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SIGN LANGUAGE RECOGNITION APPLICATION-SANKET

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ABSTRACT

This project aims to bridge the communication gap faced by deaf and dumb people who struggle in expressing their thoughts, as majority of population does not know American Sign Language and remembering all the gestures is difficult. Hence with the help of Machine learning algorithms including Convolution Neural Network (CNN) we have created a Mobile Application having only one functionality so that user can easily interact with the application, which when fed a real time image of Hand Gesture of American sign Language shows the alphabet associated with it on the user's screen.

Keywords: American Sign Language, Gesture Recognition, ASL Alphabets, ASL Numbers, Preprocessing, Region Properties.

I. INTRODUCTION

According to the World Health Organization (W.H.O), over 5% of the world's population is deaf and mute. They communicate with each other by hand gestures, reading lip movements, body language. They have special language for themselves to interact with each other and that's called Sign language. In different countries there are different sign languages for example American sign language (ASL), British Sign Language (BSL), Indian Sign Language (ISL). British and American sign languages. British sign language (BSL) is not easily intelligible to users of American Sign Language (ASL). Unlike ASL, BSL uses a two-handed alphabet. In developing countries, deaf people may use the sign language of educators and missionaries from elsewhere in the world.

Over 34 million children are deaf and dumb and every child is not privilege who can afford private tutors, interpreters. For countries like India, Sri lanka, Bangladesh which are developing countries where having meals 2 times a day can be a challenge for many people, they can't afford homeschooling so they have to struggle more. They have to use their hands as tongues and their eyes as ears. For them sign recognition apps are very helpful and the majority of people don't know sign language so there becomes a bridge between deaf and dumb people and normal people.

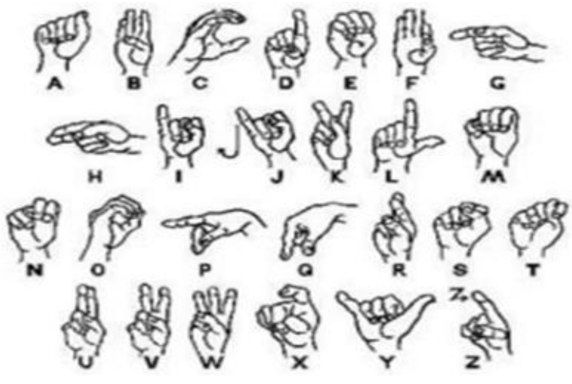

Fig.-1: American Sign Language.

Sign recognition is a topic in computer science and language technology to interpret human gestures through machine learning algorithms. Gestures can occur in any body movement or position but usually from the face or hand. Users can use sign language to easily control or communicate with devices without physically touching them. Many methods have been developed using cameras and computer viewing algorithms to interpret sign language. The main areas of application for status recognition are the automotive sector, the electronics sector, the transport sector, the sports sector, gaming sector, to unlock smartphones, defense, home automation, and sign language translation.

In this project we are trying to develop a machine learning algorithm that will recognize the hand gestures and translate it in text and that algorithm can be used in a mobile app.

II. LITERATURE SURVEY

"Gesture Recognition using Recurrent Neural Networks" By Kouichi Murakami and Hitomi Taguchi helped us to understand Gesture recognition with Recurrent Neural Network.

"Multi-column Deep Neural Networks for Image Classification" by Dan Cires¸an, Ueli Meier and J¨urgen Schmidhuber helped us to learn about multi column Image classification.

We were inspired by "Sign Language Recognition Using Convolutional Neural Networks" by Sign Language Recognition Using Convolutional Neural Networks Lionel Pigou(B), Sander Dieleman, Pieter-Jan Kindermans, and Benjamin Schrauwen for using CNN for recognition.

"Visualizing and Understanding Convolutional Networks" by Matthew D. Zeiler and Rob Fergus helped us to visualize and understand convolutional networks.

"What is the Best Multi-Stage Architecture for Object Recognition?" by Kevin Jarrett, Koray Kavukcuoglu, Marc'Aurelio Ranzato and Yann LeCun.

III. METHODOLOGY

Dataset

We used the "ASL alphabet" Image data set for alphabets in the American Sign Language.

The data set contains images of alphabets from the American Sign Language with 29 classes.

It contains 87,000 images which are 200x200 pixels. There are 29 classes, 26 of which are letters A-Z and extra 3 are delete, space and nothing.

