SIGNSENSE REGOGNITION USING AI-ML

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ABSTRACT:

Human-Robot Interaction (HRI) presents a challenge in facilitating interaction between humans and robots. The main issue is that robots cannot directly understand human language, and HRI requires a medium of communication that is both understandable by robots and easy for humans to use, especially for those who are deaf, patients, or elderly. Therefore, gesture recognition has been identified as a potential communication medium to enable humans to giveorders to robots. Machine learning, which is a part of Artificial Intelligence (AI), is a technology that relies on data and information to develop systems. This paper explores sign language recognition as input, using two methods: Fuzzy C Means clustering and Decision K- Means clustering. These methods cluster data by applying the Euclidean distance concept between data elements, using feature extraction and feature matching concepts. Our goal is to use these techniques to obtain clear output at the end of this project.

INTRODUCTION:

Machine Learning combines computer science, mathematics, and statistics. Statistics is essential for drawing inferences from the data. Mathematics is useful for developing machine learning models and finally, computer science is used for implementing algorithms.

However, simply building models is not enough. We must also optimize and tune the model appropriately so that it provides we with accurate results. Optimization techniques involve tuning the hyperparameters to reach an optimum result.

The world today is evolving and so are the needs and requirements of people. Furthermore, weare witnessing a fourth industrial revolution of data. In order to derive meaningful insights fromthis data and learn from the way in which people and the system interface with the data, we need computational algorithms that can churn the data and provide us with results that would benefit us

in various ways. Machine Learning has revolutionized industries like medicine, healthcare, manufacturing, banking, and several other industries. Therefore, Machine Learninghas become an essential part of modern industry.

Data is expanding exponentially and in order to harness the power of this data, added by the massive increase in computation power, Machine Learning has added another dimension to the way we perceive information. Machine Learning is being utilized everywhere. The electronic devices we use, the applications that are part of our everyday life are powered by powerful machine learning algorithms.

LITERATURESURVEY

The paper"Hand Gesture Recognition using Deep Feature Fusion Network based on Wearable Sensors".By Guan Yuan, Xiao Liu, Qiuyan Yan, Shaojie Qiao, Zhixiao Wang, and Li Yuan in 2020.A new wearable data glove is designed to collect gesture data, which does not only contain IMU to track the arm motion, but also configures a 3D flex sensor to measure finger bending degree. Then, an improved deep feature fusion network is proposed to capture fine grain hand gestures and track long distance dependency in complex hand motions

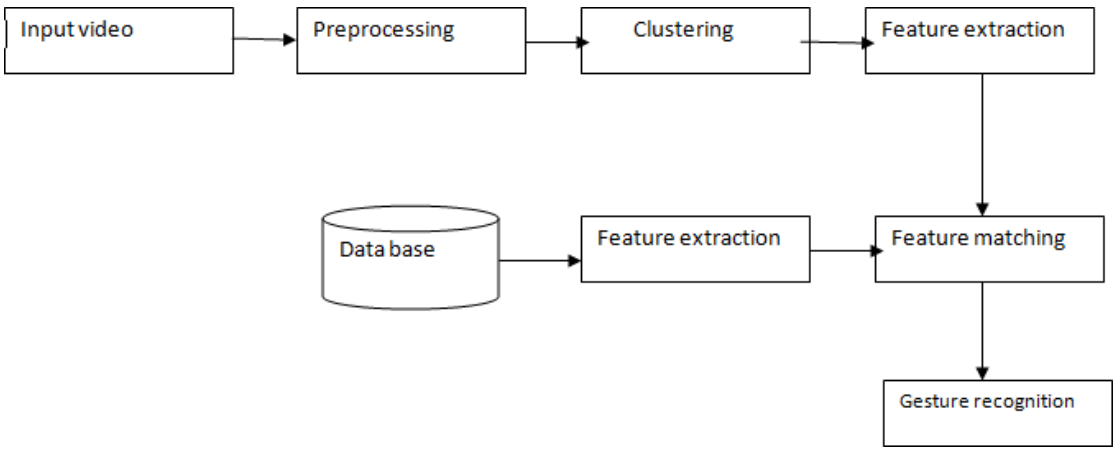
The paper "Sign Language Transformers: Joint End-to-end Sign Language Recognition and Translation".By Necati Cihan Camgoz, Oscar Koller, Simon Hadfield and Richard Bowden CVSSP in 2020. We evaluated our approach on the challenging PHOENIX14T dataset and report state-of-the-art sign language recognition and translation results, in some cases doubling the performance of previous translation approaches. Our first set of experiments have shown that using features which were pretrained on sign data outperformed using generic ImageNet based spatial representations. Furthermore, we have shown that jointly learning recognition and translation improved the performance across both tasks. More importantly, we have surpassed the text-to-text translation results, which was set as a virtual upper-bound, by directly translating spoken language sentences from video representations.

