

# Mudra

## An Innovative Device Helping Deaf-Mute People to 'talk'



IMAGE: Kind courtesy Amrita University

A number of innovations are being done all over the world. In our country also innovations are taking place to solve the societal, environmental and economic problems. Recently, we read a story about an innovative device -Mudra, developed by Mr. Apurva Venkat, a student of Amrita School of Engineering, Bengaluru. The highlights of this innovative device are shared here thinking that it may inspire our young innovators and researchers to be more sensitive towards social problems and the people around. Further, they may be inspired to develop such innovative products, processes and services for betterment of the society.

### What lead this Innovation?

There is a large number of people across the world who can not listen and speak. For a common person it becomes difficult to communicate with such persons. Recognizing this problem, four students from Amrita School of Engineering in Bengaluru, Mr. Abhijith Bhaskaran, Mr. Anoop G Nair, Mr. Deepak Ram and Mr. Krishnan Ananthanarayanan thought of developing a smart glove that can recognise commonly used gestures in India and translate them into voice, so that a common person can understand what they want to say.

### How 'Mudra' Works?

Mudra glove can be worn like any other riding glove. Once worn, the glove recognises hand gestures in all possible directions and angles, using flex resistors, accelerometer and gyroscope. The corresponding output is transmitted as speech through inbuilt speakers. The glove can currently recognise numbers from one to 10, and gestures frequently used by Indians corresponding to words such as goodbye and thank you.

According to Mr. Anoop Nair, they have used a combination of finger gestures and hand movement to help detect and understand an action. In fact, they have feeded about 70 words that correspond to various actions in the gloves. This can be extended further as well.

Initially, the team had planned to use a camera device but it proved to be bulky and expensive. Again adding an innovative dimension, they shifted to flex technology. Each flex sensor costs them around Rs 750. The team used 10 flex sensors, an accelerometer and a gyroscope, taking the total cost to Rs 7,500. The camera device version would have cost the team at least Rs 70,000. A prototype of the glove, built in 16 weeks, is being tested at the Amrita Robotics Research Lab. The students say that the most difficult part of the glove, also their final-year project, was the design part.

It is not the first time that this team developed automated glove for deaf and dumb. In fact, such similar gloves using flex technology had also been developed by a team of students Team QuadSquad in Ukraine. But they used 15 flex sensors and gave the option to transfer the voice (recording) via Bluetooth to a mobile device and also to a computer. But the cost of the glove, which is called EnableTalk, is estimated to be \$150 (around Rs 10,000). Another team of two students from the University of Washington also created a similar glove and called it SignAloud. The cost of this device is not known. In addition to it, a collaborative group from New Zealand and Malaysia are also working on a sign-to-text program, which translates gestures from Malaysian sign language to multiple languages.



## Innovative Features of ‘Mudra’

But as compared to the earlier gloves, the gloves developed by the Indian team have several innovative features. The innovative features of the Mudra gloves are as follows:

- These are cost effectiveness, easy to use and works on Indian sign languages,
- The smart glove recognizes commonly used gestures in India and translates them into voice,
- While the glove helps speech-and hearing-impaired people, it is multi-purpose as well.
- Once worn, it recognizes hand gestures in all possible directions and angles using flex resistors, accelerometer and gyroscope,
- These gloves can be reprogrammed for a range of applications in which motion-sensor technology plays an important role, such as gaming stations, virtual reality, remote control of devices, and the robotics and medical industry, etc.

## Challenges Faced While Developing ‘Mudra’

According to the team, there were some challenges also while developing the smart gloves. Some of them are given below:

- The design of the gloves was crucial, as a stiff hold was required on the fingers. For this purpose, a range of values was calibrated precisely for each specific position of the finger and the rest was filtered out.
- Calibration of values for specific positions was a time consuming activity and had to be very accurate.

- The movement of the hand also posed another challenge. Although the inertial measurement unit offered values, these were not accurate, owing to noise. Filtering techniques were adopted for precision.
- Since differentiating between various orientations and movements of the hand with only one sensor was proving to be difficult, the students developed a novel method of state estimation.

Once the Mudra glove comes in market, it can be a very good means of communication between deaf and normal peoples. Though, the team from India says that these may be more cost-effective, but in the absence of a proper comparative research study on what the other teams have done, it may be difficult to confirm. Even than the innovation by the Indian team is appreciable.

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**“Innovators are those who do not know that it cannot be done. Innovators are those who see what everyone else sees but think of what no one else thinks. Innovators refuse status quo, They convert inspirations into solutions and ideas into products.”**

—Bill Gates

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**“Exploration is the engine that drives innovation. Innovation drives economic growth. So let’s all go exploring”.**

—Edith Widder