MULTILINGUAL LIVE FEED SIGN LANGUAGE INTERPRETER USING MACHINE LEARNING

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Abstract:*In this paper, we mainly describe a Multilingual Live Feed Sign Language web-based software that Interpreters sign language using Machine Learning. There are different sign languages used in different countries.So, the text translation is between English and other languages. A real-time sign language translator could break the communication barrier between the deaf community and the general public. Previous research works have shown us different types of efficient methods of interaction between the deaf community and the general public. However, there aren't any that are compatible enough to implement on a mobile device. So, we decided to build an efficient web system that can be used as an interpreter among the hearing impaired and the normal people even on mobile devices. We used TensorFlow's k-nearest neighbor's algorithm or KNN to train and predict words from a live video along with a pertained model MobileNet and Squeeze Net. with the usage of the Teachable Machine's PostNet, we could achieve more accurate results.*

Keywords: Machine Learning, TensorFlow, kNN, MobileNet, Teachable Machine, PostNet, Squeeze Net.

1. INTRODUCTION

Sign language is the most popular language among deaf and dumb community. Unfortunately, not everyone knows how to interpret a sign language. So, with sign language, it is difficult for these community people to have proper communication with the general public, especially in their educational, social and professional environments. Considering the deaf and dumb population as 100 percent about 90 percent of this population knows sign language. But among them, only less than 50 percent of the population gets graduated and only less than 20 percent get a proper job. There is always a need for communication in any field of jobs. It is very hard for these community people to have personal sing language interpreters in person. So, it is necessary to have an application-based sign language translator using machine learning. We aim at making the application compatible with mobile devices and also to be multilingual supportability. We used the K nearest neighbor's algorithm for classification. For efficient prediction, we included tensorflow.js in developing this application along with Mobile Net and Teachable machines.

1.1.SIGN LANGUAGE:

Sign language is a communication language used by the deaf and dumb community. The regional sign language differs from people to people and from region to region. There are multiple sign languages for multiple countries. As sign language is used for communication by the deaf and dumb community, it can be made easier for them to communicate with normal people.

1.2.MACHINE LEARNING:

Machine learning is a branch of artificial intelligence, is the practice of teaching computers how to learn. We teach the computer to find similarities about objects of the same label which is known as supervised learning. Gesture recognition by the camera is a way through which the movements of the hand can be recognized easily and this can be easily achieved using Machine learning.

1.3.TENSORFLOW:

TensorFlow is that the second machine learning framework that Google created and usually design, build, and train deep learning models. You can use the TensorFlow library for numerical computations. TensorFlow is an open source software library created by Google usually to implement machine learning and deep learning systems. Good support of deep

neural networks and machine learning concepts helps Sign Language Gesture Recognition to get input from live feed video capturing and can be manipulated by using tensor flow library files.

1.4.KNN:

K-Nearest Neighbors (KNN) is one among the only algorithms utilized in Machine Learning for regression and classification problem. KNN algorithms use data and classify new data points supported similarity measures. Classification is completed by a majority vote to its neighbors. The information is assigned to the category which has the closest neighbors. As you increase the number of nearest neighbors, the worth of k, accuracy might increase.

1.5.TEACHABLE MACHINES:

Teachable Machine could be a web-based tool that creates machine learning models fast, easy, accessible, and compatible to everyone. Teachable Machine could be a browser application that you just can train along with your webcam to acknowledge objects or expressions. No coding of the user is required, and no hyper-parameters or specification needs to be programmed. Users can take pictures of some instances of objects they need to acknowledge. Training is accelerated by downloading the pre-trained neural network called squeeze net.

1.6.SQUEEZE NET:

Squeeze Net may be a convolution neural network that's trained on quite 1,000,000 images from the Image Net database. The network is eighteen layers deep and may classify images into 1000 object classes, like keyboard, mouse, pencil, and plenty of animals. As a result, the network has extracted rich feature representations for a large range of images.

2. MACHINE LEARNING TECHNIQUES

*2.1 Multi-Task Learning:*Multi-task learning is a type of supervised learning that involves fitting a model on one dataset that addresses multiple related problems.

2.2 Active Learning: Active learning is a technique where the model is able to query a human user operator during the learning process in order to resolve ambiguity during the learningprocess.

2.3 Online Learning: Online learning involves using the data available and updating the model directly before a prediction is required or after the last observation was made.

2.4 Transfer Learning: Transfer learning is a type of learning where a model is first trained on one task, then some or all of the model is used as the starting point for a related task.

2.5 Ensemble Learning: Ensemble learning is an approach where two or more modes are fit on the same data and the predictions from each model are combined.

3.RELATED WORKS

Sakshi Goyal, Ishita Sharma, Shanu Sharma[1]

In this paper the proposed algorithm consisted of Image Acquisition, Feature Extraction, Orientation Detection and Gesture Recognition using SIFT

(scale invariance Fourier transform) algorithm.