The paper "Sign language Recognition Using Machine Learning Algorithm".By Prof. Radha S. Shirbhate, Mr. Vedant D. Shinde, Ms. Sanam A. Metkari, Ms. Pooja U. Borkar, Ms. Mayuri A. Khandge in 2020. we have gone through an automatic sign language gesture recognition system in real-time, using different tools. Although our proposed work expected to recognized the sign language and convert it into the text, there's still a lot of scope for possible future work.

SYSTEM ARCHITECTURE DIAGRAM FOR ADVANCED SIGNLANGUAGE RECOGNITION

System design is the process of defining the architecture, modules, interfaces and data for a system to satisfy specified requirements. System design could be seen as the application of systems theory to product development. There is some overlap with the disciplines of systemsanalysis can cross many different groups within an organization to ensure requirements are gathered and met for all stakeholders.

SYSTEM ARCHITECTURE DIAGRAM FOR ADVANCED SIGN LANGUAGE RECOGNITION



In this diagram, the system consists of three main components: the user interface, the sign language recognition module, and the database. The user interface allows the user to provide input in the form of sign language gestures. The sign language recognition module includes four sub-components: image/video preprocessing, hand tracking, feature extraction, and classification. These components work together to identify the sign language gesture and classify it. The database contains a sign language dictionary that is used to search for a matching sign. Once a match is found, the recognized sign is displayed to the user.