Proposed Architecture

The Architecture consists of three convolutional layer and pooling methods used is Max Pooling of pool size 2X2. Every Convolution layer used "same" padding, input size of (32, 32, 3) and "relu" activation function, the final dense layer uses softmax activation function.

There are total 11 layers:

- 1st Convolutional Layer
- 1st MaxPooling Layer
- 2nd Convolutional Layer
- 2nd MaxPooling Layer
- 3rd Convolutional Layer
- 3rd MaxPooling Layer
- Batch Normalization Layer
- Flatten Layer
- Dropout Layer
- Dense Layer (Sigmoid Activation)
- Dense Layer (SoftMax Activation)

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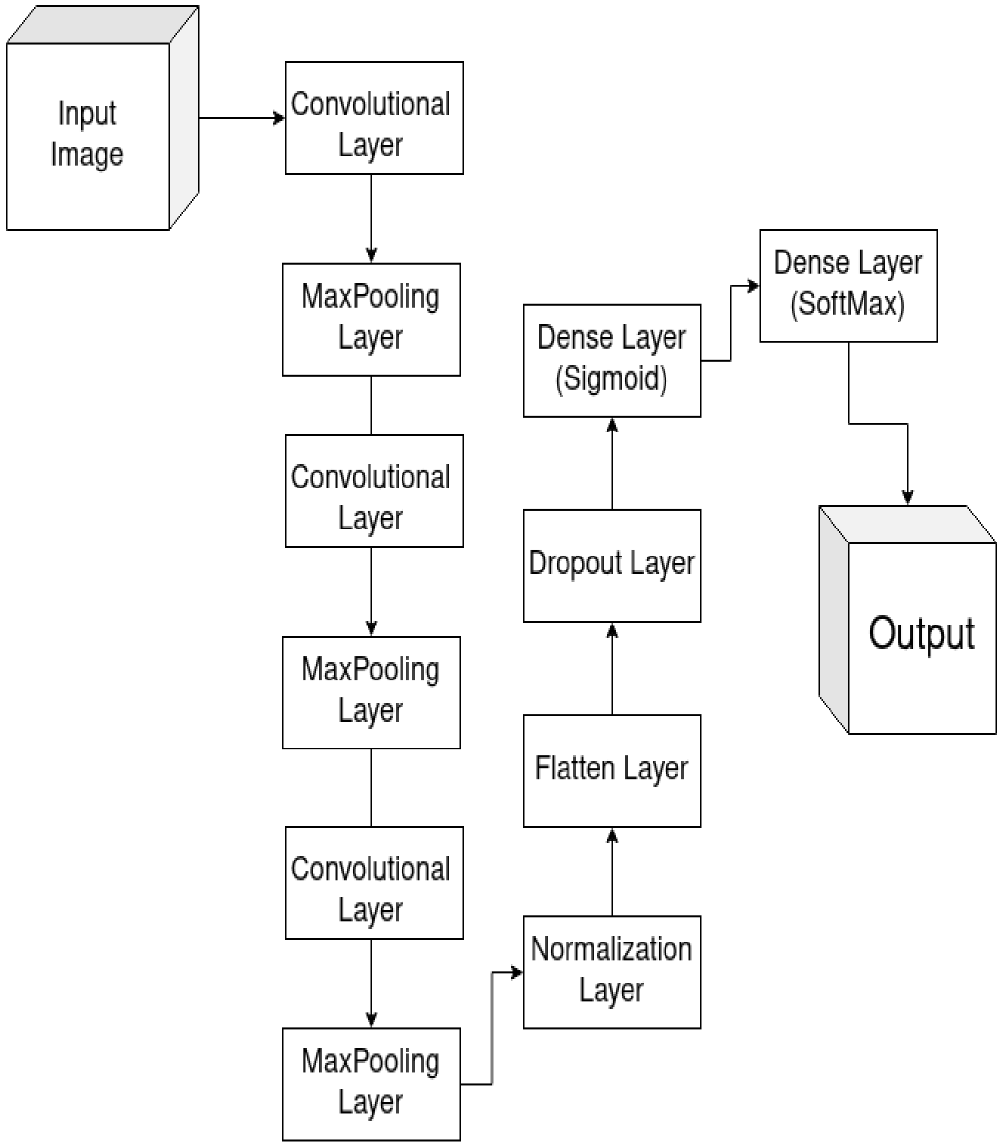

Fig.-2: Architecture

Mobile Application

In the Sanket App we are providing information about gestures and posture of sign language. It helps those people who can't understand the sign language but wants to communicate with deaf and dumb people.

