# Gesture Based Assistant For People With Disabilities Using IOT

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***Abstract*— Technology has been advancing rapidly in the modern world and has revolutionized the way we carry out our daily lives. It has impacted various aspects of society such as education, communication, and even how we interact with the environment around us. However, it is important to remember that not everyone has the same level of ability when it comes to using technology or interacting with the world. Some individuals are differently abled and may face significant challenges in using their senses to the best extent possible. This can lead to a major communication barrier between those who are differently abled and the rest of society, particularly in educational, social, and professional settings. To overcome this barrier, an advanced gesture recognition system is necessary. Through this project we present an idea that will enable these individuals to interact with the rest of the society.**

**The project involves the use of flex sensors, which are attached to the user's fingers and detect the degree of finger bending. This information is then transmitted wirelessly to a microcontroller, which interprets the data and activates the appropriate action. The project aims to provide an intuitive and hands-free method of device control, particularly for individuals with physical disabilities. The proposed system is low-cost, easy to use, and has the potential for various applications in the fields of medicine, robotics, and entertainment. This abstract provides a brief overview of the project and its potential benefits. This results in accurate and seamless communication between the individual and their care taker.**

**Keywords—sign language, communication, hand gestures.**

## I. INTRODUCTION

According to the World Health Organization, there are approximately 300 million people worldwide who are deaf, and one million who are unable to speak. For these individuals, sign language is their primary means of communication. Sign language involves the use of hand gestures and facial expressions to convey meaning, and each country has its own native sign language, with some countries having more than one. While sign language is a powerful tool for communication, it can also be challenging for some individuals to understand and use. This can create a significant roadblock for those in the elderly community, as well as individuals with disabilities, as they may struggle to interact with others in their educational, social, and professional environments. This lack of communication can have a profound impact on the lives of those affected, making it difficult for them to achieve their goals and pursue their dreams. It can lead to feelings of isolation and exclusion, as well as a lack of access to information and resources. Therefore, it is crucial that we find new and innovative ways to bridge the communication gap and provide equal opportunities for all.

One solution is the development of an advanced gesture recognition system. Such a system would involve the use of sensors, cameras, and algorithms to interpret hand gestures and movements, allowing individuals to communicate more easily and effectively. This technology is already being used in gaming and virtual reality applications, but its potential for enhancing communication is enormous.

In an educational setting, an advanced gesture recognition system could be used to help students with disabilities participate more fully in class discussions and activities. For example, they could use hand gestures to answer questions, participate in group discussions, and even give presentations. This would not only help them feel more

included in the classroom, but also give them the opportunity to develop their communication skills and gain confidence. In a social setting, gesture recognition technology could be used to help individuals with disabilities to interact with others more easily. They could use hand gestures to order food in a restaurant, ask for directions, or even make new friends. This would help them feel less isolated and more connected to their communities. In a professional setting, gesture recognition technology could be used to help individuals with disabilities access job opportunities and participate fully in the workplace. They could use hand gestures to operate a computer, control machinery, or even communicate with colleagues. This would help them feel more valued and productive in their work, and benefit employers by enabling them to tap into a wider pool of talent.

However, the development of an advanced gesture recognition system is not without its challenges. One of the biggest challenges is the need for accuracy and reliability. The system must be able to interpret hand gestures accurately and in real-time, without making mistakes or misinterpreting the user's intentions. This requires sophisticated algorithms and sensors, as well as a deep understanding of human behavior and communication. Another challenge is the need for accessibility. The system must be designed to be accessible to individuals with a wide range of disabilities, including those who are visually impaired or have limited mobility. This requires careful consideration of factors such as user interface design, feedback mechanisms, and training resources. Despite these challenges, the development of an advanced gesture recognition system has the potential to transform the lives of millions of people worldwide. It could provide a powerful tool for communication and enable individuals to participate more fully in their communities, achieve their goals, and pursue their dreams. It is up to us to embrace this technology and work together to create a more inclusive and accessible world for all.

## II. PURPOSE OF STUDY

According to the World Health Organization (WHO), over 466 million individuals worldwide suffer from disabling hearing loss, including 34 million children. In Egypt alone, 7.5 million people experience deafness or hearing impairment. These figures are expected to increase to 900 million by 2050. The world's aging population is also growing rapidly, with 617 million people aged 65 and over today, projected to reach 1.6 billion (nearly 17% of the global population) by 2050, as per the report "An Aging World: 2015". As a result, it can be challenging for those who are deaf, dumb, or bedridden to communicate effectively with others, emphasizing the need for systems that aid them in their daily activities.

The purpose of the hand gesture based on flex sensors project is to develop a hands-free method of controlling electronic devices using hand movements. The project aims to explore the use of flex sensors as a means of detecting finger bending and translating this information into specific commands for the electronic devices. The system is designed to be intuitive and accessible for individuals with physical disabilities, allowing them to control devices without relying on traditional input methods such as buttons or touchscreens.

