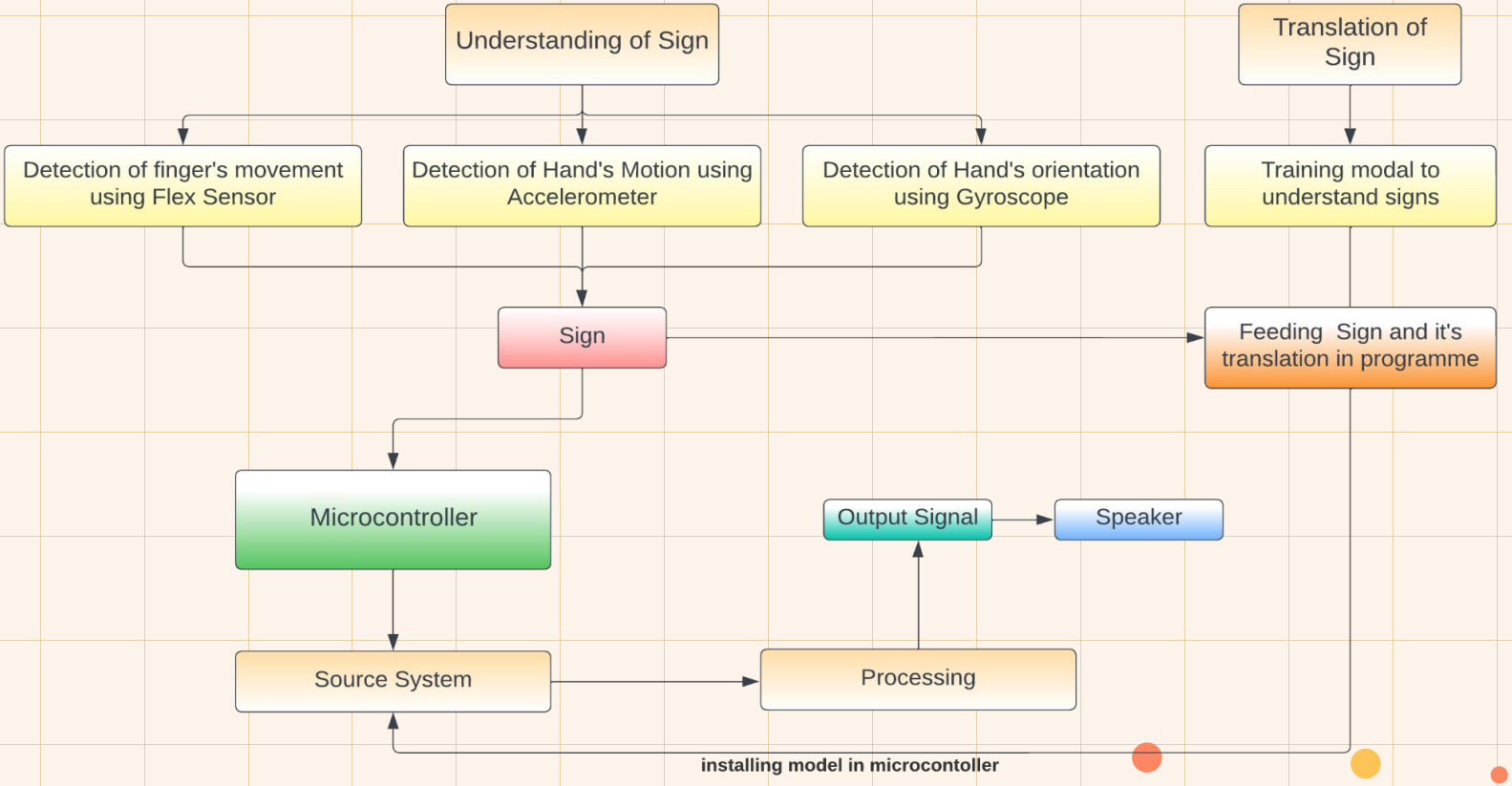
Conceptual diagram



Calculations/Quantifications

- There are no as such calculations, we need to create Machine Learning Model to understand signs.
- Taking input from all the sensors and then converting it into useful data that could be used to read sign language.
- We shall send data from Node MCU to the Computer with the help of ROS (Robot Operating System) and then the processing done by the ML Model will result to Speech Conversion.
- Converting the text into sound using the NLP(or something similar) and then output it through speaker.

