

Edustream- An online Tutoring App with Smart onscreen Writing and Multistreaming Using Deep Learning and Hand Gesture Recognition

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Abstract - The traditional The development of EduStream, an application for hand detection, is the focus of this project.Streaming continuous video feed of on-screen writing with gesture recognition.Online teaching is for students. Identifying purposeful writing activities among extraneous ones.Treating finger movements that are not related to letters or words presents a challenge.Apart from the conventional issue of recognizing patterns. Dealing with the proposed projectTotrack the key points on the hand, a deep learning-based approach is used for hand pose estimation. Recognition of gestures for writing on screen, followed by palm detection. Flask Web application is developed which will be used to generate the link with which students can join and visualize the stream. This can form as an easy online tutoring system with the same outcomes as boardbased teaching using deep learning and hand gesture recognition.

Keywords—Deep learning, Streaming app, Online tutoring, Hand Gesture, Landmark estimation, LSTM, Flask App, Python etc.

I. INTRODUCTION

The development of EduStream, an application for hand detection, is the focus of this project. Streaming continuous video feed of on-screen writing with gesture recognition. Online teaching is for students. Identifying purposeful writing activities among extraneous ones. Treating finger movements that are not related to letters or words presents a challenge. Apart from the conventional issue of recognizing patterns. Dealing with the proposed project To track the key points on the hand, a deep learning-based approach is used for hand pose estimation. Recognition of gestures for writing on screen, followed by palm detection. This will save the time in online teaching by providing a powerful tool on screen writing and teaching just by using hand gestures while teaching. Educational institutions (schools, colleges, and universities) in India are currently based only on traditional methods of learning, that is, they follow the traditional set up of face-to-face lectures in a classroom. The sudden outbreak of a deadly disease called Covid-19 caused by a Corona Virus (SARS-CoV-2) shook the entire world. hand gesture recognition for on screen writing in continuous video feed and streaming it to the Students for Online teaching.

The scope of the project is to make it easy for the online tutoring by providing a smart teaching platform which can ease the process of online teaching by eliminating the need for the board or white board based teaching by providing with a onscreen writing platform in online teaching methods. With the new waves of COVID19 approaching every year online teaching has become an important part of current education system. This project can be used for effective online teaching by providing an powerful AI based tool for onscreen writing and editing as well as streaming to the multiple students. This project performs a study on utilizing hand gestures for writing on screen for the purpose of online teaching.The proposed presents an innovative approach for teaching using online approach for onscreen writing using Hand gestures determined by tracking the palm points in hand pose estimation using deep learning. The suggested approach is novel and innovative as it provides the teachers to directly write on screen which can help them teach effectively without the need of extra teaching aid. The system implements deep learning based approach for estimation and detection of hand poses and use multiple hand gestures detected for effective online teaching using deep learning.The system implemented does not exist as of now on any of the online group video calling platforms. The system can provide an easy teaching tool for the educational institutes and schools as it permits to directly write on the screen using the detected hand gestures.

The system uses on screen writing is which far effective and performance efficient compared to current digital displays and digital pens in practice today. This provides a power tool for distant teaching or online teaching using deep learning. Since deep learning based approach is used for hand gesture detection using hand pose tracking points it is very efficient and can be easily scaled in future for commercial applications

OBJECTIVES :

The main objective of the project is to a complete system for onscreen writing by determination of hand gestures using deep learning for smart education. The objectives of the project are:

- To develop a hand gesture recognition using hand pose estimation using the camera video stream as data using deep learning
- To implement hand point tracking system to utilize the detected gestures to write on screen for the purpose of online teaching
- To implement different gestures for different applications while teaching such as on screen writing, erasing etc
- To develop a python application for smart teaching which can be used to generate the link of the stream and send to the different students
- To Develop as Flask based application through which different students can visualize the stream which is broadcasted using developed streaming link generated by the Application
- To implement multithreading system so that multiple students can join the stream.