C. Badhe, Vaishali Kulkarni[2]

In this paper the algorithm first performs data acquisition, then the pre-processing of gestures is performed to track hand movement using a combinational algorithm, and recognition is done using template matching.

Vishwas S, Hemanth Gowda M, Vivek Chandra H N, Tannvi, Ravi Kumar V[3]

In this paper the system involves capturing the gesture using a webcam along with pose estimation library [1]. The webcam captures the image and image is processed with pose estimation algorithm in tensor-flow utility.

M.Viswajith Reddy, K.Hemanth Gupta, M. Narengurusai, M.Kalyankumarchowdary, K.Helenprabha[4]

In this paper it is proposed that a method of converting the cue symbols and hand movements to speech (or) into text format. Reducing limitation with the existing mode where the accuracy rate is increased.

Thad Starner, Joshua Weaver, Alex Pentland[5]

In this paper two real-time hidden Markov model-based systems for recognizing sentence-level continuous American Sign Language (ASL) using a single camera to track the user's unadorned hands.

4.PROPOSED SYSTEM

This system consists K-Nearestneighbour's (KNN) Algorithm. K-Nearest Neighbours (KNN) is one among the only algorithms utilized in Machine Learning for regression and classification problem. KNN algorithms use data and classify new data points supported similarity measures. Classification is completed by a majority vote to its neighbour's. The information is assigned to the category which has the closest neighbours. As you increase the number of nearest neighbour's, the worth of k, accuracy might increase.

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communication by the deaf and dumb community, it can be made easier for them to communicate with normal people. For this we used machine learning methods.

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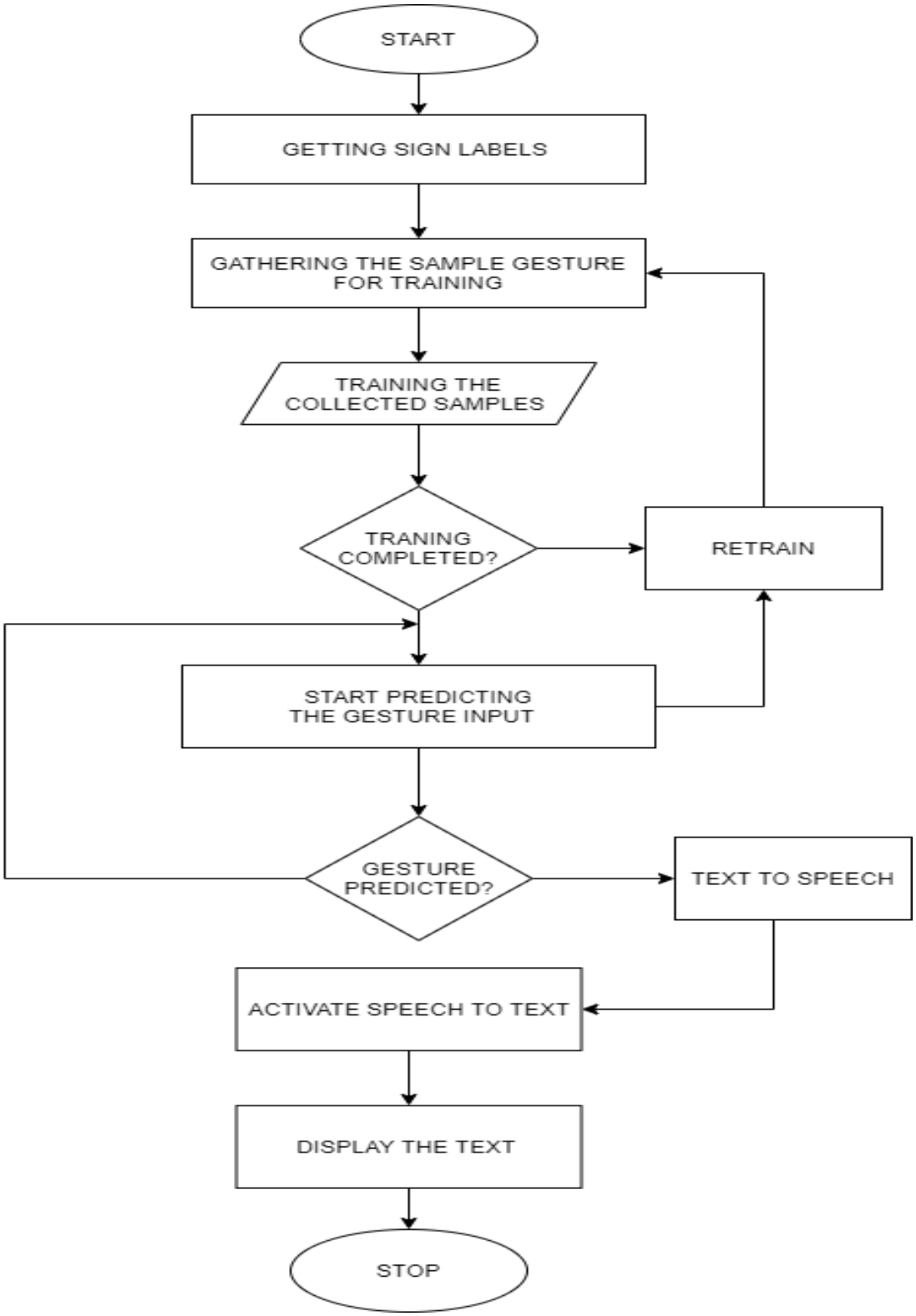
All the above mentioned is used to make the Sign language interpreter is properly Optimized and the training samples are taken from live feed camera.

