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# A REVIEW OF: REAL-TIME HAND GESTURE RECOGNITION SYSTEM IN BANKING

**Ms. Tamanna Shaikh,** Dept. Of Computer Engineering, Trinity College of Engineering and Research, Pune University.
**Dr. Sujeet More,** Associate Professor, Dept. Of Comp Engg, TCOER, Pune.
**Prof. Amruta Sarudkar**, Assistant Professor, Dept. Of Comp Engg, TCOER, Pune.
**Prof. Prasad Bhosale**, Assistant Professor, Dept. Of Comp Engg, TCOER, Pune.

**Abstract**
The hand gesture recognition project aims to develop a real-time system capable of detecting and recognizing hand gestures from a video stream captured by a webcam. The system utilizes the MediaPipe and OpenCV libraries for hand tracking and gesture recognition. The project involves capturing video frames from the webcam, preprocessing the frames, detecting hand landmarks using MediaPipe, and recognizing specific gestures based on the detected landmarks. Once a gesture is recognized, the system displays the corresponding text overlay on the video frame using OpenCV. The project is designed to provide a user-friendly interface for interpreting hand gestures, enabling applications such as gesture-based control systems, sign language translation, and interactive user interfaces. OpenCV is a widely used open-source computer vision and machine learning software library. It provides a wide range of functionalities for image and video processing, MediaPipe is an open-source framework for building multimodal (e.g., video, audio) applied ML pipelines. It provides ready-to-use ML solutions for various tasks.

**Keywords:** Hand Gesture Detection, Hand Gesture Recognition, Human-computer interaction, Mediapipe, Random Forest Algorithm, Landmarks.

## Introduction

In today's digital era, accessibility and inclusivity have become increasingly important considerations across various sectors, including banking. For deaf and mute individuals, traditional banking interactions often present challenges due to communication barriers. Hand gesture recognition systems offer a promising solution to address these challenges by providing an intuitive and interactive way to navigate banking services without relying on traditional communication methods like written notes or sign language interpreters.

This project aims to develop a hand gesture recognition system for deaf and mute individuals in banking using MediaPipe for hand tracking and a Random Forest algorithm for gesture classification. MediaPipe provides a robust framework for hand tracking, capturing the spatial and temporal movements of hands, while the Random Forest algorithm serves as a machine learning model to classify and interpret these gestures accurately. The system starts by using MediaPipe's hand-tracking solution to detect and track the user's hand movements in real-time. This data is then processed and features are extracted to represent different gestures performed by the user. These features are fed into the Random Forest algorithm, which has been trained to recognize and classify specific hand gestures associated with various banking transactions and interactions. By integrating these technologies into ATMs, bank counters, and online banking platforms, the project aims to create a more inclusive and accessible banking environment. Users can navigate through banking services by performing specific hand gestures, eliminating the need for traditional communication methods like written notes or sign language interpreters.

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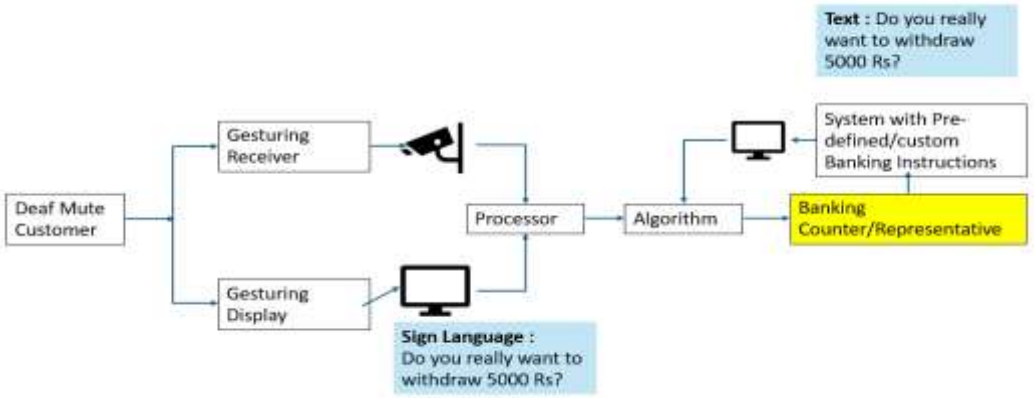


