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Hand Gesture Recognization for Indian Sign Language

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ABSTRACT:
Sign Language Recognition is a device or program to help deaf and mute people. However, communication has always been difficult for a person with verbal and physical disabilities. Sign language recognition communication between the average person and the disabled using this device easily communicates with people who cannot communicate with the average person, this program reduces the communication gap between people. In total, the world has a population of about 15 -20% of the deaf and mute population which is a clear indication of the need for a Sign Language Awareness Program. Different methods are used to identify sign language but they are not effective due to the economic and commercial situation so we use this cheap and affordable method for people. Therefore, sign language recognition systems based on image processing and sensory networks are preferred over gadget programs as they are more accurate and easier to implement. This paper aims to create an easy-to-use and accurate sign language recognition system trained in the neural network thus producing text and speech input.
Keywords:
KEYWORDS: Indian Sign Language (ISL), Sign Language Recognition; Convolutional Neural Network (CNN); Python;

I. INTRODUCTION

Sign language is a gesture-based language that uses gestures, gestures, and facial expressions in place of a word such as our common language used by ordinary people. This type of language is not a universal language because each language has a different grammar such as American language, Nepali language, etc. that is why Indian Sign Language is different from other sign languages. However, since most people do not have prior knowledge of sign language and cannot understand sign language, they need an interpreter or a speaker to communicate with the deaf and the dumb.

This paper applies to handwriting based on computer view in python. The largest data collection to date is the Indian Sign Language alphabet. Touch databases are pre-processed using Python libraries and packages. Known inputs are converted into speech and text.

The biggest problem is when we make a sign language data set using images as the data set camera takes a token image and detects that a dynamic image problem arises due to the quality of the image camera taking a colorful and visual image. a color image with a data set is very complex so it converts a color image as a gray image and matches it to the database so that the image is processed in a short time.

This paper aims to find the best and least expensive sign language recognition program with the help of previous research and new research to come.

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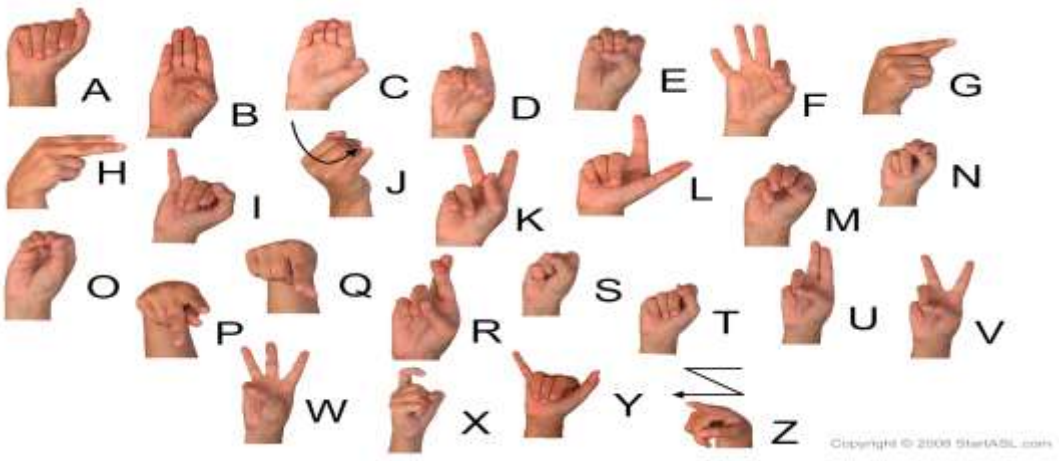

Fig 1: Indian Sign Language

II. PROPOSED METHOD FOR GESTURE RECOGNITION: -

System Description: -

We use a convolutional neural network which is also known as CNN.

In this System, we simply give the image as input using a camera and pre-process the image and find the border of hand gestures and math with the dataset and find the correct word across the image and then give output on a screen as a text and as a voice through the speaker.

