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Hand Gesture Recognition to Help Mute and Deaf People Using Image Processing

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Abstract - Hand gestures are an important aspect of communication for both hearing and non-hearing people. However, for mute and deaf individuals, sign language is their primary mode of communication. In this paper, we propose a system that recognizes hand gestures to aid communication between hearing and non-hearing individuals. The system employs image processing techniques to recognize hand gestures and translates them into text or speech which can be understood by both hearing and non-hearing individuals. The system is designed to use a camera to capture images of hand gestures, and then processes those images using various image processing techniques such as thresholding, skin color detection, and contour detection. The system then applies Image Processing algorithms to classify the hand gestures and translate them into text or speech. Our experimental results show the effectiveness of the proposed system in recognizing hand gestures and aiding communication between hearing and non-hearing individuals

keywords:
Hearing and Non-Hearing, M, Information and Communication technologies.

1. Introduction

Communication is an integral part of human interaction. However, for the mute and deaf individuals, communication can be a challenge as their primary mode of communication – sign language – may not be understood by everyone. This can lead to a sense of isolation and exclusion. In recent years, there has been a growing interest in developing technology to aid communication between hearing and non-hearing individuals. One such technology is gesture recognition, which recognizes hand gestures and translates them into text or speech. Communication acts as a main channel between people to communicate with each other. But there are some unfortunate ones who are deprived by this who are known as dumb people. Dumb peoples always find difficulties to communicate with normal people. These people who cannot speak make use of Sign language to communicate with other people who knows the meaning of that particular sign or there must be an interpreter who always needs to translate their sign language to the normal people. This challenge makes them uncomfortable, and they feel discriminated in the society. In the contemporary era, there are several new technologies which can be implemented for making physically disable people to lead their life in a normal way without facing any difficulties.

Nowadays Hand gesture play an important role in interchanging information. By taking this into the account, a "Hand Gesture Recognition to help mute and deaf people using image processing" is built, which localizes and track the hand gestures of dumb people and convert it into speech in order to maintain a communication channel with other people. The goal of this paper is to propose and implement a system that recognizes hand gestures to aid communication for mute and deaf people. The system employs image processing techniques to detect and classify various hand gestures. Specifically, we use thresholding, skin colour detection, and contour detection techniques to extract the hand regions from the input image. We then apply image processing algorithm to classify the hand gestures and translate them into text or speech. The proposed system has several advantages. Firstly, it is non-invasive and does not require any special equipment or devices to be worn by the users. Secondly, it is cost-effective and can be easily deployed in different environments. Finally, it promotes inclusivity and accessibility by facilitating communication between hearing and non-hearing individuals.

2. Literature Survey

The idea used in assistive translator for deaf and dumb people, involves glove-based technique comprising of flex sensors tactile sensor and accelerometer sensors. They overcome "pot and mechanical assembly technique" since it requires very precise assembly, and it is bit delicate. The whole assembly is placed on a palm and different strings are connected to the fingers, whenever position of pot varies it results in a variable voltage. But this mechanism is uncomfortable and inconvenient for daily use and precision required is more, but system does not provide enough accuracy to match the requirement. The advantage of this system is that the system-based technique offers greater mobility and reduce ambiguity among gestures. The drawback of this system is that the output of the system is an alphabet, combining these alphabets and comprising the word is a complex thing and takes more time. The aim of this hand gesture recognition system involves "finger spelling" that means spelling out words in an alphabetical language using hand gesture. They use wireless glove which is fitted with flex sensors (bend sensors) which recognize the gesture by means of resistance associated with the flex sensors. The advantage of this system is, it provides more accuracy in terms of hand gesture recognition and also it is cost efficient. The drawback of this system is, it causes uncomfortable to wear the gloves whenever they want to communicate and also this system carries a lot of cables and flex sensors which are somewhat delicate in terms of quality and any wear and tear can cause changes in resistance which impacts the final **output**. A system which uses color bands to implement the sign language is proposed in. These bands are matched with color bands and the corresponding output is generated. This system overcomes the usage of electromechanical gloves for recognition. The output accuracy is improved due to usage of colour bands.

