

Real-Time Hand Signs Language Detection System Implementation paper

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Abstract— this paper proposes the real-time hand signs language detection system. As communication is an important part of life. And communication plays a vital role. Learning and remembering hand signs is not easy because of the above major issue, there is a huge communication gap present between mute/deaf persons with normal persons. To avoid the misleading interpretation of communication is being improved by this proposed system. The above problem is giving a serious impact on their lives, by clearing this problem the object can be involved freely environment and express the communication. The given proposed system is to solve the above communication problem, by evaluating the pre-defined dataset of signs images.

Keywords— Real-Time Detection, Hand Signs Detection, Image Processing, Object Detection, American Sign Language.

1. INTRODUCTION

Learning and remembering hand signs is not as easy, the understanding of the sign language is difficult for remember. Because of the above major issue, there is a huge communication gap present in between mute/deaf with normal person. As this communication gap is too high, those children cannot express their thoughts, ideas in front of the world.

Hand gesture system classify it into two categories: sensor based and object based approaches. First category will make the user to wear a hand detection/capture device for interaction like camera devices, finger markers, etc. Forcefully, these methods ensure an easy hand detection process and provide good detection results, but they are unnatural and uncomfortable and not real-time for daily applications.

The second category. Which uses the techniques which is the field of computer vision on the images capture, the segmentation of skin generally the step first and which is obtained skin points. As compare with the other existing works then found that most of the existent works are really limited with in the cloths and background and this makes difficult to find the possibility of the hand detection.

With the help of booming technologies like object detection, openCV and ML, it can overcome the above Problem of communication.

2. LITERATURE SURVEY

Paper [1]:

Hand and Wrist Localization Approach for Features Extraction in Arabic Sign Language Recognition Year: 2017
DOI Bookmark:9.1109/AICCSA.2017.67

System Goals: Receiving input by various methods and processing it to produce appropriate results.

Methods Used: Wrist Localization Approach for Features Extraction in Arabic Sign Language Recognition Uses some hardware to achieve output.

Paper [2]: Deep Learning Based Hand Detection in Cluttered Environment Using Skin Segmentation Year: 2017 DOI
Bookmark:10.1109/ICCVW.2017.81

System Goals: Input by camera and processing it to produce appropriate results.

Methods Used: Detection in Cluttered Environment Using Skin Segmentation labels colors to different objects that's how it identifies skin objects.

Paper [3]: Capturing human hand motion in image sequences 10.1109/MOTION.2002.1182220

System Goals: Input by camera and processing it to produce appropriate results.



Methods Used: By Capturing human hand motion in image sequences compares points plotted on same images and gives output.

Paper [4]: Efficient Hand Gesture Rendering and Decoding using a Simple Gesture Library, Year: 2006, Volume: 1, Pages: 1857-1860,

DOIBookmark:10.1109/ICME.2006.262916

System Goals: Input by camera and processing it to produce appropriate results.

Methods Used: This method uses the Tensor flow library, also for comparing images it uses an object detection model.

Paper [5]: Hand Skeleton Estimation Based on Two Specific Gestures, Date of Conference: 21-22 Oct. 2017, DOI: [10.1109/ICVRRV.2017.00057](https://doi.org/10.1109/ICVRRV.2017.00057)

System Goals: Mathematical calculation produce appropriate results.

Methods Used: design a calibration method based on two specific gestures to achieve the correction of the initial error of the sensor-wearing process and calculate the proportion of the main bones of the hand.

Paper [6]: Development of a Method for Capturing Human Motion Using a RGB-D Camera. Year: 2017, Volume: 1, Pages: 97-106DOI Bookmark:[10.1109/SVR.2017.21](https://doi.org/10.1109/SVR.2017.21)

System Goals: Input by camera and processing it to produce appropriate results.

