

SIGN LANGUAGE CONVERTER

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ABSTRACT

People with hearing and speaking disabilities face problems in communicating with other hearing people. Sign language is a visual language that is used by deaf and dumb people as their mother tongue. It uses body movements (usually hand movements) for the purpose of communication. But sign language is not so easy to be understood by abled persons. They do require a translator for translation. A translator is a person who knows both local and sign language. He will listen to the abled person and translate it into sign language for the specially abled person. And then translate the responses from specially abled people from sign language to the local language. The application Sign Language Converter will act as a translator for 2-way communication.

I. INTRODUCTION

Sign language is used by people who have speaking or listening disabilities so that they can exchange information between other people and within their own community. This can be used on a wide scale to make most of the public understand what a person is trying to convey to the world through sign language. This will prevent disabled people from hiring other people who can speak and understand sign language just to be their communicator. Sign Language Converter is a machine learning program that detects and recognizes audio signals received to text using speech to text API (python modules or Google API) and then making a visual presentation (video) of the converted sign language which requires machine learning as a part. Sign gestures can be majorly classified into two types, static and dynamic. The static gesture is simpler than dynamic gesture recognition, in a static only a single image is recognized at a time while on the other hand dynamic gesture is a moving gesture represented by various images. Various signs are performed by hand and converted into text/speech.

II. PROBLEM FORMULATION

According to the World Health Organization (WHO), around 5% of the world population belongs to the people with the hearing and speaking disability that totals over 360 million people across the globe. The majority of these people live in countries with comparatively low incomes. Sign Language is an independent language which is different from spoken/written language, the basic difference is it has limited vocabulary compared to written/spoken. Sign language is not the same in every country, different sign languages are used in different countries or regions. There are two separate languages ASL and BSL among which ASL is the most widely used signed language. This paper describes a technology in which real time videos are analyzed and are used for hand movement detection and recognition, thus helping them to convey what they want to explain or tell, in the form of transcripts and converts it into audio. The system developed identifies sign language (non verbal communication) done by using some hand gestures and the machine is trained to recognize some daily frequently used gestures and convert them into verbal communication so that the other people who are not familiar with this non-verbal communication can be understood easily which will ultimately prevent them to hire a person to communicate for them and save their money. We focus on mainly these two points: - Persons who are disabled to speak or hear converse in sign language and have a problem in communicating what they actually mean. A mediator is needed just for the communication between two people if one is disabled and the other is not.

III. PROPOSED SOLUTION

The current system that we are proposing would work on processing of live video streams rather than processing of a still image. It actually identifies the signs on a real time basis which are in front of a machine or host that has a webcam and tells us about the communications done in transcripts form to read. The current system is developed in python and works on machine learning algorithm that uses supervised learning as its basis. It uses a specified Dataset which has information (Q&A) about a finite number of sign videos provided, using this information only the algorithm recognizes the nonverbal communication done in front of the

machine. It also has the capability to recognize all types of characters from A to Z or numbers 0 to 9.

Technologies used in the project

a) Machine Learning

Artificial intelligence (AI) is a subarea of computer science that emphasizes the creation of automated machines that work and react like humans. Machine learning system is a branch of artificial intelligence based on an idea that a system can produce general hypothesis by learning from data provided, identify patterns and make decisions with minimal human intervention. Machine learning is important because as models are exposed to new data, they are able to create a predictive model capable of inferring annotations for future data. They learn from SIGN LANGUAGE ORATOR previous computations to produce reliable, repeatable decisions and results without needing multiple manual edits to the program.

b) Supervised Learning

Supervised Learning is a computational task of automated data (the training data set) to produce general hypotheses. The training data set comprises input and output pairs which are used to train the model and determine a hidden pattern. This hidden pattern is then used for recognition of specific patterns when working data is provided in future. Supervised learning is in which you have input variable

(a) and an output variable

(b) and you apply an algorithm to learn the mapping function from the input to the output. $Y = f(A)$