The author has proposed a Gesture to Speech (G2S) system which is developed using the skin color segmentation. Based on the values of RGB in the image frame the skin color is detected. They use Centre of Region (COR) of the hand region as well the farthest point from the COR for feature extraction process. By taking wrist segment as the reference segment, classification of the gesture is made. The system shows maximum classification accuracy of 80%.

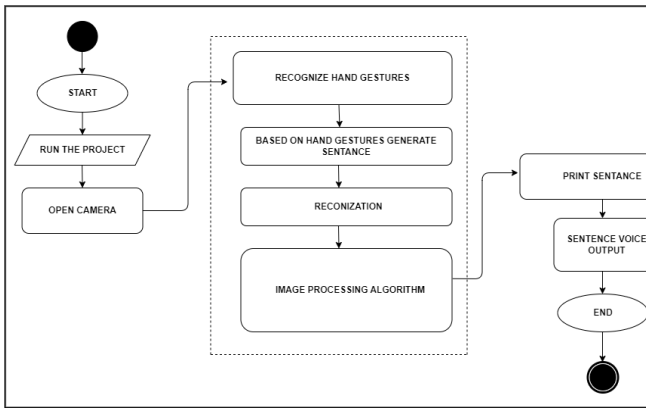
Hand Gesture Recognition and Voice Conversion for Deaf and Dumb [5] uses Principal Component Analysis (PCA) method for feature extraction. K-Nearest neighbor method and Support Vector Machine (SVM) algorithm for classification. This method take image as input gives text and speech as an output. Accuracy of the system is up to 90%.

In the idea of this work is classifying ISL static gestures captured under indistinct conditions, gestures were divided into single handed or double handed gestures. Geometric descriptors and HOG features are used to extract features. A database consisting of 260 images captured under simple and complex background for experimental purposes. **By comparing** KNN and SVM classifier, it is concluded that SVM was Superior to KNN algorithm in terms of accuracy on both geometric and HOG features.

3. Problem Definition

To develop a Hand Gesture Recognition to help mute and deaf people using image processing. Hand gesture recognition can be useful in facilitating communication for mute and deaf individuals. However, current methods for hand gesture recognition are often limited by the accuracy of the image processing algorithms used. Additionally, some gestures may be difficult to distinguish from one another, leading to errors in interpretation. As such, there is a need for a robust and accurate hand gesture recognition system for aiding communication for mute and deaf individuals. This system will require advanced image processing algorithms to accurately recognize a variety of hand gestures, as well as a user-friendly interface to facilitate communication.

4. Proposed Working



For deaf and dumb persons, we suggest converting hand gestures into text & text to speech in this project. The main goal of our project is to recognize hand gestures, detect gestures, and display the results as text. In front of the camera, the end user must make hand motions. Our application will identify the motions as they are made by the user and will convert them into text in real time. The video obtained from the camera unit will be presented on the screen, and inside that video, alongside the hand, the required output will be displayed. Our project serves as a deaf and dumb translator. It solves a number of issues, including the necessity for a human translation. Our program will allow deaf and dumb individuals to express themselves. We'll use the camera to identify hand motions. To use a camera to detect these motions, we must first isolate the hand region, deleting any undesired sections from the video sequence collected by the camera. We count the fingers visible to the camera after segmenting the hand region to direct a program based on the finger count. As a result, the entire problem can be handled in five easy steps: We must first locate and segment the hand region in the video stream. Then, from the segmented hand region in the video sequence, count the number of fingers and the size of the palm. The segmented section will then be matched to the available dataset. Then, for quicker data selection, choose the most accurate data from the dataset and apply a weight for the next comparison. Finally, we'll translate the data we've gathered into text and display it. In front of the camera, the end user must make hand motions. Our application will identify the motions as they are made by the user and will convert them into text in real time. Our project serves as a deaf and dumb translator. It solves a number of issues, including the necessity for a human translation. Our program will allow deaf and dumb individuals to express themselves.