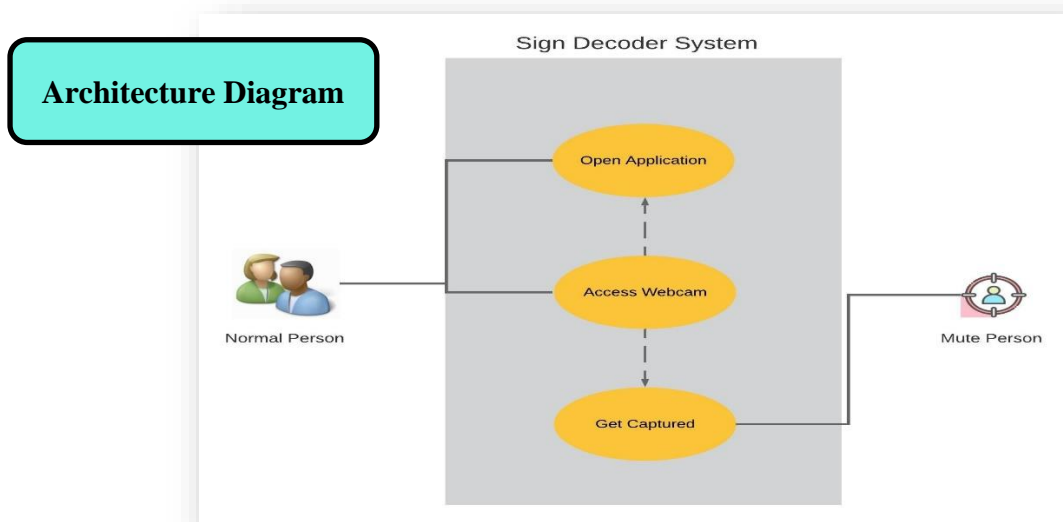
Methods Used: This systems are able to track joints of human body using only one RGB-D sensor and obtain accurate results.