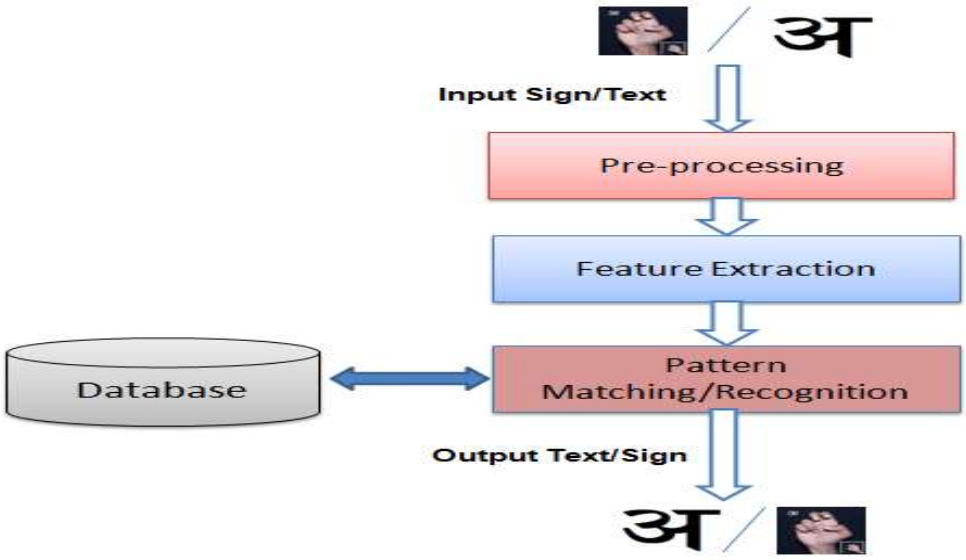

Fig 2: Flow Chart

Hardware Components:-

1. Camera: - Since the input system is in image mode, a camera is required to take a picture Raspberry Pi 4 Model B 2.
2. 18 cm (7 inches) LCD Capacitive Touch Screen Display with HDMI for Raspberry Pi (800 x 480 Resolution).
3. Speaker: - for output as a speech.

Software Components: -

1. Python: - We use python programming language and libraries for coding purposes like Numpy, Pandas, etc.
2. Colab: - We use Google collab as an editor for coding.

III. IMPLEMENTATION

Data Acquisition: -

Images of various Indian Sign Language alphabets were collected using various webcams.

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Initially, the data collection system was created using OpenCV and Python Library library packages. In this program, we captured images manually using a camera and collect different images of every sign of a particular letter with different backgrounds and store images in front of a particular letter like in front of the "S" letter S sign image is stored in the database and so on. After that, after that, we started working on a data processing system that would convert images that had been resized to gray.