Flowchart of Algorithms involved



Any Other Information

Work Distribution

Working on ML Model and softwares(ROS etc.):

- Pranjal Gaur (22110201)
- Suteekshna Mishra (22110266)
- Aditya Mehta (22110150)
- Chandrabhan Patel (22110057)
- Kaushik (22110113)

Interfacing Sensor and Electric Circuit:

- Dev Chauhan(22110058)
- Kaushik (22110113)
- Aditya Mehta (22110150)
- Ashish Poonia (22110039)
- Chandrabhan Patel (22110057)

Sign Language and Glove Designing:

- Md Sibtain Raza (22110148)
- Monu Sunia (22110155)
- Shivaprakash (22110120)
- Om Gupta (22110174)
- Chirag Patel (22110183)
- Ankit Singh(22110025)

Any Other Information

Materials/Instruments Required

Node MCU
Raspberry Pi or Similar Micro Controller (May be Used)
Flex Sensors - 5, Accelerometer, Gyroscope
Small Speaker
DF Mini Player
Gloves
Basic electronic components (Jumper Wires, resistances etc.)

Note: We may use any other material to make the electrical system even smaller.
Est. Price - INR 7000/-

References

1. Translation of sign language for deaf and dumb people - researchgate. Available at: https://www.researchgate.net/publication/339069522_Translation_of_Sign_Language_for_Deaf_and_Dumb_People (Accessed: 04 June 2023).
2. Agarwal, T. (2019) Flex sensor: Pin Configuration, working, types & its applications, ElProCus. Available at: https://www.elprocus.com/flex-sensor-working-and-its-applications/ (Accessed: 04 June 2023).
3. Understanding the concept of microcontroller based systems to choose, Available at: https://www.researchgate.net/publication/322436662_Understanding_the_Concept_of_Microcontroller_Based_Systems_To_Choose_The_Best_Hardware_For_Applications (Accessed: 04 June 2023).
4. Gyroscope Technology and applications: A review in the industrial, Available at: https://www.researchgate.net/publication/320292459_Gyroscope_Technology_and_Applications_A_Review_in_the_Industrial_Perspective (Accessed: 04 June 2023).
5. *Interactive Lesson for Elementary*, *Slidesgo*. Available at: https://slidesgo.com/ (Accessed: 04 June 2023).