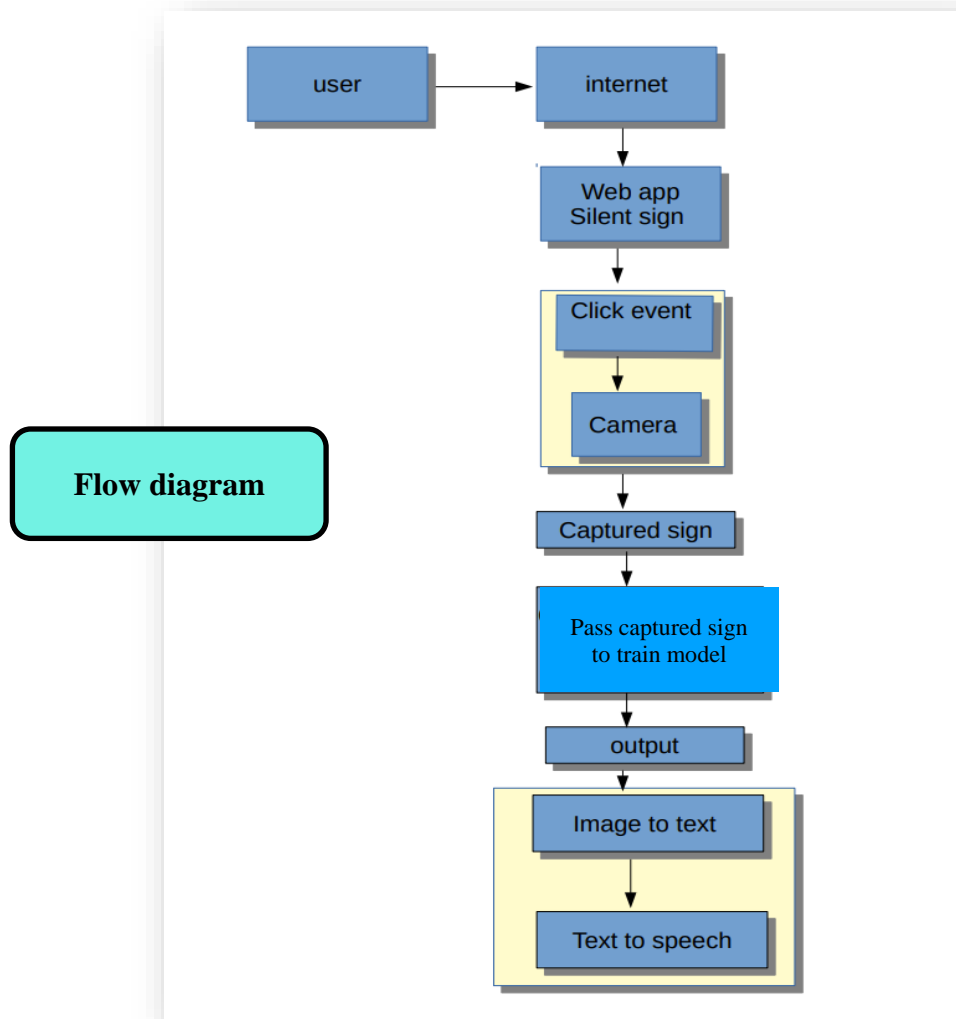
2. PROPOSED SYSTEM

- As our focused on Real-Time hand signs detection, so our proposed system is like

- Create/Collect the dataset for image comparison using python
- Label that dataset images for their meanings..
- Create UI for better interaction.
- By using system camera for the Real-Time detection.
- Capture the whole image from the camera window.
- Without storing that image, that input image directly pass into teachable machine.
- It will compare input image, with pre-define dataset model.
- After the comparison, we get the output.
- Display the Output.

As shown in architecture diagram and flow diagram, which is mentioned below.





4. PROJECT IMPLEMENTATION

Stage 1 – Frontend Module Implementation

To interact with user from technical as well as non-technical person, we are obligated to create UI as simple and user responsive as possible.

However project comprises hardware like web camera we are concentrating on connection module for the same. Design of the UI should be efficient for the user. So a UI is going to be a mediator between user and a Machine.

So by using UI user can simply handle the system, like capturing images and showing output in proper manner. So our first implementation in this project is created simple and attractive UI for users.

This UI Implementation includes,

- 1) Home page – where user can access hand sign recognition system.
- 2) About page – where user can find about project and team.



3) Contact page – where user can contact our team, if they have any queries, questions and facing any problem. The user queries comes from contact page is stored in MySQL database. For Front-end UI creation and database, technologies used are HTML, CSS, JavaScript and MySQL

Stage 2 – Backend Module Implementation

For the smooth interaction with user and rendering the web pages, we have to use backend implementation.

By using backend, we are able to perform

- 1) Rendering web pages.
- 2) API for web pages.


```
@app.route("/contact")
def contact():
return render_template("contact.html")
```

3) Database Connectivity.

For database connectivity, we are using mysql-connector. Syntax for creating database object is,

```
db = mysql.connector.connect(database, username, password, database name)
cursor = db.cursor()
```

Cursor is used to execute the database queries, for example
`cursor.execute("select * from table")`

The return type of the MySQL query is nested tuple.

For Backend and database connectivity, we are using Python3 language and Flask package for Rendering web pages and connection of web with database.

Stage 3 – Image Processing Module Implementation

This Model is divided into different small modules which required for the whole model implementation, the divisions are,

- 1) Creating hand sign's Dataset.
 - 2) Train Model for the signs dataset.
 - 3) Connection between System Camera with web application.
 - 4) Capturing image from the Camera window.
 - 5) Pass the captured image directly to the Train Model.
 - 6) Take the result comes from model, and display the result into webpage.
- All the steps in Image processing Model Implementation, is done at backend using Python and Flask.

1) First step in this module is creation of dataset for the hand sign's, this step is performed using openCV for accessing webcam and Python. We can also collect the hand signs dataset from the website like kaggle. And this is the internal process not for the user.

2) Second step is labelling the images, means in this step we are giving meaningful name for the hand signs in images. Like if we consider the hand sign of image A then label name for the image will be A. so this label is return when the input image matched with this image.