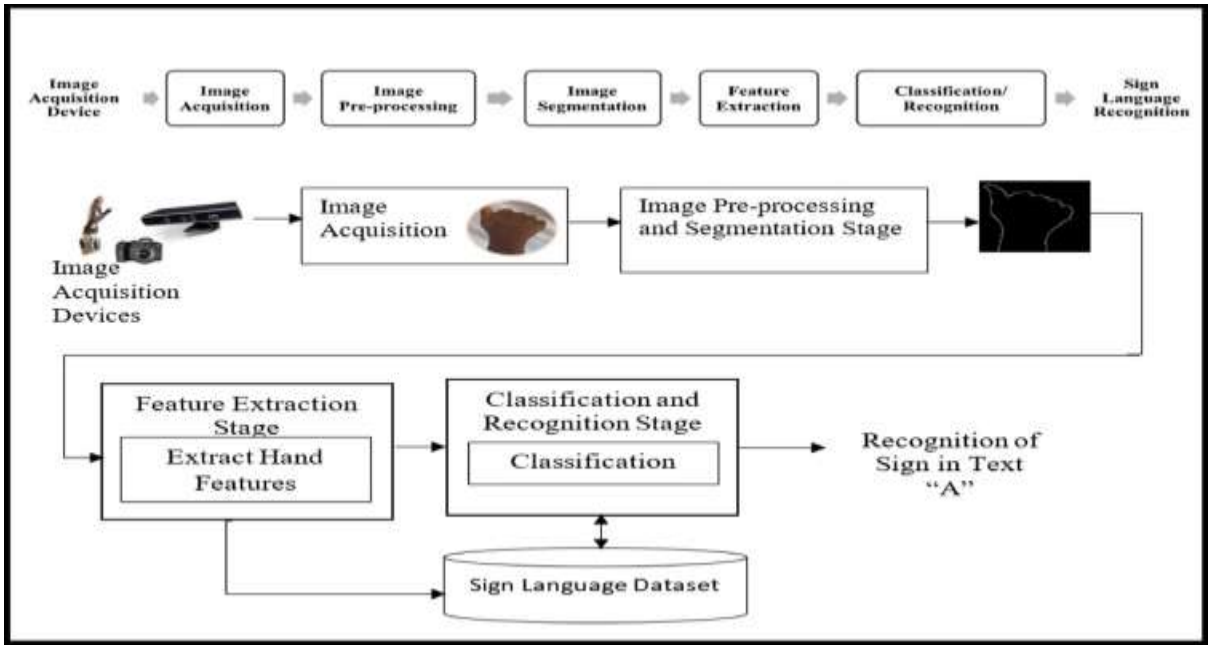

Fig 3: Data Acquisition

CNN model generation and training: -

Convolutional neural network known as CNN is a layer of Artificial Neural Network neurons arranged in 3 dimensions: width, height, depth.

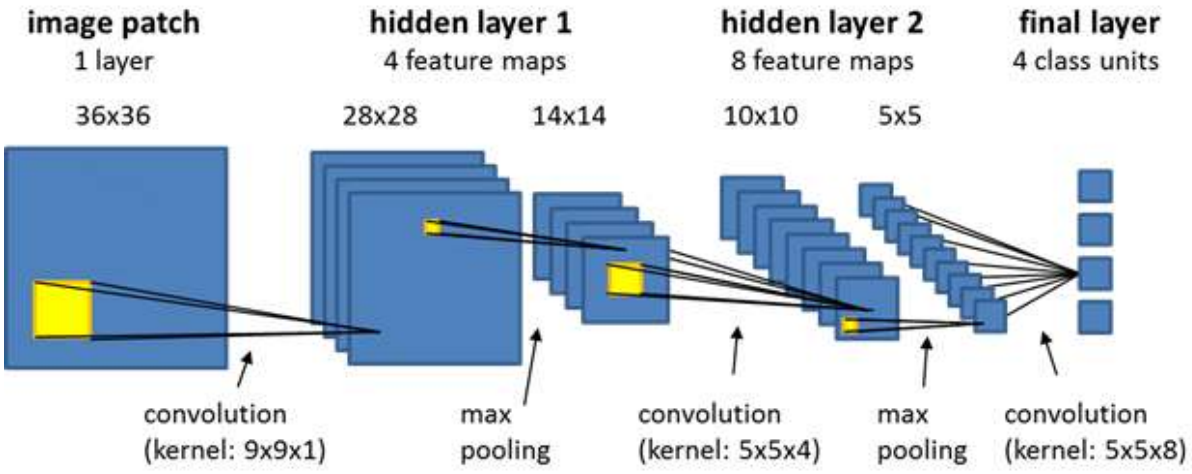

Fig 4: CNN Layers

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1. Convolutional Layer:

The convolution layer is the main building block of the CNN model. Convolution layers scan images with a size 3 by 3. Converts RGB images into gray images using pixels and calculates image weight. After each convolution layer we apply a coating layer.

2. Pooling Layer:

There are two types of Pooling Layer:

• High Combination: - In most combinations, we take window size [for example window size 3 * 3], and we only take the maximum 4 values. So finally get half of the activation matrix of its actual size.

• Medium Merge: - With Medium Merging we take the sum of all the values in the window.