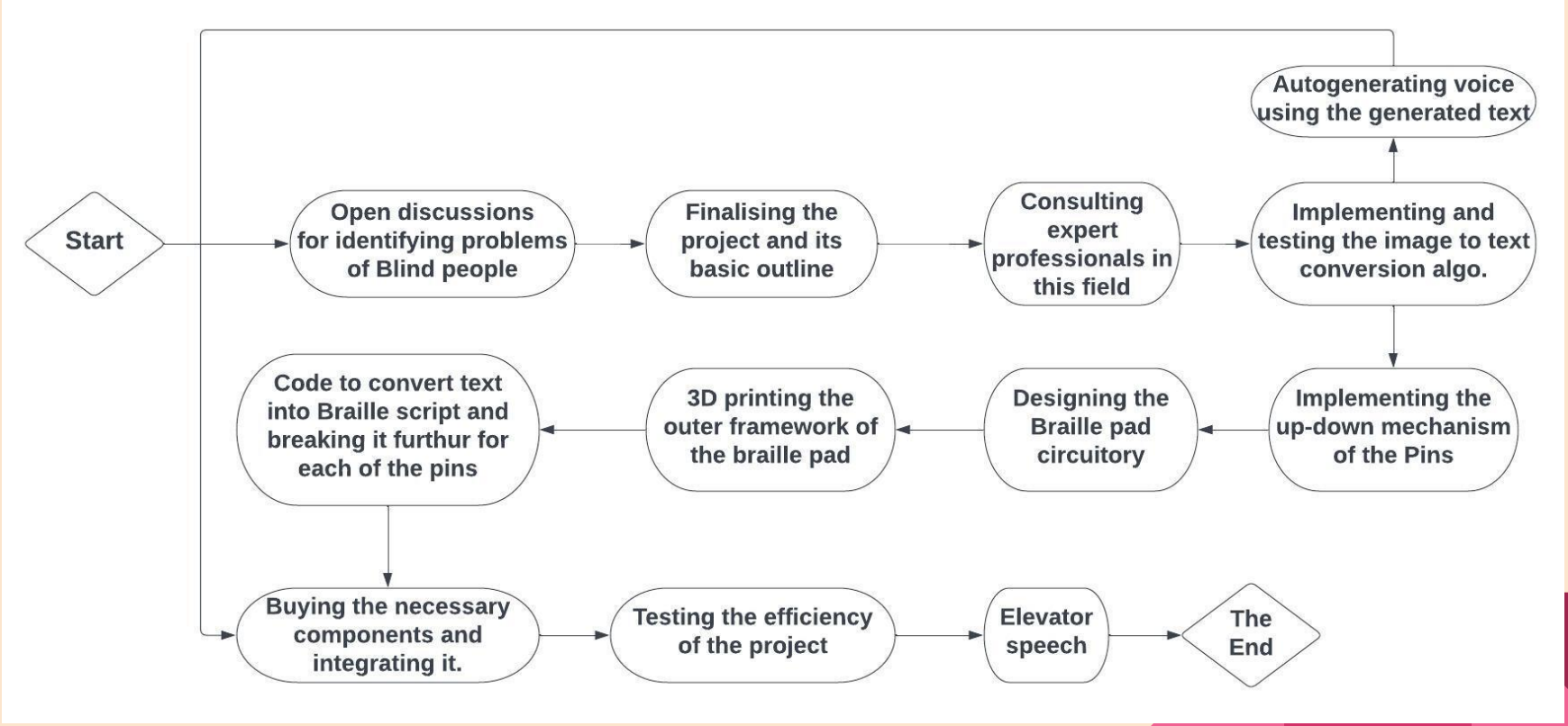
2nd Half of the Team

Team Captain - Aditya Prasad

Specific Problem Statement

- Blind and deaf individuals face significant challenges in accessing textual material, thereby limiting their ability to engage with written information and participate fully in various aspects of life.
- The current lack of inclusive technologies and resources prevents these individuals from effectively engaging with textual information, hindering their educational, social, and professional opportunities.
- They face challenges accessing Braille boards, because feasibility of making braille boards for different written materials is very low and inefficient.

Flowchart of Workflow and Concept



Quantifications & Dimensions

- Camera resolution:- 1920×1080p
- Imaging range:- IR vision with a large range
- Dimensions of Braille pad:- 40×30×25 cm^3
- Field of view of the head camera:- Around 150°
- Space consumed by each pin:- 10 mm^2
- Battery Power Rating:- 300 mAh
- Braille translation accuracy:- 90-95%
- Refresh rate:- Around 30 fps or 60 fps
- Cost analysis:- Around ₹8000

