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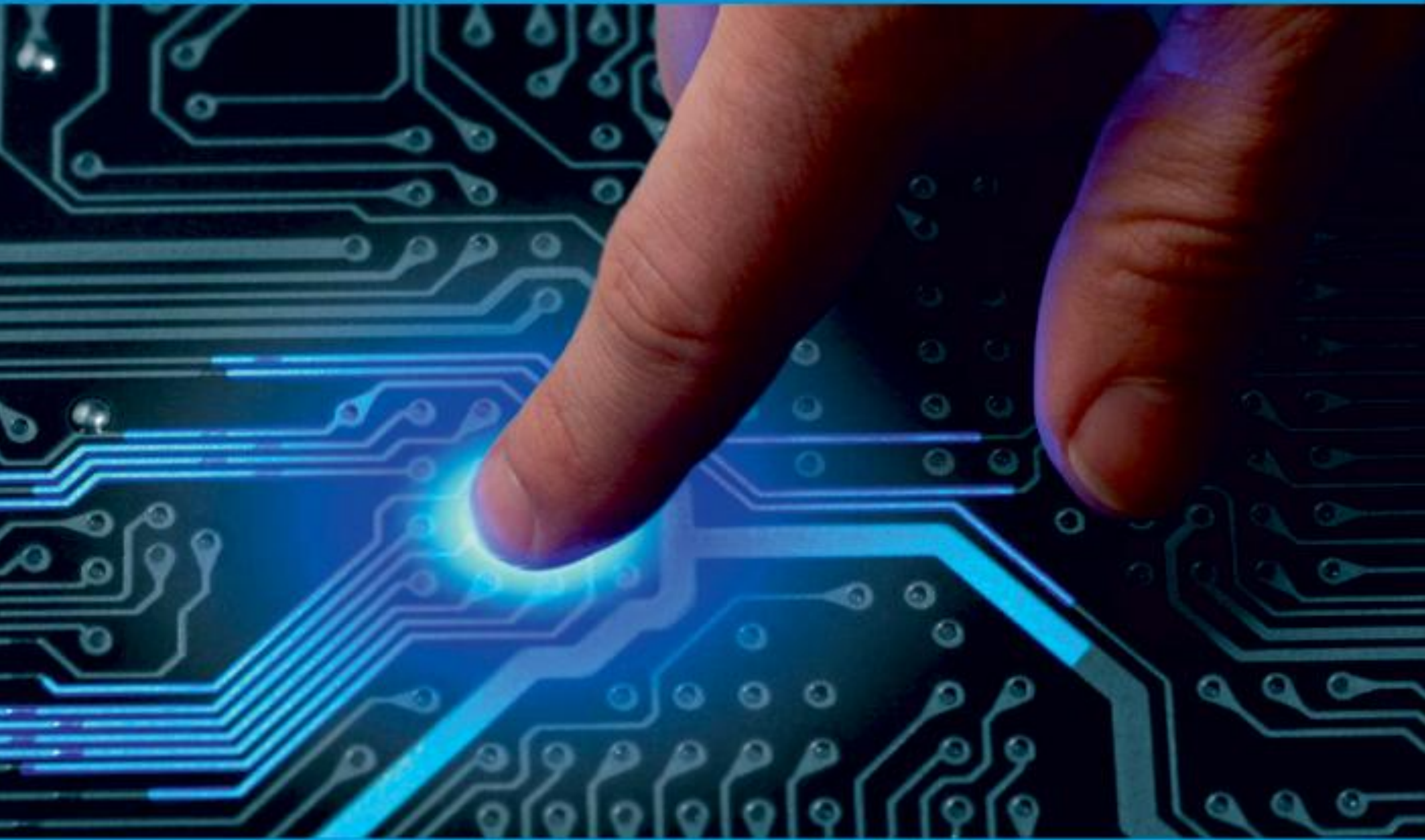

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Sign Language Interpreter using Hand Gesture Recognition

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ABSTRACT: Among hard-of-hearing and non-hard-of-hearing people, sign language is the most popular and successful mode of communication. Because normal people have trouble understanding and interpreting the meaning of sign language used by the hearing impaired, an interpreter is required for sign language translation. There are very few technologies that can enable this social group to connect to the rest of the globe. Understanding sign language is one of the most important factors in assisting hard of hearing people in interacting with the rest of society. With the help of this Sign language identification software, persons who have trouble speaking and hearing can communicate more effectively. Many forms of study are currently being conducted in order to make this procedure easier and more accurate. By developing a gesture-to-text converter that can potentially serve as software for communication between the deaf and the abled, the team hopes to bridge the gap between the disabled and the abled.

I. INTRODUCTION

One of the most basic necessities for societal life is communication. Deaf and dumb people interact with one another through sign language, but it is difficult for non-deaf and dumb people to understand them. As a means of communication, sign language is widely utilised. It has a large number of signals for static words as well as various phrases used in everyday life. We will use Python as our programming language, as well as OpenCV and TensorFlow for object detection in our project.

OpenCV is a computer vision and machine learning software that is free to use. The library contains over 2400 of the top algorithms, including a comprehensive collection of classic and cutting-edge computer vision and machine learning methods. The majority of these algorithms are used to distinguish and detect faces, identify objects, classify human activities in movies, monitor camera movements, track moving objects, and extract 3D ones.