3) As our system in Real-Time capturing system, for that we want to bind system camera with our web application. So this step is performed using openCV package and python. In other way you can use canvas and JavaScript for the same.

```
cam = cv2.VideoCapture(0) -> initialization of system webcam for access
cam.read() -> for reading value/image from the camera
```

4) After the binding of camera with system, user can easily access the module and captured hand sign using the camera.

5) The hand sign input comes from the system camera bind with system, is directly passed to the Train model which created from the dataset. We are using teachable machine for the train our dataset signs. Teachable machine directly compare our input image with dataset images in that Model and returned the output label where matched is found.

6) After the match, label of that imaged where comparison is done is returned and that result will be displayed on web application. Final Outcome of project will allow user to handle particular application with hand signs.

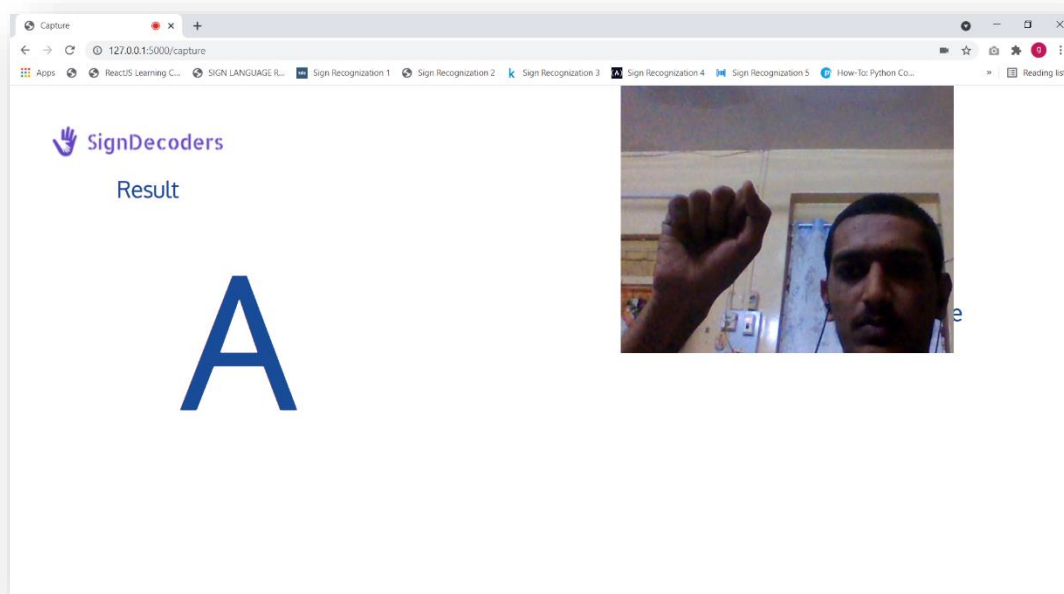
The system will provide the user with the ability to capture the input hand signs and user can see the text related with input hand signs on the screen. The final outcome is the proper UI which interact with user easily. Normalized steps are,

