International Journal of Research in Engineering, Science and Management
Volume 5, Issue 1, January 2022
https://www.ijresm.com | ISSN (Online): 2581-5792

An AAC Device for Speech Impaired People

Ramesh Suryadev Singh[1*], Md. Tabish Alam[2], Mohammed Ata Ur Rahman[3], Kumbham Harika[4], Gampa Sai Nikhil[5]

***Abstract*: This paper presents implementation of AAC device for speech impaired people.**

***Keywords*: AAC device, Microcontrollers.**

1. Objective

Around 466 million people worldwide have disabling hearing loss, and 34 million of these are children. In India, for speech disability, 7.5% (1,640,868) and for hearing disability, 5.8% (1,261,722) of the population faces difficulty everyday. What we did not find was a comfortable wearable technical product for such people empowering them to express there emotions to all. Lack of expression reduces life expectancy by 10-15 years Also we found out that most of the assistive tech that exists caters to the blind. It was around a decade ago that someone is trying to build something for this community.

2. Need

Social communication is one of the most important pillars of our society. We believe that people with special needs are members of this society and have the right to enjoy the communication with the external environment in an easy and professional manner. To cater to the need of a segment of people who hadn't had any innovation for them for about a decade. To create a technology to give the people with limited mobility an option to convey their feelings and thoughts. People with ALS, etc. cannot move their body at their command as easily as mute people, so these people face the problem of lack of expression a lot more than a person who is just mute or deaf. It is based on the need of developing a smart, comfortable, easy to use device that the people with special needs can wear daily without feeling awkward and can communicate not only with the people around them but also take benefits of the latest technology like google assistant, etc.

A lot of Manual operation. Person's actions are difficult to understand (Sign Language is not understood by all) Complicated to use and awkward to wear daily to work or restaurant, etc. Conveying information takes more time. Very Expensive. Such people are not able to make full use of the functionality provided by Google Assistant, Alexa, etc.

Fig. 1.

3. Competitive Analysis

- Most people have to depend upon Sign Language which is not understood by all.
- Most people who cannot afford these devices rely on 'alphabet card'.
- Yingmi Technology (glove that translates gestures developed by a Chinese VR startup); Market Price – less than $200(14.5k).
- TALK (an augmentative and alternative communication device which uses breath as the way of interaction); Market Price – $199(14k).
- SGD (Speech Generating Devices); Market Price – $400 to $800(29k to 58k).
- Allora (AAC Device developed by Talk to Me Technologies); Market Price – $5995(425k).
- Lightwriter SL40 Connect; Market Price – $ 6995
- Eye Tracker; Market Price- $ 7000.

4. Concept of Innovation

The aim is to create a useful and fully functional real-world product that efficiently translates the movement of the fingers into onscreen text and voice for better communication for the deaf and mute (dumb) community.

Every user of "Saksham" gets a small device, which sits, in the palm and comes with five customize-able buttons, namely, dot key, dash key, space key, enter key and backspace for Morse

*Corresponding author: singhramesh1563@gmail.com

input. The user starts typing his thoughts using just 5 buttons, the next word and the current word being typed are suggested on the LCD display via our predictive text algorithm. Then the input is processed and given to our code. The code converts the Morse into readable text and displays it on the screen when you press enter and reads the text aloud. The output given by the code is sent to the screen and speaker via the micro- controller. This process is extremely fast. Even the input is made faster via the "Next word prediction model" making the conversation smoother.

Our device only involves two main buttons to replace a whole keyboard for the same purpose, having a full-fledged keyboard on a small daily wearable device does not make sense. Moreover, it is easier and faster for a single-handed use.

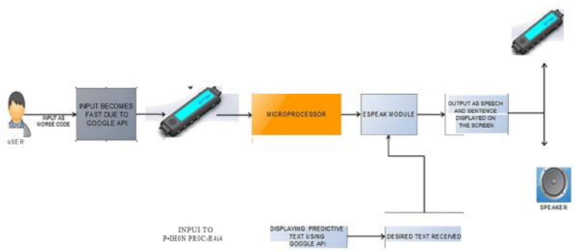

Fig. 2.

Advantages:

- Effective and fluent communication
- Low cost
- Compact device (daily use)
- Flexible to users (customize)
- A lot faster (comparably)
- Less power consumption
- Lightweight

Proof of Concept:

We have made the industrially designed 3D model of the device in Solidworks Software. The casing is analyzed on ANSYS Software for weight reduction and ergonomic design and is 3D printed. PCB fabrication to be done for downsizing the circuit. The hardware is easily available and we have assembled the components is done into the casing. The software is booted with the help of a computer onto to the micro-controller with our code and the chip is installed in the device. 3D printing and PCB fabrication helps us reduce the cost to a minimum.