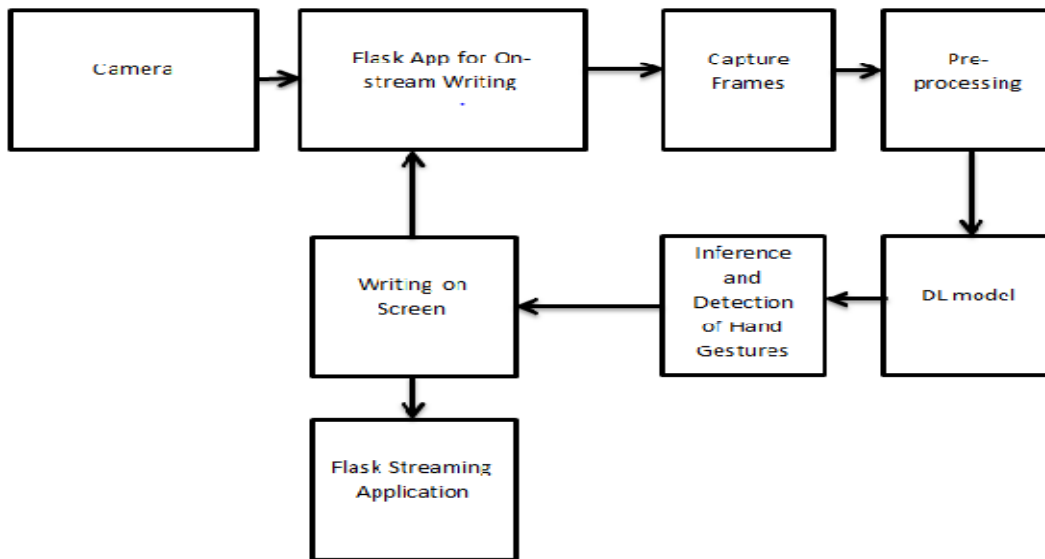
II. LITERATURE SURVEY

1. **Lowe D (1991) IEEE trans Multimedia 15(5):1110-1120 27. Murata T, Shin J(2014)**
This paper as presented general methods for fitting models with arbitrary curved surface. DP-matching-based numeric and alphabet character recognition system . The image processing in this problem Multimedia Tools and Applications is very complex, and a huge computational time is required. Deep learning methods have been used to solve problems in various fields of gesture recognition in recent years.
2. **Amma C, Georgi M, Schultz T (2014) UbiquitComput 18(1):191-203**
A wearable handwriting recognition system.
The proposed system can serve as an input device for wearable computers, allowing the input of text in way and without the need to operate any handheld device.
3. **Chua C, Guan H, Ho Y (2002) Image Vis Comput 20:191-202**
Model-based 3D hand posture estimation from a single 2D image
Passive sensing of the 3D geometric gesture of the human hand has been studied.
4. **Ren Z, Yuan J, Meng J, Zhang Z (2016) IEEE trans Multimedia 15(5):1110-1120 27.**
In this paper, we presented a robust part-based hand gesture recognition system using the Kinect sensor.
A novel distance metric is used for dissimilarity measure, which represents the hand shape as a signature with each finger part as a cluster .
5. **Li Q, Cao H, Lu Y, Yan H (2016) System and software reliability (ISSSR), international symposium on, pp. 68-76.IEEE***
Controlling non-touch screens as touch screens using Airpen , a writing tool with in-air gesturing mode.

III. SYSTEM ARCHITECTURE

The figure below shows the block diagram of the project. The proposed project consists of development of Edu-Stream . As shown in block diagram the system consists of python based application, Python backend with OpenCV and a deep learning model capable of detecting or recognizing the hand gestures'. The python application developed will have the option of starting a live video stream to detect the hand gestures using hand pose estimation. The Camera captures the video and feeds the frame by frame data to the python backend where opencv performs image preprocessing to feed it to the deep learning model. The Deep learning neural network is trained detect different hand gestures for different teaching tools such as writing or clearing the screen using the provided dataset and to predict the gesture made accurately using hand pose estimation and palm points tracking. The output the gesture detection model will be used to write on the screen or clear any previous written text depending on the gesture detected.

The second part is the flask based streaming application to generate the streaming link which can be shared with students to view the broadcasted lectures. Using Edu-Stream python app.



IV. CONCLUSIONS

Edustream is an innovative online tutoring app that utilizes deep learning and hand gesture recognition to provide a unique and interactive learning experience. The app's smart onscreen writing and multistreaming features allow students to communicate with their tutors in real-time, making it easier for them to understand difficult concepts. Additionally, the app's user-friendly interface and personalized learning plans make it accessible and adaptable to each student's needs. Overall, Edustream has the potential to revolutionize the way we approach online education and make it more engaging and effective for students of all ages.

V. REFERENCES

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 2. Li Q, Cao H, Lu Y, Yan H, Li T (2016) Controlling non-touch screens as touch screens using Airpen, a writing tool with in-air gesturing mode. In: *System and software reliability (ISSSR), international symposium on*, pp. 68–76. IEEE
 3. Chua C, Guan H, Ho Y (2002) Model-based 3D hand posture estimation from a single 2D image. *Image Vis Comput* 20:191–202
 4. Lowe D (1991) Fitting parameterized 3D models to images. *IEEE Trans Pattern Anal Mach Intell* 13:441–450
 5. Ren Z, Yuan J, Meng J, Zhang Z (2016) Robust part-based hand gesture recognition using Kinect sensor. *IEEE Trans Multimedia* 15(5):1110–1120
27. Murata T, Shin J (2014)