5. Result

This method provides the output for numerous soil parameters for various soil samples and suggests the recommended amount of fertilizers, minimizing the use of extra fertilizers and increasing yield. Accurate results are now possible because to technological advancement, which promotes
cultivation. Precision agriculture thus provides realtime responsive data that enhances farming practices.

Fig 5. Moisture value shown in Ardunio IDE

Fertilizer values for phosphorus in soil

Fertility Rating for Phosphorus	
Levels	**Range**
Low	0-11 Kg p/ha
Medium	11-22 Kg p/ha
High	>22 Kg p/ha

Fertilizer values for nitrogen in soil

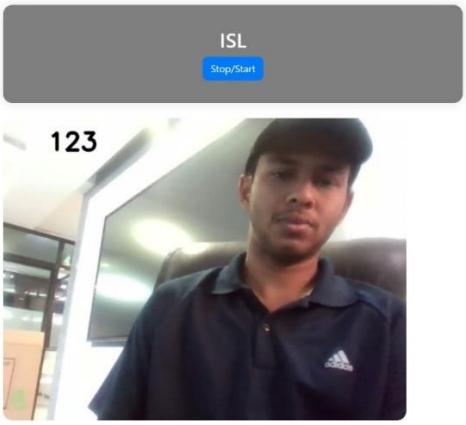
Fertility Rating for Nitrogen	
Levels	**Range**
Low	0-280 Kg/ha
Medium	280-450 Kg/ha
High	>450 Kg/ha

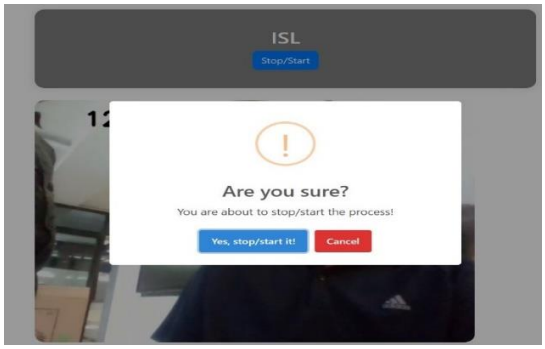
Fertilizer values for potassium in soil

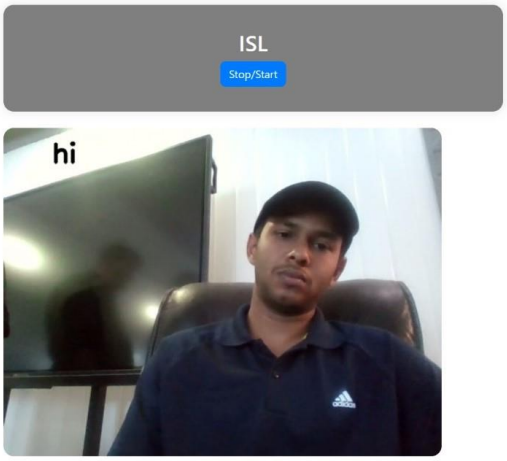
Fertility Rating for Potassium	
Levels	**Range**
Low	0 – 118kg K/ha
Medium	118 – 280 kg K/ha
High	>280kg K/ha

INPUT SINGS:

OUTPUT SIGNS:







6. Conclusion

In conclusion, the use of hand gesture recognition technology to help mute and deaf people is a promising area that holds significant potential to improve communication and quality of life for individuals with speech and hearing impediments. The advancements in image processing technology have enabled the development of increasingly sophisticated hand gesture recognition systems that can recognize and interpret a wide range of hand gestures accurately. These systems have the potential to transform how individuals with communication difficulties interact with the world around them, enabling them to communicate more effectively and independently. The future of hand gesture recognition technology looks extremely promising, with the continued development of more comprehensive and accurate recognition algorithms, the integration of artificial intelligence and machine learning, and the integration of hand gesture recognition with other assistive technologies.

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