Hardware and Software:

- Microcontroller
- RF modules
- Voice Module (ISD1820)
- LCD Display (16*2 LCD)
- Speaker
- USB charging port
- Power Supply
- Arduino
- Python
- OS Module

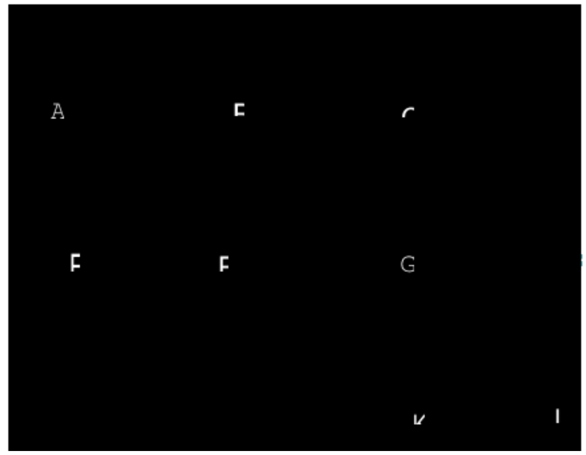

Fig. 3.

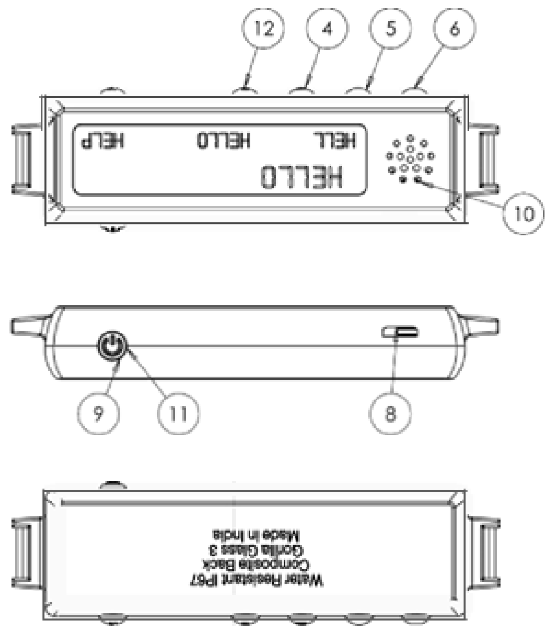

Fig. 4.

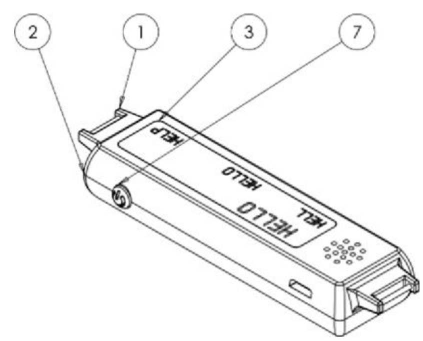

Fig. 5.

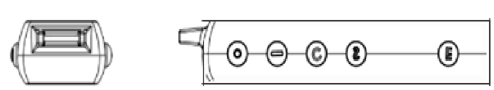

Fig. 6.

Break Even Analysis:

In simple words, the break-even point can be defined as a point where total costs (expenses) and total sales (revenue) are equal. Break-even point can be described as a point where there is no net profit or loss. The firm just “breaks even.” Any company which wants to make abnormal profit, desires to have a break-even point. Graphically, it is the point where the total cost and the total revenue curves meet.

Calculation (formula) Break-even point is the number of units (N) produced which make zero profit. Revenue – Total costs = 0

Total costs = Variable costs * N + Fixed costs Revenue = Price per unit * N

Price per unit * N – (Variable costs * N + Fixed costs) = 0
Fixed costs= 2000

Price per unit=2650

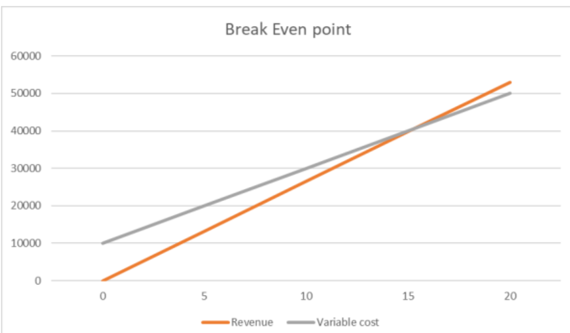

Fig. 7.

1) App

Saksham app is an android based app to help users to learn and use Morse code in an interactive and easy way. It is an interactive and learning app designed to address multipurpose device solutions. This app is built on android platform using Java as main programming language.

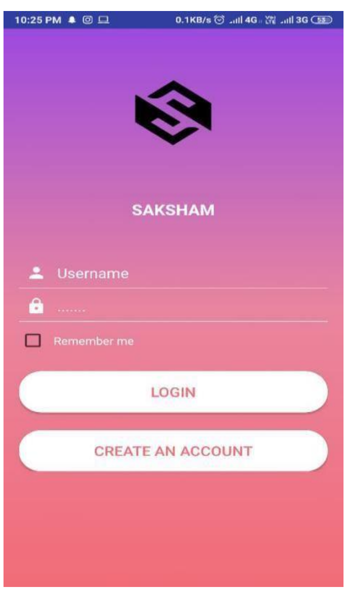

Fig. 8.