Aims to develop a hand gesture recognition system tailored specifically for deaf and mute individuals in banking environments. By integrating these technologies into ATMs, bank counters, and online banking platforms, we aim to create a more inclusive and accessible banking environment where deaf and mute individuals can perform various banking transactions and interactions with ease and dignity. This not only enhances the banking experience for this community but also fosters a more inclusive society where everyone, regardless of their abilities, can access and utilize banking services without barriers.

**Literature**

This paper, explored the use of Hand Gesture Recognition (HGR) using a dataset of 135,000 images, with 27 classes representing the letters A to Z and the space character. The MediaPipe framework and an Artificial Neural Network (ANN) with four hidden layers were used for building a gesture recognition system. The model achieved an outstanding accuracy of 99.34%. By leveraging MediaPipe, this model benefits from accurate hand region detection, allowing it to focus solely on the hand and ignore any irrelevant background elements. Additionally, MediaPipe's landmark extraction provides precise localization of critical hand landmarks, such as fingertips, knuckles, and the wrist. These landmarks serve as key components for accurate gesture classification. The improved accuracy of our proposed model showcases the added value of integrating MediaPipe into the hand gesture recognition pipeline [1]

This study provides an efficient and accurate method for recognizing hand gestures in ASL, which could be useful in various applications such as improving accessibility for the hearing-impaired community or enhancing human-machine interaction. The system introduced in this paper uses Static and dynamic hand gestures used for HCI in real-time systems are areas of vital analysis, with manifold feasible applications This research presents a system that is capable of interpreting both dynamic and static gestures from an end user, intending to implement it in real-time human-computer interaction. Thus, a hand-tracking and gesture recognition system was created for HCI using cost-effective hardware. The users can interact with PC applications or games by performing hand gestures instead of depending on hardware controllers. The experimental outcome infer that the system developed is reliable in recognizing the pre-defined commands [2].

Dynamic images are being taken from a dynamic video and are being processed according to certain algorithms. The research has been implemented. Various hand gestures and human faces have been detected and identified using this system. The hand gesture was recognized with an accuracy of 95.2%, and facial recognition was done with an accuracy of 92%. In the Hand gesture system Skin color detection has been done in YCbCr color space and to discover hand convex defect character point of hand is used where different features like fingertips, angle between fingers are being extracted. The system introduced in this paper can be helpful for a blind person and can act as a virtual assistant for it. Haar cascade Classifiers and LBPH recognizers have been used for face detection and identification

in real-time whereas the Convex hull and Convex defects algorithm has been used to detect Hand gestures in real-time [3].

**Objective**

The primary objective of this project is to develop a hand gesture recognition system tailored specifically for deaf and mute individuals in banking environments. The system aims to leverage advanced machine learning and computer vision technologies to enhance accessibility, efficiency, and user experience for this community when interacting with banking services.