The study aims to investigate the feasibility and effectiveness of the proposed system and its potential for various applications in different fields. The project also seeks to explore the potential of the system to enhance the user experience, particularly for individuals with physical limitations, by providing a more natural and intuitive way of interacting with electronic devices. The study may also investigate the cost-effectiveness and scalability of the proposed system to make it accessible to a broader range of users. Therefore, this project aims to facilitate communication between individuals with disabilities and the general public.

## III. SCOPE OF THE PROJECT

Disabilities can make life challenging for many people, and those who are bed-ridden or have difficulty communicating may struggle to express their needs and connect with others. In particular, individuals with hearing loss and speech impairments face significant communication barriers that can limit their ability to interact with the world around them. The Smart Glove project seeks to address this issue by providing a simple and effective means of communication for those with disabilities. One of the key benefits of the Smart Glove is that it enables speechless individuals to communicate with those who do not have hearing or speech impairments. By simply making a finger movement, they can convey their thoughts and connect with others in a more meaningful way. This can help to minimize the existing communication gap and provide a sense of ease and collaboration for those who may have felt isolated or disconnected from the world around them.

Moreover, the Smart Glove has the potential to make life easier and better for many individuals, especially the elderly population who may have limited mobility. By providing a simple means of communication that requires minimal effort, the Smart Glove can help these individuals to express their needs and connect with others more easily, thereby improving their quality of life. Overall, the Smart Glove project is an important step forward in addressing the communication challenges faced by those with disabilities. By providing a reliable, easy-to-use solution, it has the potential to help many individuals connect with the world around them and lead more fulfilling lives. As such, it represents an important contribution to the field of assistive technology and has the potential to make a significant difference in the lives of those with disabilities.

## IV. METHODOLOGY

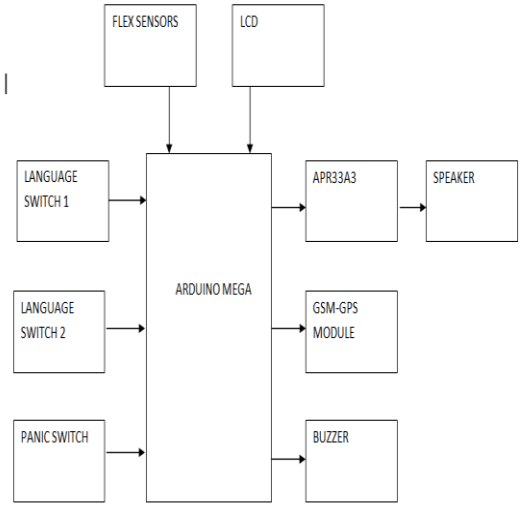
The flow chart below shows. The user is given the choice of selecting the desired language, upon selecting the required language the gesture input is given to the Arduino.

• Flex sensors are placed on gloves which can be easily operated by the user by making gestures. The resistance values will change according to the gesture made by the user and sensor produces voltage correspondingly. The output voltage of flex sensors is in the analog form which is converted into digital form by using inbuilt ADC 2560.

• Predefined gestures with corresponding messages are stored in the database of the microcontroller in different languages.

• Microcontroller produces the speech signal using APR (Auto Playback Recorder) and matches the motion with the database. The output is given out through the speaker as per the language chosen by the user by operating the switches. For a Specific gesture the GPS module will track the location of the device user and GSM module is used to send a text message which consists of location address of user to guardians when he/she is in emergency situations.

In this system flex sensors are placed on gloves according to the gesture made by the user the resistance




values will change, and sensor produces voltage. The output voltage of flex sensors is processed using Arduino Mega2560. Predefined threshold values for each gesture and its corresponding messages are stored in the database of the microcontroller. When the input voltage of the microcontroller exceeds the threshold value, LCD displays the message that was assigned to the gesture in the database and the speech signal is produced using APR33A3 through speaker in our system.

Fig 1 Architecture Diagram

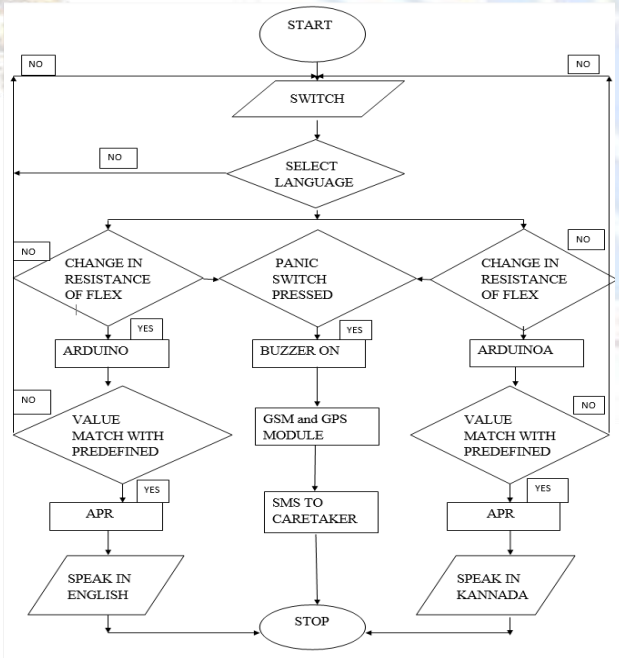



Fig 2 Working of the System

The user is given a choice for selecting a desired language through switches in the beginning itself. A panic switch is provided in case of emergency situations to track the location of the device user using SMS sent by the system.