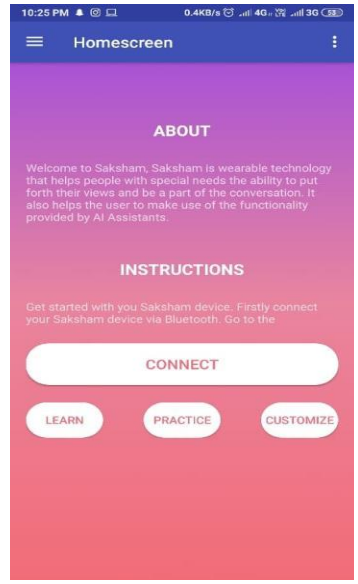

Fig. 9.

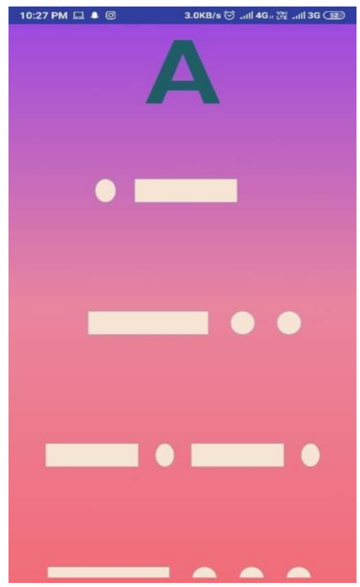

Fig. 10.

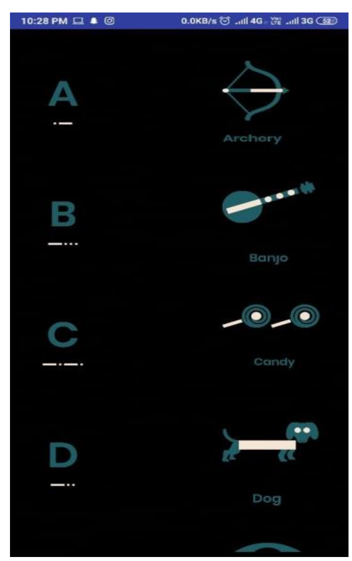

Fig. 11.

An interactive environment to connect with the device and perform various tasks. A great and easy platform to learn and master Morse code using object symbols.

Practice tests in order to evaluate how much accurate are you. Unique login id and password for each user and device. Easy customization is available so that one can use this app according to his/her convenience.

Additional setting to make the app more interactive to users. Customer feedback, complaints and suggestions are heartily welcomed.

5. Conclusion

We expect following outcomes from the Saksham app regarding our start-up.

It will generate a huge convenience for our users who want to learn morse code. Instead of searching for other sources they will directly learn from this app and keep learning while using our product. Thus making people more aware this app will create an ease to use our product. This app will serve as platform to quickly and directly connect and interact to our users and make them aware of the new development in the device and other customer services. All update notifications and messages will be directly sent through this app. Apart from customer services, this app will also be a tool to advertise our product in the social media. A network will be created using this app to join all people who use our product so that they can connect to each other and share their experience and knowledge.

We have developed this app making as as user friendly as possible. We examined technical bugs with help of experts. User interactiveness and graphics was well received by people in general. We hope that this app will serve its objective in best possible way and will help our project Saksham to grow.

Future Work:

First step will be making the alpha prototype, by 3D printing the device body and assembling the hardware (after purchase) and booting the software. We are ready to go with the first step and it will be the first use of the funding obtained. We are confident to be able to produce the alpha within the next 4 months after funding. We want to give it to focus groups and analyse the feedback for beta.

We are making an app as well which will help the people to learn ‘morse’ with the help of interactive exercises.

The app will also allow the user to customize his/her Saksham device according to his/her own preference.

(You just have to connect your Saksham device via Bluetooth and you can customize not only the physical appearance of the device but also the buttons depending on your comfort.)

Beta app for the same is ready for demonstration. We are confident that the final versions can be made within 3 months after the funding.

We are working on adding gestures to it. As gestures are the future. It will be implemented to add quick replies as speed dials in the device. We can add or define our own gestures (can be done via the app). For this, we are working with another Start-Up, which makes human augmentation devices and tech based prosthetics. As one of our member works with that start-up we are confident in achieving this milestone within a year.

References

[1] Blackstone, S. W.; Williams, M. B.; Joyce, M. (2002). "Future AAC Technology Needs: Consumer Perspectives". Assistive Technology. 14(1): 3–16.

[2] Ashraf, S.; Warden, A.; Shearer, A. J.; Judson, A.; Ricketts, I. W.; Waller, A.; Alm, N.; Gordon, B.; MacAulay, F.; Brodie, J. K.; Etchels, M. (2002). "Capturing phrases for ICU-Talk, a communication aid for intubated intensive care patients.". Proceedings of the fifth international ACM conference on Assistive technologies - Assets '02. p. 213.

[3] https://www.nidcd.nih.gov/health/assistive-devices-people-hearing-voice-speech-or-language- disorders

[4] Higginbotham, D. J.; Shane, H.; Russell, S.; Caves, K. (2007). "Access to AAC: Present, past, and future". Augmentative and Alternative. Communication. 23(3): 243–257.