Human Sign language Detection

DISSERTATION

Submitted in partial fulfilment of the requirements of the

MTech Data Science and Engineering Degree programme

By

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MID SEMESTER REPORT

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CHAPTER 1: INTRODUCTION

Interaction with Mute & deaf people communicate with others using the sign language. Lack of knowledge in sign language has resulted in the communication gap. Getting proficiency in the sign language is difficult task unless its dedicated effort. Another challenge is there are lot of localized sign language used by the people based upon the region where they live.

People with Speaking difficulties are having challenge task while communicating with outside world even in the world of digital advancement where there is lot of video interaction tools used for communication.

CHAPTER 2: SCOPE OF PROJECT

The scope of this project is to design and implement the basic sign language detection using images first and then enhance the project to include real time detection. The future scope of the update of this project to enhance the communication through advancement in technology will also be determined.

The plan is to use python programming , Open CV , Deep learning technique like Convolution neural network (CNN) model , SSD to cater the real time detection for nonverbal people.

Scope of Work: The scope of the work is to start recognizing the human sign (hand sign) in the images and enhance this work to real time camera like web camera.

CHAPTER 3: DATA COLLECTION

1. Data Description:

The Development of Hand Sign detection Model begin with the creation of dataset.

The custom dataset is created for hand sign like “thanks”, “hello”, “I love you”, “no”, “yes”. Then the model is trained with model differentiates between the various hand signs.

The data set is collected to differentiate between various hand sign. The webcam/handphone image are used for the data collection. The collection image is then categorised into group of hand sign.

The example of data is below.

Fig1: Hand sign “hello”

Fig2: Hand sign “thanks”

Fig3: Hand sign “I love you”

Fig4: Hand sign “no”

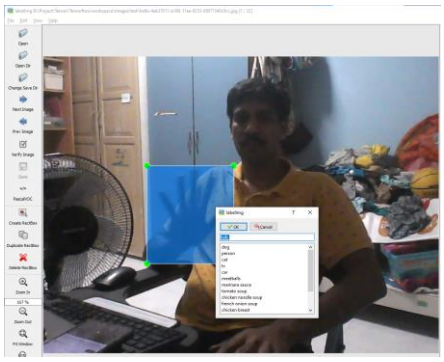
Fig5: Hand sign “yes”

2. Preprocessing:

Labelling the data: Tool : LabelImg

labelImg Tool is the opensource tool that is used to label the various handsign.by opening the image folder and then selecting the area that must be labelled.

The below image shows the hello sign being labelled as hello by selecting the hand sign. Similar process is followed for all the images to label the hand sign accordingly.



Data Augmentation:

In order to increase the number of images in the dataset, data augmentation techniques is used.

1. Rotation of the image: Rotating the image to certain degree (180 degree) to create variants.
2. Flipping the image: The image is flipped horizontally or vertically to create mirror image
3. Cropping the image: This enable model to focus on the certain areas to increase robustness

Next step is resizing the image which is 320 * 320 as part of the preprocessing step.

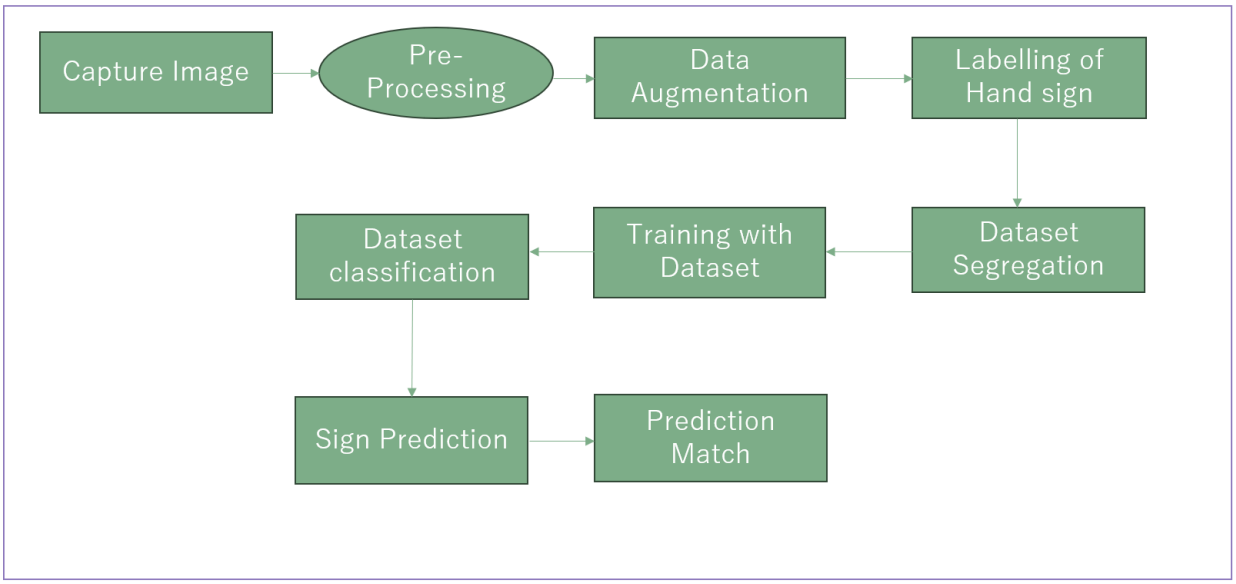
Split the Data.