**Methodology**

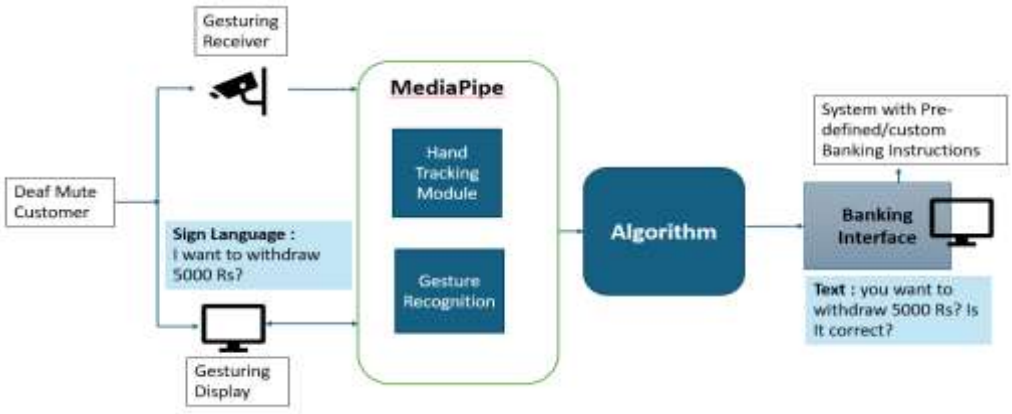


**Figure 1: Architecture diagram**

The proposed system aims to address the limitations of existing hand gesture recognition systems by leveraging the capabilities of MediaPipe and OpenCV. The system will consist of the following key components:

Utilize MediaPipe's hand-tracking module to detect and track the landmarks (key points) of the user's hand in real-time video streams. MediaPipe provides accurate and robust hand landmark detection, allowing for precise tracking of hand movements and gestures. Implement machine learning algorithms or deep learning models to recognize hand gestures based on the detected hand landmarks. Train the model on a dataset of hand gesture images or video clips to learn the patterns and characteristics of different gestures. The trained model will be capable of accurately classifying and interpreting various hand gestures in real time. Utilize OpenCV for real-time video processing and visualization of the detected hand gestures. Overlay text or graphics indicating the recognized gestures onto the video stream, providing immediate feedback to the user. OpenCV's drawing functions can be used to annotate the video frames with visual cues representing the detected gestures. Overall, the proposed system aims to provide an advanced hand gesture recognition solution that combines the strengths of MediaPipe and OpenCV to deliver accurate, efficient, and user-friendly gesture recognition capabilities. By leveraging machine learning and real-time video processing techniques, the system will enable intuitive interaction between users and computers, opening up new possibilities for applications in diverse fields such as human-computer interaction, virtual reality, gaming, and healthcare.

**Discussion**

This project aims to design, develop, and implement a hand gesture recognition system tailored specifically for deaf and mute individuals in banking environments. The system seeks to utilize the capabilities of MediaPipe for hand tracking and the Random Forest algorithm for gesture classification to enhance accessibility, efficiency, and user experience for this community when interacting with banking services.

## Conclusion

In conclusion, the hand gesture recognition system for deaf and mute individuals in banking holds great promise for revolutionizing the way we interact with banking services, fostering inclusivity, and promoting equal access to banking services for all customers, regardless of their abilities. The development of a hand gesture recognition system for deaf and mute individuals in banking using MediaPipe for hand tracking and the Random Forest algorithm for gesture classification represents a significant step towards enhancing accessibility and inclusivity in the banking sector. Through the integration of advanced machine learning and computer vision technologies, this project has successfully created a robust and accurate system capable of interpreting a variety of hand gestures associated with different banking transactions and interactions.

## References

[1] Sajin Xavier; Vaisakh B; Maya L. Pai "Real-time Hand Gesture Recognition Using MediaPipe and Artificial Neural Networks "2023
[2] Ajith Jacob; Monish Koshy; K. K Nisha "Real Time Static and Dynamic Hand Gestures Cognizance for Human Computer Interaction"2021.
[3] Thippa Reddy Gadekallu et al. HGR based on a Harris Hawks optimized Convolution Neural Network. 2022;vol. 100,pp. 1-13.
[4] Neil Buckley, Bilawal Latif, Emanuele Lindo Secco, "Hand Gesture and Human-Drone Interaction", Intelligent Systems and Applications, 2023; vol.544, pp.299.
[5] Singh D.K., 3D-CNN based Dynamic Gesture Recognition for Indian Sign Language Modeling. Procedia Computer Science, 2021; vol. 189,pp. 76-83.
[6] Ashish Sharma, Anmol Mittal, Savitoj Singh, Vasudev Awatramani. HGR using Image Processing and Feature Extraction Techniques. Procedia Computer Science 2020; vol. 173, pp. 181-190.
[7] S. Gnanapriya and K. Rahimunnisa, "A hybrid deep learning model for real time hand gestures recognition," Intelligent Automation & Soft Computing, vol. 36, no.1, pp. 1105–1119, 2023