The aim is to approximate the mapping function so well that when you have new input data (a) you can predict the output variables (b) for that data

Supervised learning is called so because the method of algorithm learning from the training dataset can be thought of as a trainer supervising the learning process. We know the accurate results; the algorithm iteratively makes predictions on the training data and is corrected by the trainer. Learning stops when the algorithm achieves an agreeable level of performance.

c) Deep Neural Networks

Neural networks is a set of algorithms which is used to recognize the relationship between the underlying set of data in the way that a human brain works which constantly tries to recognize patterns and categorize and classify information. It is an excellent tool for finding patterns which are complex as well as numerous for programmers to teach the machine to recognize. It usually involves a large number of processors that are operating in parallel and are arranged in tiers. Hidden layer is in between the two input and output layers. Deep neural network is similar to deep learning, with a certain level of complexity and has more than two layers. The different layers of such a system could be seen as a nested hierarchy of related concepts or decision trees. Deep neural network systems need large quantities of data in order to be trained as the systems learn from exposure to huge numbers of data points. Google Brain learning to recognize cats after being shown over ten million images can be seen as an early example of this.

d) TensorFlow

TensorFlow is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. It is used for both research and production at Google. It is a standard expectation in the industry to have experience in TensorFlow to work in machine learning. TensorFlow was developed by the Google Brain team for internal Google use. It was released under the Apache 2.0 open source license on November 9, 2015.

e) OpenCV

OpenCV (Open Source Computer Vision Library) is a library developed by Intel for programming functions and is released under BSD license hence it's free for both academic and commercial use. It is a powerful library designed to work on real time applications with a strong real-time efficiency. It is written in C++ and its primary interface is based on C++ this makes OpenCV portable to almost any commercial system includes Python, JAVA, MATLAB/OCTAVE interfaces which are supported by Windows, Mac OS, iOS, Linux, FreeBSD, OpenBSD and Android as it was designed to be a cross-platform, the library can take advantage on multi-level processing thus makes it easy for businesses to utilize and modify the code.

IV. PROJECT SCOPE

The scope of the project is that it can be used to help disabled people. It can also be used by abled people to understand sign language and help people to communicate through it. It is used on a wide scale to make most of the public understand what a person is trying to convey to the world through sign language. This will prevent disabled people from hiring other people who can speak and understand sign language just to be their communicator.

V. PROJECT OBJECTIVE

The main objectives achieved in the project are real-time translation, elimination of an interpreter between sign language and common speech. It does not require additional hardware and is easy to incorporate in any OS.

VI. HARDWARE REQUIREMENTS

The hardware requirements of this project are: -

- a) Processor: Pentium, AMD or Higher Version
- b) Operating System: Windows XP/ Windows 7/ Linux
- c) RAM: 2GB recommended
- d) Hardware Devices: Keyboard with mouse
- e) Hard disk: 10 GB or more
- f) Display: Standard Output Display
- g) Voice Input: Microphone (preferred)

VII. SOFTWARE REQUIREMENTS

The software requirements of this project are as follows: -

- a) Android Studio
- b) MySQL Server
- c) Python IDLE

VIII. SCREENSHOTS OF THE PROJECT

- a) **Main window**



- b) **Audio to Sign Language Converter**



- c) **Sign Language to Text Converter**



IX. CONCLUSION

This is to conclude that the project that we undertook will work upon with a sincere effort. Most of the requirements will be fulfilled up to the mark and the requirements which will be remaining will be completed with a short extension. This project would definitely satisfy all the needs and help the community of deaf people and people who are disabled to speak.

Limitations

Although the project is capable of doing the conversion of sign language to common speech and vice-versa, it does face some limitations. The first one is the need for internet availability and the second one is the requirement of android smartphones. Also, it is a bit of a time-consuming task as the project requires some time for the conversion. Also, some amount of memory is utilized for loading images and videos.

Future Enhancements

This project can be extended to achieve greater efficiency. In the future, it can be made available on the iOS platform too. Also, the current GUI can be improved.

X. REFERENCES

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