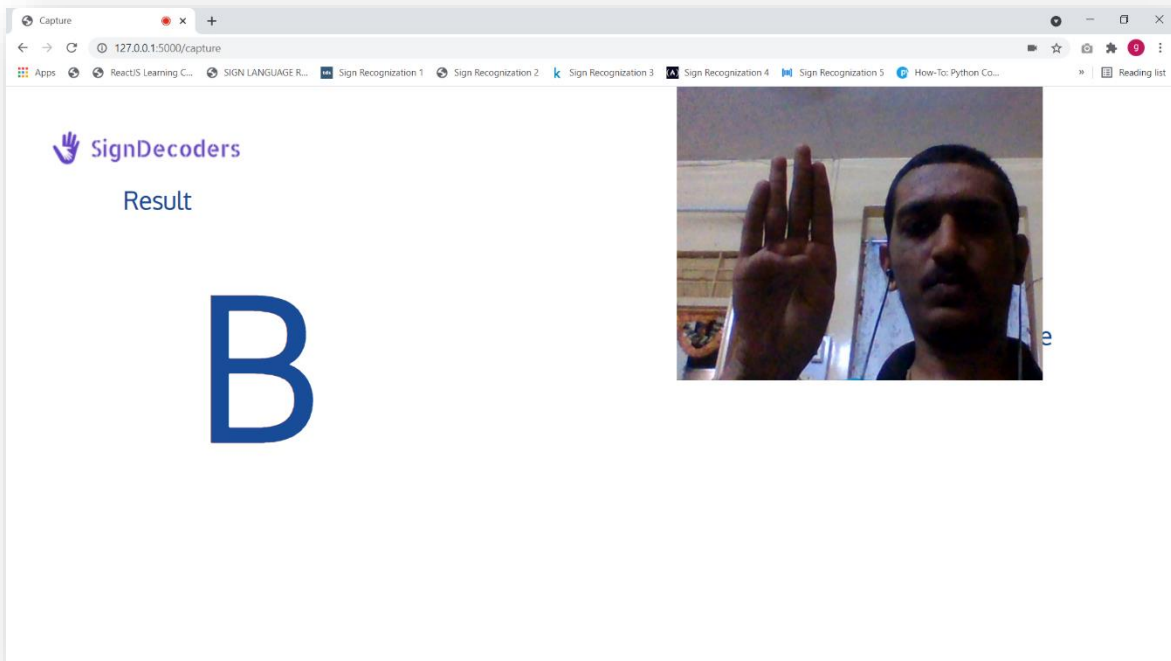
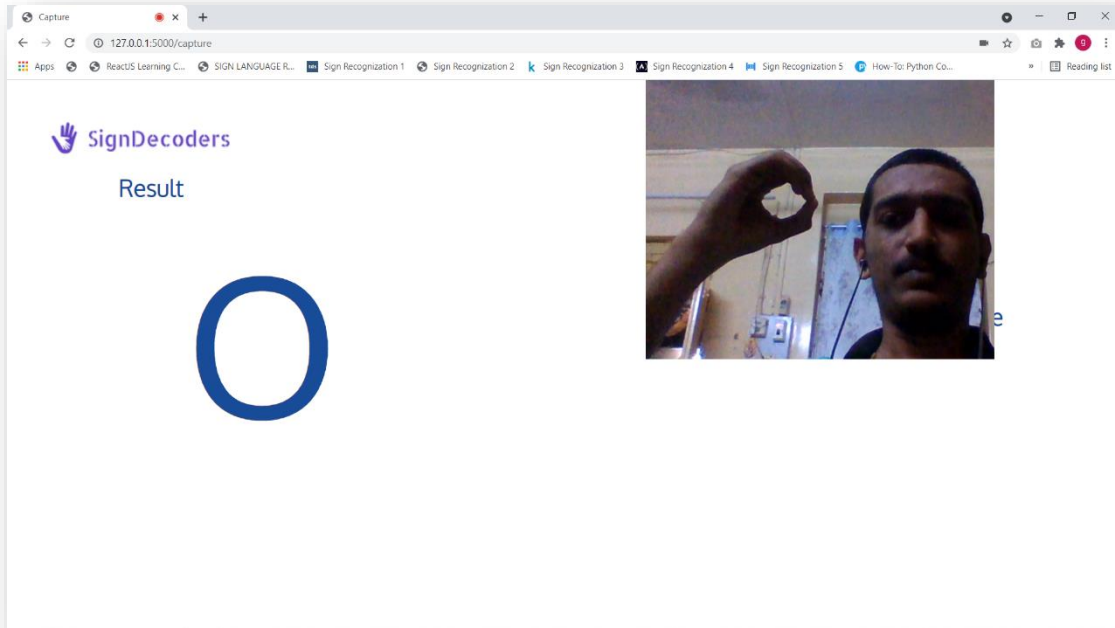
Step 1: Detect the hand sign using system camera using openCV library.

