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Hand Gesture Recognition for Specially Abled

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ABSTRACT: Hand gesture recognition is a pivotal advancement in Human-Computer Interactions (HCI), particularly within the context of Industry 4.0. This technology enables computers to capture and interpret hand gestures, allowing for command execution without physical contact. The MediaPipe framework, with its built-in machine learning capabilities, offers a robust solution for hand gesture recognition systems. In this research, we develop a simple user guide application leveraging the MediaPipe framework. User guides, commonly known as technical documentation or manuals, provide step-by-step instructions to assist users in navigating and troubleshooting systems. These guides help alleviate user frustration by enabling users to identify, understand, and resolve technical issues independently.

Our experiment involved capturing real-time images using a webcam, training on various hand gesture datasets, identifying each gesture, and recognizing them to convey information within the user guide application. The system allows users to access information based on recognized hand gestures, enhancing the convenience and interactivity of the user guide application.

I. INTRODUCTION

Hand gesture recognition presents significant challenges for real-life applications due to the demands for robustness, accuracy, and efficiency. Our project aims to design a system that allows users to perform computer operations using hand gestures, with a simple web camera serving as the input device. This system is composed of four phases: image acquisition, image preprocessing, feature extraction, and gesture recognition.

Sign Language, a gesture-based form of communication primarily used by individuals who are deaf or hard of hearing, enables people to convey ideas and thoughts, effectively overcoming auditory communication barriers. However, a major challenge is the widespread lack of knowledge about Sign Language among the global population. Learning Sign Language, like any other language, requires significant time and effort, which can be discouraging for many.

A promising solution to this issue lies in the fields of Machine Learning and Image Detection. By implementing predictive model technology to automatically classify Sign Language symbols, we can create real-time captioning for virtual conferences, such as Zoom meetings. This technology would significantly enhance service accessibility for those with hearing impairments, complementing voice-based captioning and fostering a two-way online communication system.

Our project aims to demonstrate a system that enables users to perform computer operations using hand gestures, utilizing a simple web camera as the input device. This system involves four phases: image acquisition, image preprocessing, feature extraction, and gesture recognition. By leveraging Machine Learning and Image Detection, we can address the communication barriers faced by the hearing impaired, significantly improving their access to various services through enhanced, interactive communication technologies.

II. LITERATURE SURVEY

A Robotic Hand: Controlled with Vision Based Hand Gesture Recognition System
Human-robot interaction (HRI) has become an important topic in today's robotic world, especially in assistive robotics. Now pen, mouse, keyboard etc. are not sufficient due to limitations of these devices for taking command. Vision based hand recognition system has come with a solution for these type of demands of human. In this system, human need not to operate any kind of devices, instead a camera is used for recording the movements of hands and these recorded data are used as input for performing any kind of gesture control. The elderly people, patients and disabled can be benefitted from these kind of gesture control. Besides it can be used in extreme environments where human can't go directly. The

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main intension here, is to implement a vision based gesture recognition system that recognizes data gathered from hand movements through a camera.

Deep Learning Based Hand Gesture Translation System
Sign language plays an important role for the people who have the hearing and speech problems for the Non-verbal communication between the deaf-mute people. For the Kinetics gestures plays a crucial role in our day-to-day life. Main problem with this system is very difficult to translate the symbols and required special training on sign language. To overcome this problem we have implemented a Hand Gesture Translation System it provides an ability to interact with the machine efficiently. It will help the deaf-mute to express their feelings and views more effectively with normal people.

Communication through the Recognition of Sign Language
This reveals the frameworks used and the attempts which have been tried to tackle these signs language recognition through the videos, images and also using various algorithms. The author suggests to use the filters in the algorithm so that can resolve the tone of the skin identification. This sign language which can be converted can be achieved to almost 96%. Secondly to collect the dataset containing of forty words which are common and ten thousand images of sign language, to easily and fatly locate these images R-CNN along with an embedded RPN module issued. According to this the performance is improved and the accuracy is also high. R-CNN it increase from 89% to 91.7% where they used YCbCr skill module to identify the skin colour, used in the hand gestures. In the low cost approach all the images were been captured in the green screen background.

III. PROBLEM STATEMENT

Individuals who use sign language to communicate can face challenges when interacting with those who are not familiar with it. As a result, there is a need for systems that can recognize different sign language gestures and convey their meaning to others. This would greatly enhance communication and understanding between sign language users and non-users.

IV. OBJECTIVES:

1. To recognise hand gestures and effectively translate into text as well as audio output.
2. Integrated camera module to capture real time hand gestures based on hand key points or hand landmarks.