Flow Diagram:



5. METHODOLOGY

5.1 GETTING SIGN LABLES FROM THE USER

Sign language is a communication language used by the deaf and dumb community. The regional sign language differs from people to people and from region to region. There are multiple sign languages for multiple countries. As sign language is used for communication by the deaf and dumb community, it can be made easier for them to communicate with normal people.

As gathering sign labels may vary language to language so instead we get lables from the user as if they can customizes the label according to there choice.User creates the label under which the gesturesare clustered and classified. Also, user gets to label the Gesture in their own Indian regional language they prefer.

5.2 *TRANING THE SIGN GESTURES*

The labelled gestures need to trained under 30 image sample that is captured live feed from the web cam. This label set is gathered as train data set and further sent for training the labels based on KNN algorithm.

By doing this we get to gather minimum no. of training data and with optimal accuracy.Thus using these data set accuracy can be boosted with a booster algorithm.

5.3 *CLASSIFICATION USING KNN ALGORITHM*

KNN Algorithm gives more accurate predictions based on the on the trained label set. Classification based on KNN algorithm is implemented using tensorflow.js. And prediction is made on output of the classification.

5.3 *RETRANING THE TRAINED GESTURES*

The trained model is again subjected to retraining for better performance. Once more samples are used for training the accuracy will increase and the sign gestures are more efficiently predicted. Retraining is a method by which the accuracy of a machine learning model is enhanced.

5.4LIVE GESTUER PREDICTION

The live gesture prediction is based on the trained sample that are collected. Implementing transfer learning concept makes the gesture prediction to be more reliable and accurate. Only when the gestures matches the prediction based on KNN algorithm occurs. Once the gestures are predicted the corresponding label is displayed as final result.

5.5TEXT TO SPEECH CONVERSION

The final result is captured and this text is converted into speech form and returned. So that the physically challenged person could hear it. Also a speech to text converted is added in order to make sure that the text is been displayed back and this is considered to be output of this project .

Hardware address:

It is a 6-byte hexadecimal number which is represented by 12 digits. So it will act as a signature or fingerprint of your computer.

Each value of the hardware will give its mean address to the specific attacker and the hardware address will make the certain value of the attacker to target which address the ARP spoofing should be done. When the spoofing is estimated the value will give its turn to maintain the WLAN or LAN hardware address to the attacker and from that address the taken value will be easily featured to the spoofing time and given the protection.

A. De-Authentication Packets

This will show you how to disable a devices connection to Wi-Fi using a de-authentication attack.

A de-authentication attack is a type of attack which targets the communication between router and the device. Effectively disabling the Wi-Fi on the device.

The de-authentication attack isn't some special exploit of a bug. It's a created protocol and is being used in real world applications.

De-authentication attack's use a de-authentication frame. This frame sent from a host to the device to disconnect.

6. EXPERIMENTAL RESULT

This project proposed aweb-based solution for sign language translator which acts as a bridge between deaf and dumb community. Here in this project, we can create our own sign labels in order to train them. The labels which are trained with a minimum of 30 samples gives an accuracy more than 87 percentage. The model which are trained are retrainable.Once

the model is trained, it can be saved and used for later use. The model is based to transfer learning method.

S.NO	Less samples for training	Consistent Accuracy	Supervised learning	Mobile supportability	Efficiency
Paper 1	NO	YES	YES	NO	NO
Paper 2	NO	NO	YES	NO	YES
Paper 3	NO	NO	YES	NO	NO
Our project	YES	NO	YES	YES	YES

7. CONCLUSION

In this paper we have presented our project Multilingual Live Feed Sign Language Interpreter Using Machine Learning. Also, we have highlighted the various terms and process involved in this project. Also, we have discussed about different works and comparisons based on sign language interpreter using machine learning. With the help of this project, we are going to use some of the methods discussed here in future.

This system will help that our future work would facilitate helping deaf and dumb community.

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