Autodesk Models/Conceptual Diagrams

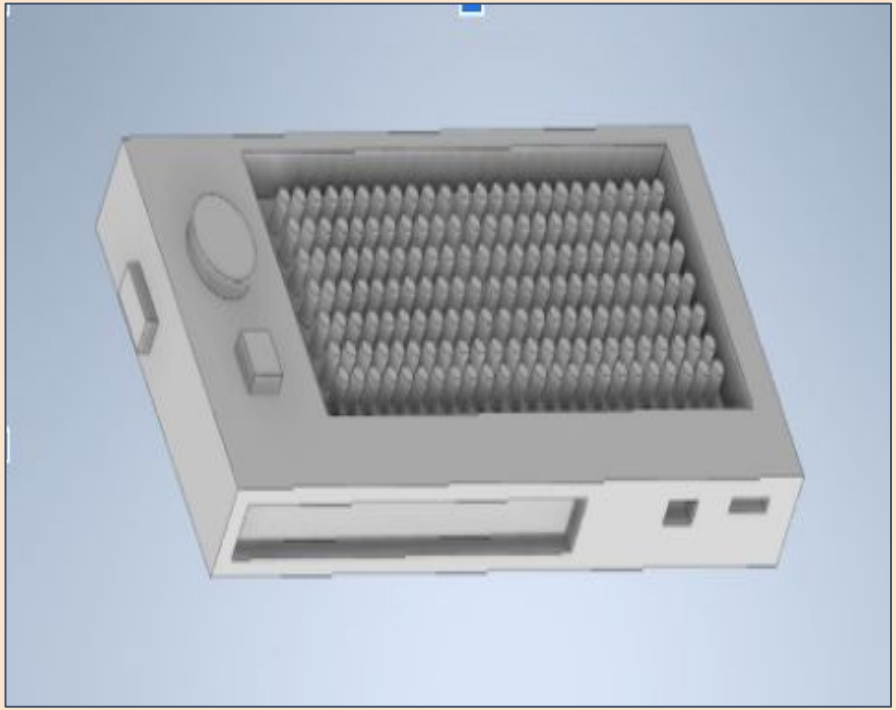


Figure: Autodesk Model of Braille Pad

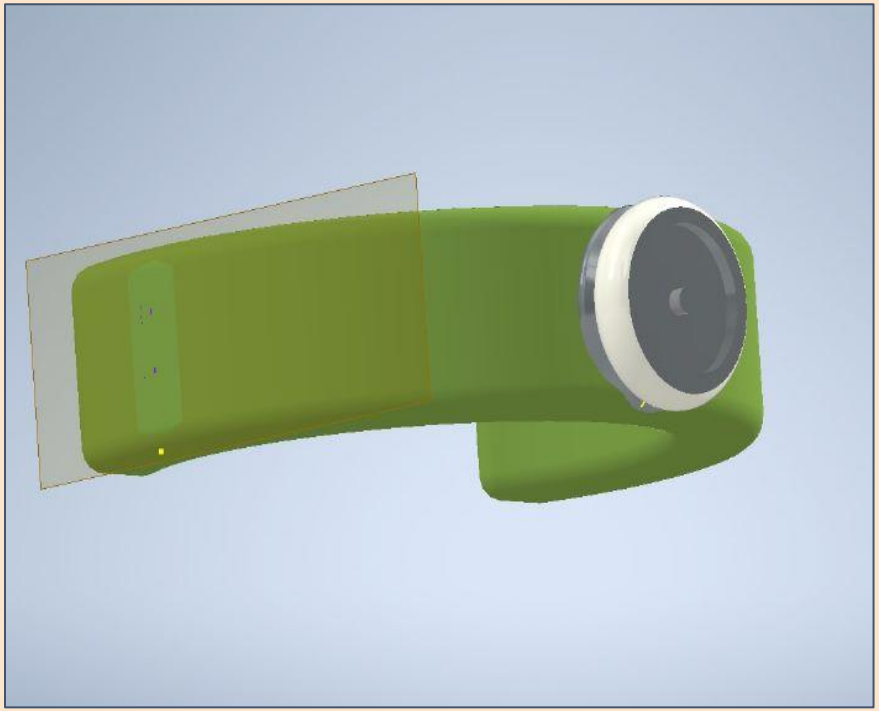
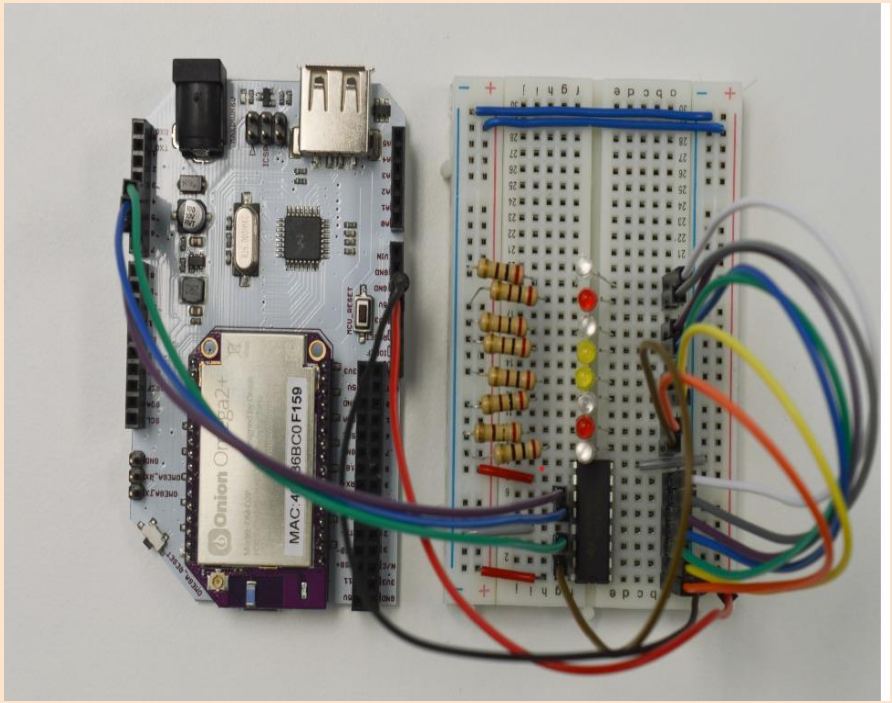