## V. RESULT

The study on hand gesture based on flex sensors showed that the system was effective and feasible in controlling electronic devices through hand movements. The flex sensors accurately detected finger bending, and the transmission of data to the microcontroller was stable and consistent. The system interpreted finger bending data and triggered appropriate actions with high accuracy.

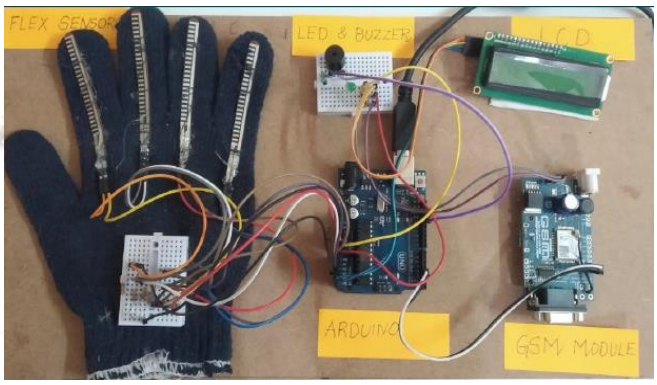



Fig 3 Working Prototype

In this system flex sensors are placed on gloves according to the gesture made by the user the resistance values will change, and sensor produces voltage. The output voltage of flex sensors is processed using Arduino Mega2560. Predefined threshold values for eachgesture and its corresponding messages are stored in the database of the microcontroller.


Fig 4 Result Message 1

A display message on LCD screen showing the message “I WANT FOOD” this message is displayed when first finger is bent.


Fig 5 Result Message 2

A display message on LCD screen showing the message “I WANT WATER” this message is displayed when second finger is bent.


Fig 6 Result Message 3

A display message on LCD screen showing the message "I WANT CHAIR" this message is displayed when third finger is bent.


Fig 7 Result Message 4

A display message on LCD screen showing the message "I WANT MEDICINE" this message is displayed when fourth finger is bent.

These are the results seen when the fingers are bent. Further more a text message will be sent to the caretaker's phone.

When the input voltage of the microcontroller exceeds the threshold value, LCD displays the message that was assigned to the gesture in the database and the speech signal is produced using APR33A3 through speaker (English and Kannada) in our system.

The research demonstrated the potential for various applications in medicine, robotics, and entertainment. It proved to be accessible and intuitive, especially for people with physical disabilities, allowing them to control devices without relying on conventional input methods like buttons and touchscreens.

In conclusion, the study showed that the proposed hand gesture based on flex sensors system could be a promising alternative to traditional input methods for electronic devices. Further research and development are necessary to refine and optimize the system for various applications and user groups, but the initial outcomes are promising.

## VI. CONCLUSION

The world is witnessing an increase in the aging population, and with it, there arises a necessity for technology that can assist them in their daily lives. One of the challenges that aging individuals face is difficulty in communicating effectively with others. Furthermore, those who are specially-abled and cannot speak or hear face similar challenges. To bridge this communication gap, an advanced gesture recognition system is needed that can help people communicate effectively without having to rely on verbal communication. The proposed gesture recognition system is an innovative solution that can be used by not only the elderly but also by individuals who have speech or hearing impairments. It is a lightweight, efficient, and reliable system that is designed to make the lives of the speechless better. The system is based on hand gestures and facial expressions that are widely used in sign language. This helps the user to express themselves in a way that is easily understood by others. The system is designed to be easy to use, requiring only simple finger movements to communicate. One of the challenges faced during the development of the system was the size and weight of the gloves. It was observed that bulky gloves were not practical for the patient, and an effort was made to develop delicate gloves that would be comfortable for the user to wear for long periods. The output of the gesture recognition system is in the form of speech, which can be easily understood by others. The system also offers the ability to manipulate the voice output in two languages, making it accessible to a wider audience. The cost-effectiveness of the system makes it an affordable solution for everyone.

In conclusion, the proposed gesture recognition system is a simple, reliable, and cost-effective solution that can help bridge the communication gap between the speechless and others. It is a valuable tool for the elderly and specially-abled individuals who face difficulty in communicating effectively. With the continued advancement of technology, it is essential that we continue to develop innovative solutions that can improve the lives of people who face challenges in their daily lives.

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