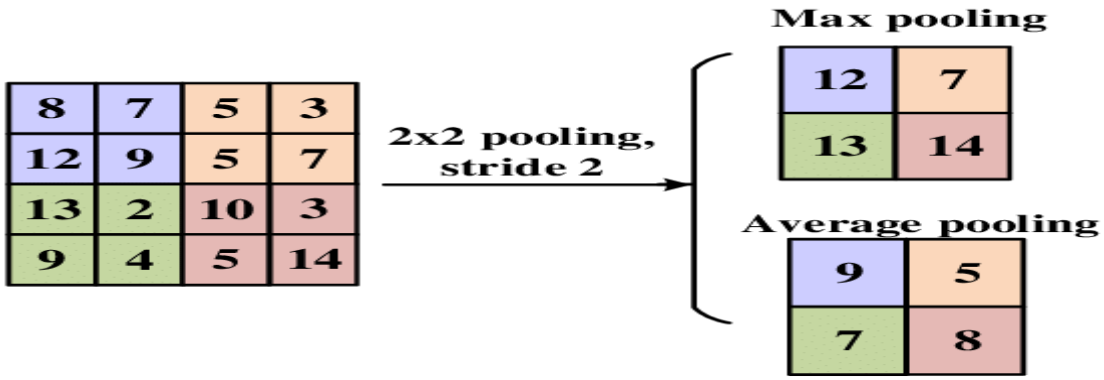

Fig 5: Pooling

3. Fully Connected Layer:

A fully integrated layer is the last few layers in the convolution layer. The input to the fully integrated layer is the output from the Final Layer of the Merge or Conversion

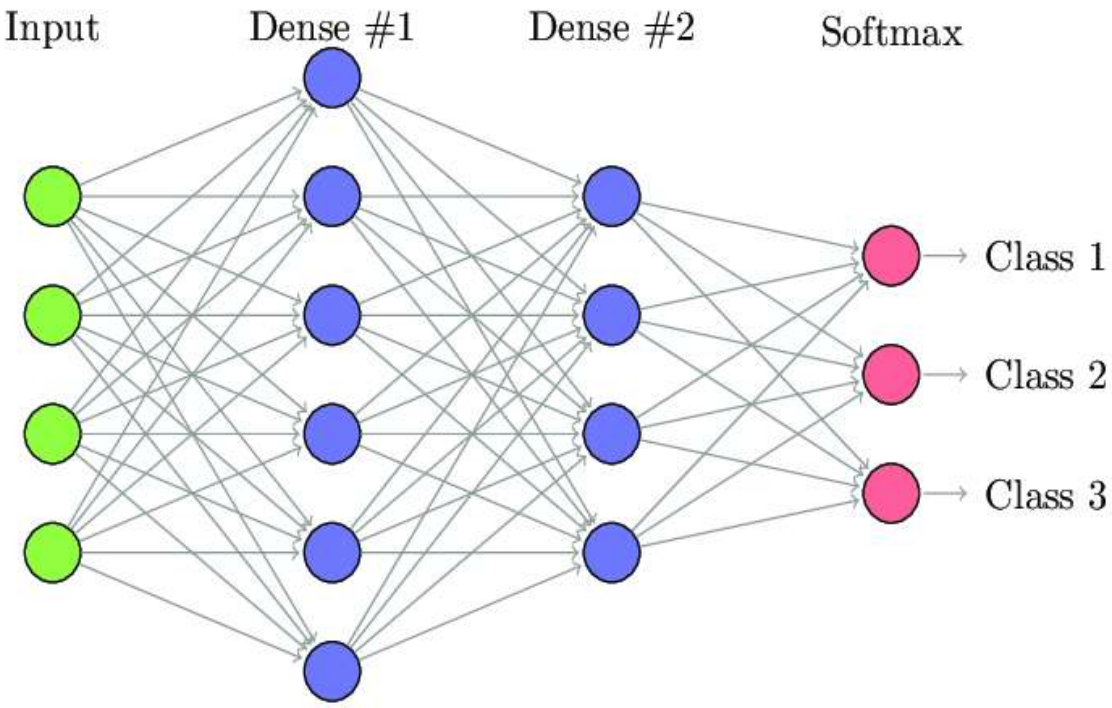

Fig 6: Fully Connected Layers

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4. Final Output Layer: -

After receiving values from the fully connected layer connect the value or provide input to the final output layer and calculate the total number of classes.

