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Virtual Personal Assistant With Sign Language

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I. Abstract

This topic is all about developing a successful Sign language recognition and translation system which is helpful for people with certain disabilities who can't use present voice enabled Virtual Assistants. Communication is important with people as it helps us understand them and gain knowledge. In case of Deaf & mute people, this becomes a problem. It is solved by creating a virtual assistant built to recognize hand gestures and translate them in normal language to perform tasks ordered by the user. This certainly helps other normal people to successfully communicate with deaf & mute people Without worrying about any misunderstanding at the listener's end. There are more than 300 sign languages used by various cultural groups worldwide. In this article, we provide a technique for generating a sign language dataset using a camera, followed by the training of a TensorFlow model using transfer learning to produce a real-time sign language recognition system. Despite the small amount of the dataset, the system still performs well.

I. INTRODUCTION

Nowadays, Communication is very important to people for connecting with each other. Today People use virtual assistants to make their day-to-day work easier. There are various virtual assistants available like Google Assistant, Microsoft Cortana, Apple Siri, Amazon Alexa, etc. but it is only used by the people who are able to speak on a major basis. A Successful Communication is done when the message sent by speaker(sender) is understood by the Listener(receiver). But if the sender is not able to speak then the voice assistant cannot understand the message and will not be able to perform the task as expected. This is where the sign language comes in. It is a language specifically made for deaf & mute people. It consists of special alphabets made of various hand movements and gestures.

There is a much larger need to make such technologies usable to the specially-abled people. Deaf & dumb people can communicate with other similar people in sign language, but normal people can't understand what they are trying to say due to lack of knowledge of their language. Such issue can easily be solved with the help of voice assistant specifically designed Digital assistant which can translate the hand gestures into commonly speaking language, English.

The suggested system has succeeded in switching from voice recognition to hand gesture recognition. The following technologies can be used by the proposed system: Convolution Neural Networks are Deep Learning algorithms that have been used for Image Recognition, transforming an image into a matrix that can be comprehended by the system model, and Tensorflow and PyTorch are the most significant libraries used for constructing these systems. In the system, CNN serves as a classifier, and OpenCV, which serves as the system's eye, will capture and process real-time hand gestures and provide outputs with the aid of a classifier.

II. Related Works

Since every virtual assistant currently in use is voice automated, Deaf-mutes and people with other disabilities cannot use them. These days, personal assistants and virtual assistants play a crucial role in our daily lives. Every business or person is converting to these technologies since they help them complete their tasks more quickly and easily. A virtual assistant is a component of this system that can take user input, comprehend it, analyse it, and carry out tasks. Users can save a tonne of time by doing this.

Understanding Deaf users is essential for designing successful sign language processing systems that satisfy user demands. Here, we provide a summary of the background information and talk about recent studies on sign language processing, which aid in our comprehension of the system's problems.

Literature Survey:

1. "Implementation of Virtual Assistant with Sign Language using Deep Learning and TensorFlow", IEEE 2020

   Drawbacks : Voice Recognition is always not perfect, The device should always be connected to the internet.

2. "Artificial Intelligence-based Voice Assistant", IEEE 2020

   Drawbacks : Additional supervision is needed to manage workload and understand.

3. "Development of Intelligent Virtual Assistant for software testing team.", IEEE 2020

   Drawbacks : Un expected events such as power outages, natural disasters, and Internet connection outages can cause problems for you and your VA.

III. Proposed Methodology

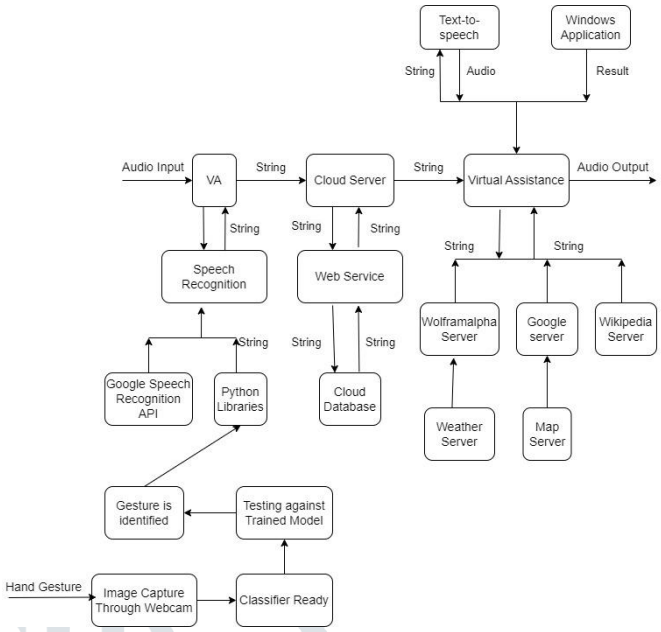

Fig. System Architecture

Following is a simple summary of the system's workflow:

In front of the webcam, a hand motion is made as seen in Fig. This sign motion is translated into text, and the written output is then spoken aloud to the assistant as an input. The assistant considers the query and provides an audio response. The output of this audio format is text. The text output will then be seen on the monitor.

The following is a quick technological description of the system: First, a sign language database is made available to the system in order to train it with a variety of hand gestures labelled with their respective labels. After training is completed, the system enters identification mode. It now utilises the camera input picture and runs it through the classifier to discover its neighbours based on the training samples or labels supplied in the previous phase. If the Gesture does not match the specified dataset, it appends a label to the frame, indicating that the system recognises the next hand motions accordingly. Once the gesture is recognised, it converts text to speech format using Python libraries, and the assistant can recognise the voice and provide output to the system in audio as well as on the display screen. The entire procedure can be performed several times. However, hand gestures will be recognised only if they match the trained dataset standards.

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