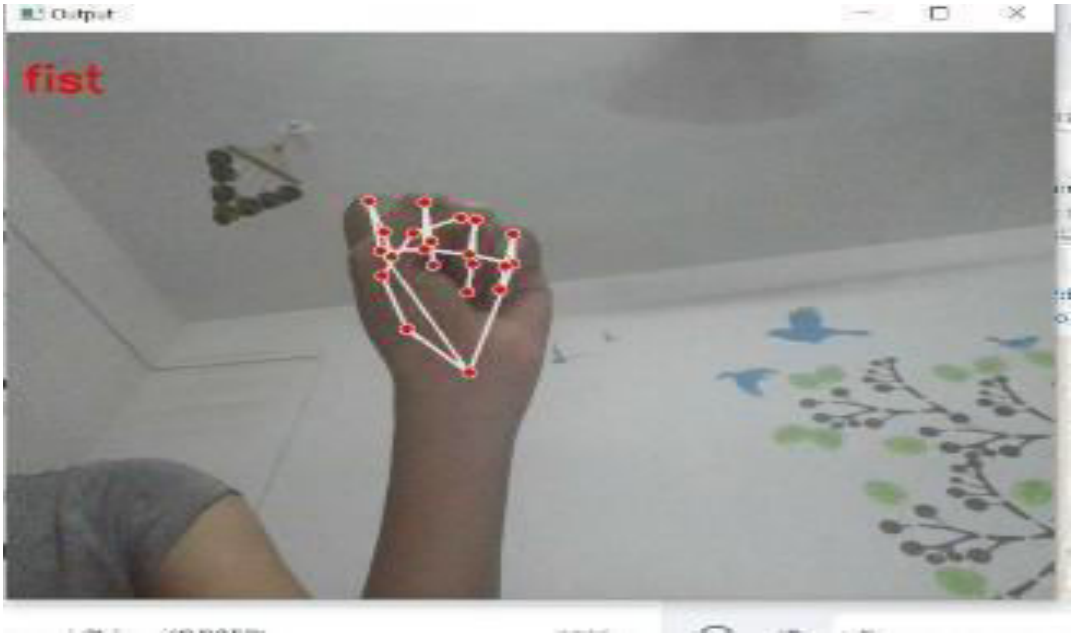
IMPLEMENTATI0N

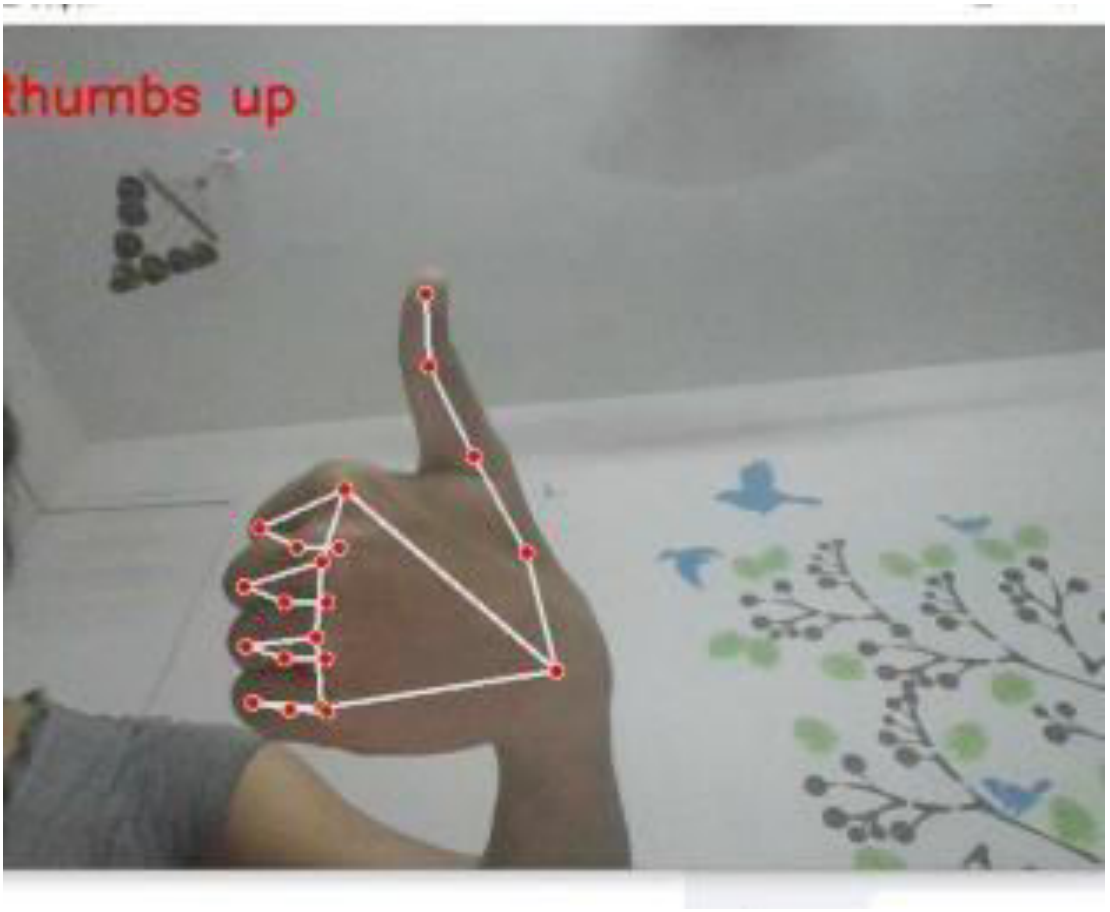
```
import cv2
import numpy as np
import mediapipe as mp
import tensorflow as tf
from tensorflow.keras.models import load_model

# initialize  mediapipe
mpHands = mp.solutions.hands
hands = mpHands.Hands(max_num_hands=1, min_detection_confidence=0.7)
mpDraw = mp.solutions.drawing_utils
```

```
# Load the gesture recognizer model
model = load_model('mp_hand_gesture')
# Load class names
f = open('gesture.names', 'r')
classNames = f.read().split('\n')
f.close()
print(classNames)
#  Initialize the webcam
cap = cv2.VideoCapture(0)
while True:
    # Read each frame from the webcam
    _, frame = cap.read()

    x, y, c = frame.shape

    # Flip the frame vertically
    frame = cv2.flip(frame, 1)
    framergb = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)
# Get hand landmark prediction
    result = hands.process(framergb)

    # print(result)

    className = ''

    # post process the result
    if result.multi_hand_landmarks:
        landmarks = []
    for handslms in
        result.multi_hand_landmarks:
     for lm in handslms.landmark:
                # print(id, lm)
                lmx = int(lm.x * x)
                lmy = int(lm.y * y)

                landmarks.append([lmx, lmy])
# Drawing landmarks on frames
            mpDraw.draw_landmarks(frame, handslms, mpHands.HAND_CONNECTIONS)

            # Predict gesture
            prediction = model.predict([landmarks])
            # print(prediction)
            classID = np.argmax(prediction)
            className = classNames[classID]

    # show the prediction on the frame
    cv2.putText(frame, className, (10, 50), cv2.FONT_HERSHEY_SIMPLEX,
                1, (0,0,255), 2, cv2.LINE_AA)

    # Show the final output
    cv2.imshow("Output", frame)
```

```
    if cv2.waitKey(1) == ord('q'):
        break
# release the webcam and destroy all active windows
cap.release()

cv2.destroyAllWindows()
```