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 128, 128, 32)      320
_________________________________________________________________
max_pooling2d (MaxPooling2D) (None, 64, 64, 32)        0
_________________________________________________________________
conv2d_1 (Conv2D)            (None, 64, 64, 32)        9248
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 32, 32, 32)        0
_________________________________________________________________
flatten (Flatten)            (None, 32768)             0
_________________________________________________________________
dense (Dense)                (None, 128)               4194432
_________________________________________________________________
dense_1 (Dense)              (None, 128)               16512
_________________________________________________________________
dropout (Dropout)            (None, 128)               0
_________________________________________________________________
dense_2 (Dense)              (None, 96)                12384
_________________________________________________________________
dropout_1 (Dropout)          (None, 96)                0
_________________________________________________________________
dense_3 (Dense)              (None, 64)                6208
_________________________________________________________________
dense_4 (Dense)              (None, 27)                1755
=================================================================
Total params: 4,240,859
Trainable params: 4,240,859
Non-trainable params: 0
```

Fig 7: Train Model

The final step is to create a GUI that will be used to convert symbols into text and form sentences.
We converted RGB images to gray images and removed the audio and green images.

We use a different layer for each character so we could not deal with the problem of finding the same characters all symbols have different layers. Flow Chart of Symbols Distribution is as follows:

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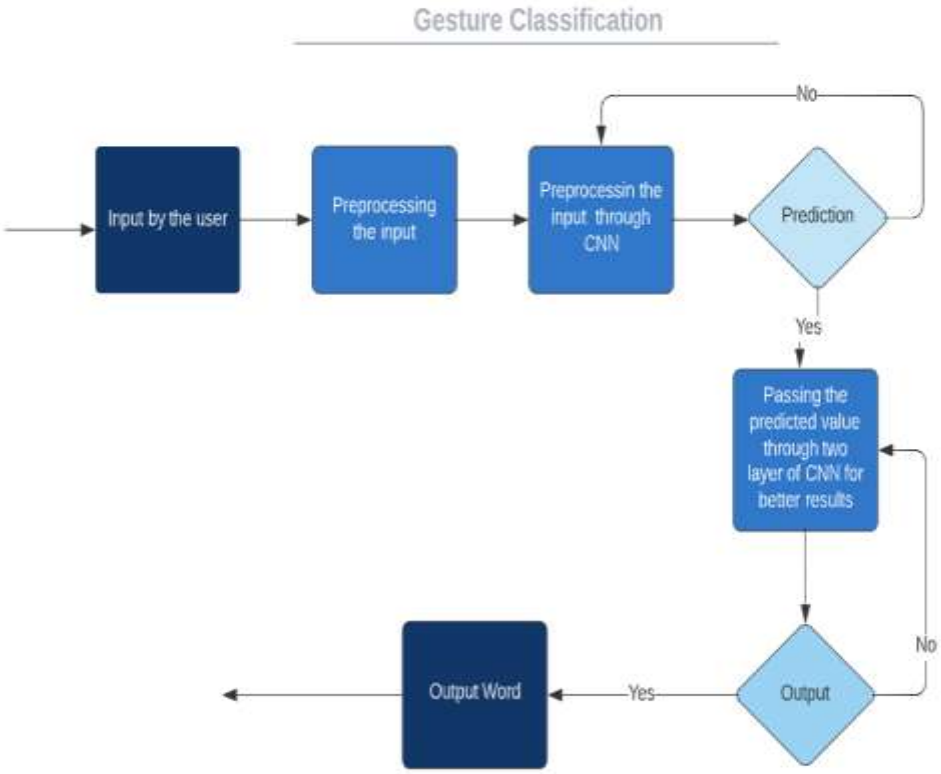

Fig 8: Flow Chart of Gesture Classification

IV. RESULT

We are able to identify all "A" to "Z" hand symbols with 85% of accuracy in our model.

V. CONCLUSION

Touch is a powerful form of human communication, vision-based hand gestures have many advantages compared to conventional devices. This project is a small contribution to removing the barrier to communication. This paper has introduced a vision-based program that translates hand gestures from Indian Sign Language and translates them into text or speech. After that, we did the opposite. We can turn symbols into text and speech using this principle. An important requirement for this type of system is manual touch and machine learning algorithms. This program is based on real-time mode. The future function of this system is to develop this system from one-way communication to two-way communication such as translation of text and speech into a token so that dumb and deaf people can easily understand our thoughts and do not need to read. sign language to ordinary people.

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