In this App by just in few clicks we can communicate with deaf and dumb people. For using this app, you need an image (upload from Gallery or click image from Camera) of any sign words after that, Click on Get Information. By just clicking you get an accurate meaning or information of that Image uploaded by the user.

In the App, we are using a restful API to get information from the image. We post images to the server and by response we get relevant data based on the image. In App, we traversed that information in an efficient and well-designed manner which can be easily understandable by any kind of user.

This App is based on the flutter framework which helps us to provide a better and easy understandable design for our app. This app is efficient and effective for every user who is interested in talking with dump people.

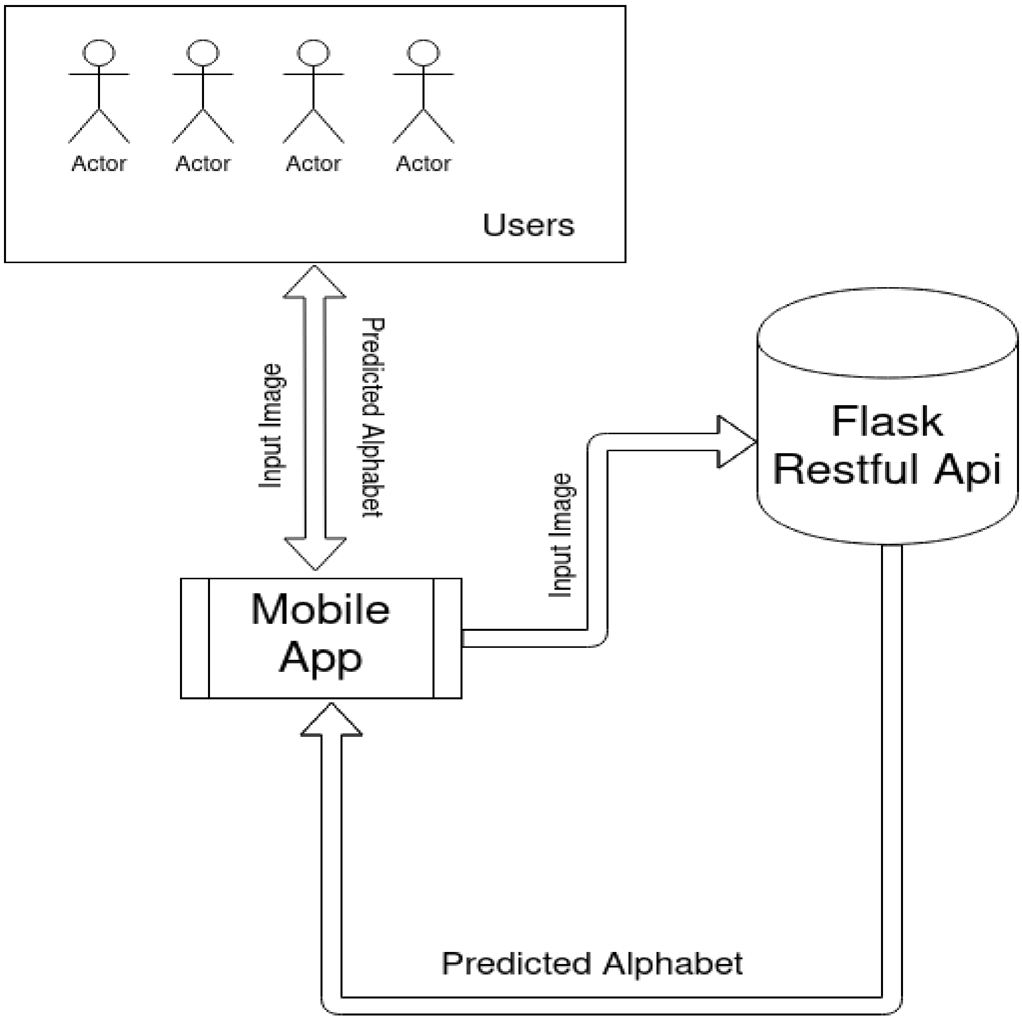

Fig.-3: Mobile Application Data Flow

IV. RESULTS AND DISCUSSION

Study Areas

The following libraries which are used in the project have been studied.

- OpenCV
- NumPy
- Matplotlib
- sklearn
- Tensorflow
- Flask

Implementation

The project has been successfully implemented.