SNAPSHOT





CONCLUSION

This project presents gesture recognition and classification based on features analysis and feature matching techniques. The results will be better identification of gesture it is fully based on feature extraction, machine learning techniques of, GLCM and clustering by using these it gives much better accuracy with lesser algorithmic complexity than other recognition approaches. Nowadays, applications need several kinds of images as sources of information for elucidation and analysis. Several features are to be extracted so as to perform various applications. When an image is transformed from one form to another such as digitizing scanning, and communicating, storing, etc. degradation occurs. Therefore ,the output image has to undertake a process called image enhancement, which contains of a group of methods that seek to develop the visual presence of an image. Image enhancement is fundamentally enlightening the interpretability or awareness of information in images for human listeners and providing better input for other automatic image processing systems. Image then undergoes feature extraction using various methods to make the image more readable by the computer.Sign language recognition system is a powerful tool to preparae an expert knowledge, edge detect and the combination of inaccurate information from different sources.The intend

of convolution neural network is to get the appropriate classification

FUTURE ENHANCEMENT

In future work, proposed system can be developed and implemented using Raspberry Pi. Image Processing part should be improved so that System would be able to communicate in both directions i.e.it should be capable of converting normal language to sign language and vice versa. We will try to recognize signs which include motion. Moreover we will focus on converting the sequence of gestures into text i.e. word and sentences and then converting it into the speech which can be heard. We can develop a model for ISL word and sentence level recognition. This will require a system that can detect changes with respect to the temporal space. In addition to recognizing signs, sign language recognition systems could be enhanced to recognize other non-verbal gestures, such as facial expressions and body language. This could improve the system's ability to accurately interpret and respond to signed communication. As with any machine learning system, sign language recognition algorithms can always be improved to increase their accuracy. This could involve using more advanced machine learning techniques, collecting larger and more diverse datasets, and improving the quality of input data through better cameras and sensors. We can develop a complete product that will help the speech and hearing impaired people, and thereby reduce the communication gap.

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