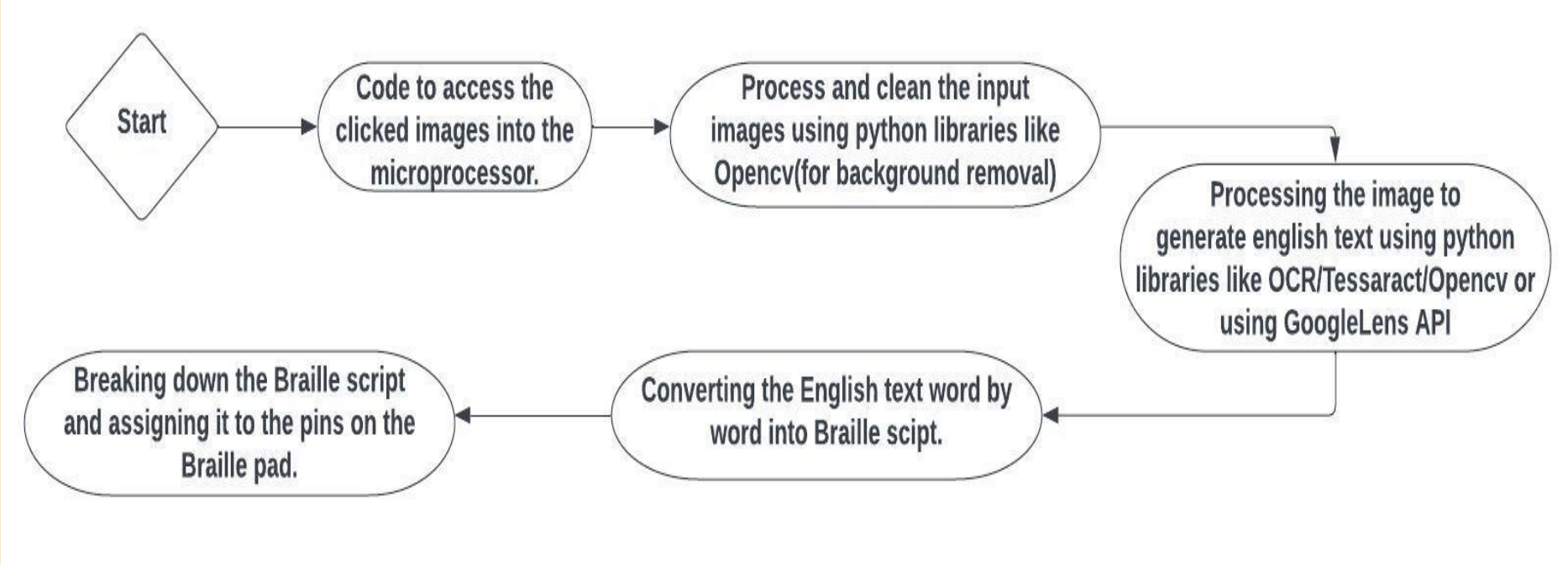
Figure: Autodesk Model of Head Camera



Arduino connections

Moving Magnet Actuators

Flowchart of Algorithms Involved



References

[1] R. Sarkar and S. Das, “Analysis of Different Braille Devices for Implementing a Cost-effective and Portable Braille System for the Visually Impaired People,” Int. J. Comput. Appl., vol. 60, no. 9, pp. 1–5, 2012, doi: 10.5120/9717-3073.

[2] https://www.amazon.in/Spy-Cameras/b?ie=UTF8&node=138920703.

[3] S. Supriya and A. Senthilkumar, “Electronic Braille pad,” *IEEE Xplore*, Jun. 01, 2009. Link (accessed Jun. 02, 2023).

References

[4] J. L. Dela Cruz, J. A. D. Ebreo, R. A. J. P. Inovejas, A. R. C. Medrano, and A. A. Bandala, “Development of a text to braille interpreter for printed documents through optical image processing,” IEEE Xplore, Dec. 01, 2017. https://ieeexplore.ieee.org/abstract/document/8269523 (accessed Jun. 01, 2023).1`

Thank You