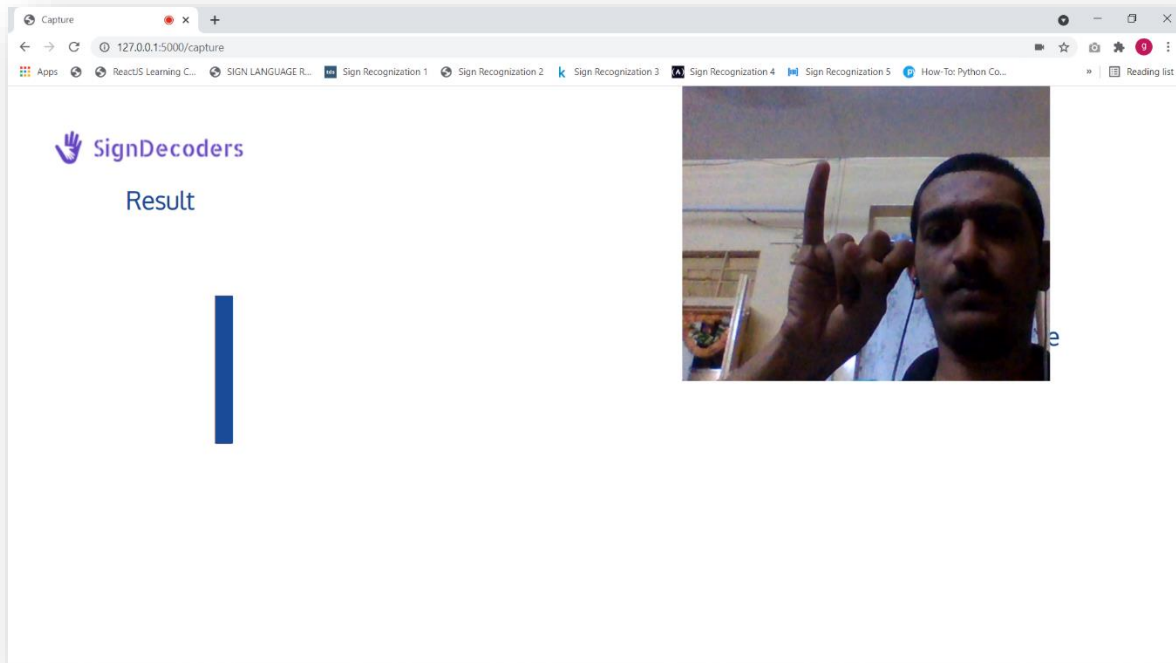
Step 2: capture the latest image of the hand sign and pass that to the algorithm.

Step 3: At final step we comparing the result by using set of images with input images. And print the final text output.

Diagram below will give a general idea of the implementation. This system is implemented with the help of booming technologies like object detection, openCV and ML, it can overcome the above Problem of communication.







5. CONCLUSION

By using OpenCV and ML, the system is proposed to solve the Real-time problems.

6. REFERENCES

- Paper [1]:** Hand and Wrist Localization Approach for Features Extraction in Arabic Sign Language Recognition Year: 2017 DOI Bookmark:9.1109/AICCSA.2017.67
- Paper [2]:** Deep Learning Based Hand Detection in Cluttered Environment Using Skin Segmentation Year: 2017 DOI Bookmark:10.1109/ICCVW.2017.81
- Paper [3]:** Capturing human hand motion in image sequences. DOI -10.1109/MOTION.2002.1182220
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- Paper [5]:** Hand Skeleton Estimation Based on Two Specific Gestures, Date of Conference: 21-22 Oct. 2017, DOI: [10.1109/ICVRV.2017.00057](https://doi.org/10.1109/ICVRV.2017.00057)
- Paper [6]:** Development of a Method for Capturing Human Motion Using a RGB-D Camera. Year: 2017, Volume: 1, Pages: 97-106 Bookmark:[10.1109/SVR.2017.21](https://doi.org/10.1109/SVR.2017.21)