Python is a general-purpose high-level programming language. The goal of the object-oriented approach is to assist programmers in writing clear, logical code for both small and large-scale projects.
TensorFlow is an open-source machine learning platform that runs from start to finish. It has a large, flexible ecosystem of tools, libraries, and community resources that allow academics to advance the state-of-the-art in machine learning and developers to quickly construct and deploy ML applications.

II. METHODOLOGIES

Steps:

- First, we start by creating our own dataset. We wrote a code for collecting several images of various static signs.
- Then said images were stored in the project directory and used for training the model.
- Once the dataset was created, it was time for labelling the images.
- The images are then labelled according to their respective signs for Object-Detection, using labelImg.
- We explicitly drew binding boxes around the hand that performed the sign recognized the meaning of the gesture. For example, in Fig 1 the box around the hand is created during the labelling stage for training the model and recognizing the sign.
- The model is then trained using Transfer Learning in the TensorFlow Object Detection API.
- After the training and testing part, we can detect signs in real time.
- The signs shown in real time will be identified and converted to text.

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The dataset was divided into two groups, one for training while the other was for testing. It was done in the ratio of 4:1 respectively. We also chose to do two datasets/folders for each sign done using the left and right hand separately. This was done to increase the efficiency of the model altogether.

III. RESULTS

Below are some of the static signs we used in this project to be detected and recognized in real time and converted to text.

The percentage at the top of the box around the hand(s), shows the total efficiency of the detection by the software.

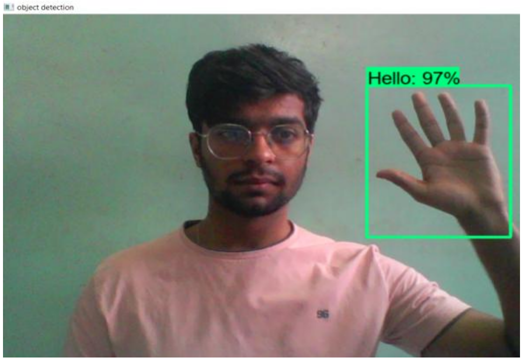

Fig1: "Hello" sign detected in real time by the software.

Fig 2: "Thank You" sign detected by the software in real time.

Fig 3: "Sorry" sign detected in real time by the software.

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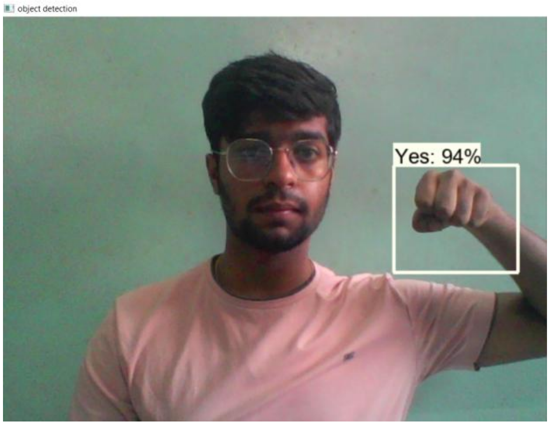

Fig 4: "Yes" sign detected in real time by the software.

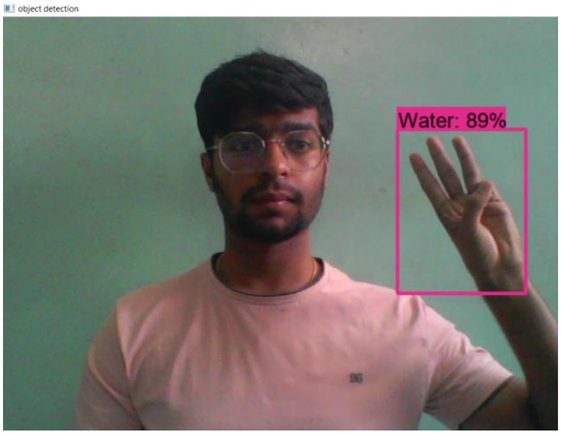

Fig 5: "Water" sign detected in real time by the software.

IV. FUTURE SCOPE

We would improve hand identification and construct a motion-to-text detector if we had more time to work on this project. We are only detecting static signs in this project; thus, it cannot be regarded a complete system or sign language detection programme.

The same concepts and methodology used in this project may also be used to recognise and analyse full sentences in sign language and convert them to text or voice. It is possible to develop motion-to-text or speech technology. The databases required for such a large endeavour would be enormous, requiring a significant amount of effort and time. This project does have certain restrictions. The detection efficiency of the indications is good, but not flawless.

For real-time detection, the background must be clear. While detecting in real time, there should not be any additional or overwhelming features in the frame. The identified signals are static signs; however, the project can be expanded to include motion detection to parse phrases. Due to poorer efficiency and overwhelming elements in the background/foreground, text on top of signs recognised flickers. This flaw could be fixed by using a wider dataset containing a variety of persons and signs to train the model.

V. CONCLUSION

In this study, we looked at how to create an autonomous sign language interpreter in real time utilising hand motion detection software and a variety of tools. Our work has identified signs in sign language; nonetheless, there are many improvements that may be made, and there is still room for further research and refinement.

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