Evaluated Results

The results have been evaluated and various tests have been performed to make the software robust and reliable. Some of those were Unit, Integration, System and User Acceptance Testing.

```
Epoch 1/5
1102/1102 [==============================] - 8s 7ms/step - loss: 0.5912 - accuracy: 0.8220
- val_loss: 0.1183 - val_accuracy: 0.9621
Epoch 2/5
1102/1102 [==============================] - 7s 7ms/step - loss: 0.0675 - accuracy: 0.9800
- val_loss: 0.1887 - val_accuracy: 0.9410
Epoch 3/5
1102/1102 [==============================] - 7s 6ms/step - loss: 0.0424 - accuracy: 0.9872
- val_loss: 0.0151 - val_accuracy: 0.9957
Epoch 4/5
1102/1102 [==============================] - 7s 6ms/step - loss: 0.0323 - accuracy: 0.9897
- val_loss: 0.0846 - val_accuracy: 0.9708
Epoch 5/5
1102/1102 [==============================] - 7s 6ms/step - loss: 0.0286 - accuracy: 0.9906
- val_loss: 0.0265 - val_accuracy: 0.9916
```

Fig.-4: Epoch with accuracy

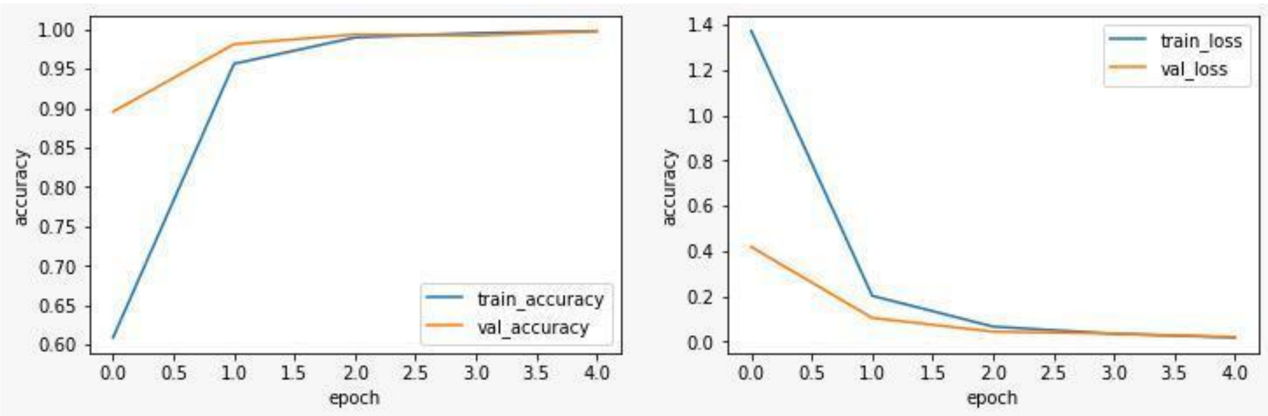

Fig.-5: Model Accuracy

V. CONCLUSION

This Project aims to develop an offline physical discovery program. We used the above-mentioned process in our 15999-image database i.e., 1200 images per letter and we were able to see all the characters. It has been determined that the mountain is the most important and can be used to discriminate between two actions. Steps to process action classification include action detection, classification, morphological filtering, line representation and classification using different techniques. The work is done by training the character set which is the sequence of the local line.

The site of computer-to-human communication is very large. This project detects hand gestures offline so the work can be done to do it for real time purposes. Handwriting systems can be useful in many areas such as robots, computer-connected people and so making this offline program in real time will be a future activity. It requires a lot of research as the use of touch detection systems continues to increase year by year. Learning and researching hands-on recognition programs not only helps to improve and improve the learning and working conditions of deaf people, but it is also helpful and can be applied to the special effects used in film, medical research, sports, robots, and much more. Hand recognition that derives its use of non-verbal communication between human and computer. With the increase in applications, the action recognition system requires a lot of research in different ways. Hand gestures can be easily seen, and gestures are a major focus of most researchers. In this paper, various methods of hand recognition can be provided. Various ways of seeing the action in this work can also be discussed. Visual acuity problems can also be discussed.

Like hand variations, gestures are very complex, and due to the variety of backgrounds and backgrounds, the hand recognition system faces many challenges. It is evident that the highest level of accuracy is achieved when the amount of light is at a certain level. Hand recognition that derives its use of non-verbal communication between human and computer. With the increase in applications, the action recognition system requires a lot of research in different ways. Touching the hand can be easily seen, and actions based on the movement of the action are the main focus of most researchers. The current launch recognizes 13 touches but the touch value can be extended to the required number of touches. The app works well with simple webcams like laptop webcams.

VI. REFERENCES

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