V. FLOW CHART

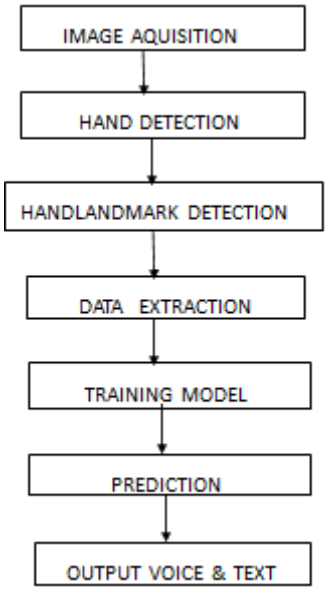

Fig 1: Flowchart of propose method

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Input: Hand Gestures
Output: Audio translation with text display
Step1: Capture the input image from camera.
Step2: Convert input BGR image into RGB image.
Step3: Perform morphological operations such as erosion and dilation to reduce noise followed by smoothing and thresholding of image.
Step4: Extract contours of hand image.
Step5: Store contours as contour templates.
Step6: Gesture is recognized using contour analysis.
Step7: For each recognized gesture, corresponding text as well as audio translation will be achieved

VI. BLOCK DIAGRAM

Raspberry Pi is the brain of system which performs all calculation and executes the program. All the devices connected to raspberry Pi as shown in the below block diagram.

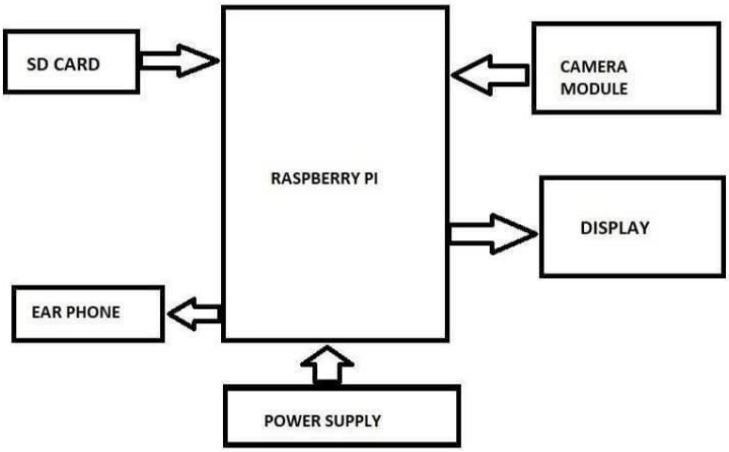

Fig 2: Block diagram of Hand Gesture recognition

VII. RESULTS

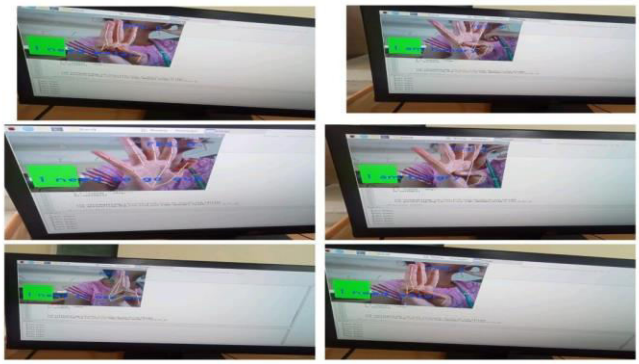

Fig 3: Output

Description:
1. I need help
2. Please call nurse
3. I need to use washroom
4. I need water

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5. I'm hungry
6. I need to go out

VIII. ADVANTAGES

1. The system is fast in predicting hand gesture.
2. Understandable corresponding audio output.
3. Cost effective and uses less RAM and storage.

IX. APPLICATIONS

1. *Communication with Individuals who are Deaf or Hard of Hearing:* This system can facilitate communication with individuals who use sign language, helping to bridge the gap between sign language users and those unfamiliar with it.

2. *Communication Aid for People with Vocal Cord Injuries:* It can also assist individuals who have suffered major injuries to their vocal cords due to accidents or stroke-related issues, providing an alternative means of communication.

X. CONCLUSION

Hand gesture recognition using Media Pipe and Open CV is a promising technology with a wide range of applications. Media Pipe and OpenCV are both powerful and open libraries that provide a variety of tools and resources for developing hand gesture recognition systems. Media Pipe is a cross-platform framework for building real-time computer vision and machine learning pipelines. It provides a number of pre-built models for hand detection, tracking, and gesture recognition. Open CV is a popular open source computer vision library that provides a wide range of Algorithms and functions for image and video processing.

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