The Data is split into training and test data with the ratio of 75%,25% respectively. Each batches have similar percentage of data for training and testing

Potential challenge & Risk during the project

Potential challenge would be real time processing of the Human sign language as there may different factor that may affect the model performance like Limited training dataset, Gestures Ambiguity, Noisy environment [varying lighting], Developing universal model.

CHAPTER 4: ARCHITECTURE DIAGRAM



CHAPTER 5 : MACHINE LEARNING MODEL & PERFORMANCE

1. Selection of the Model.

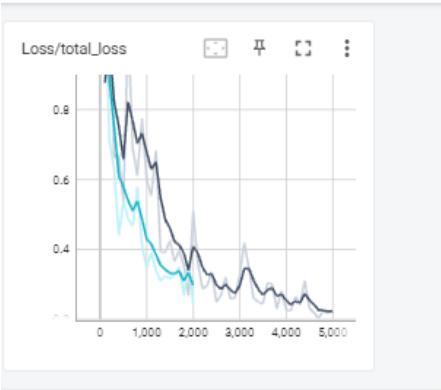
   SSD MobileNetV2 is used for tasks such as image classification, face detection and object recognition. SSD framework utilizes small convolution filters inorder to predict object classes. This also used to have bounding box locations for different aspect ratios, so combining with MobileNet allows it to perform better.

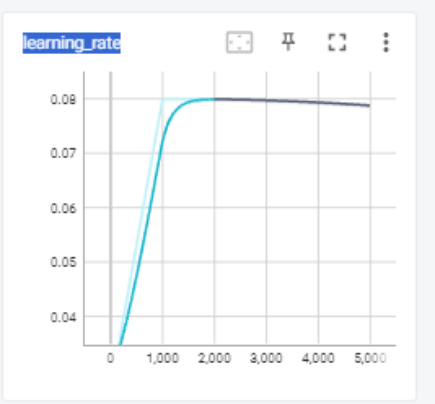
   In this project, Transfer learning is used by leveraging the MobileNetV2 on large scale datasets. The model uses the existing training knowledge while enhancing it by additional training. This way its efficient by using the existing knowledge with supplement training to predict the object.

2. Training the Model.

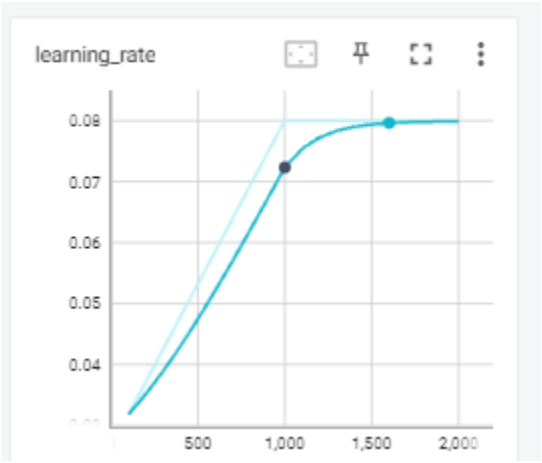
The custom dataset is created for hand sign like “thanks”, “hello”, “I love you”, “no”, “yes” and it’s trained via Model SSD MobileNetV2.

Training is performed for the 5000 epochs and total loss / learning rate is mentioned below





Training is performed for the 5000 epochs and total loss / learning rate is mentioned below



When the model is trained with more epoch the loss is minimized and training rate is getting normalised

The Prediction was established using the image and more evaluation is required with various hand sign recognition.

CHAPTER 6: REFERENCES

a. https://ieeexplore.ieee.org/document/9997680/ -Hand Gesture Recognition with ConvNets for School-Aged Children to Learn Basic Arithmetic Operations
b. https://ieeexplore.ieee.org/document/10007170/ -Malaysian Sign Language Recognition Using 3D Hand Pose Estimation

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Work Integrated Learning Programmes Division

I SEMESTER 23-24

DSE CL ZG628T **DISSERTATION**

(EC-2 Mid-Semester Progress Evaluation Sheet)

Scheduled Month : January 2024

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EVALUATION DETAILS

EC No.	Component	Weightage	Comments (Technical Quality, Originality, Approach, Progress, Business value)	Marks Awarded
1	Dissertation Outline	10%		10
2.	Mid-Sem Progress Seminar Viva Work Progress	 10% 5% 15%		 10 04 14

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