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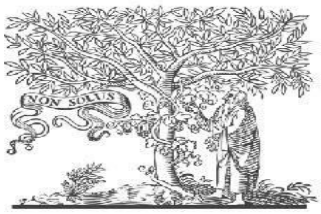

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GESTURE CONTROL GAMING

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ABSTRACT: Video gaming has become an integral part of the modern world. Irrespective of age & gender, everybody enjoys playing video games. They have become more interesting & user-friendly with the advent of gesture controlling and Machine learning. Gesture control is the ability to recognize and interpret movements of the human body in order to interact with and control a computer system without direct physical contact. We would like to take up this concept of the gesture control system and create a video game which is a Machine learning model that identifies hand gestures. The title of our project is "Gesture control gaming". Our project, includes games like, Tip Tap, Car Racing, Hill climb racing. We would like to combine all these using a Web Application, built using PyWebIO module, whose purpose is to select the game and open the required application.The system that we are implementing is a real-time hand gesture recognition, which performs actions based on the gestures given. The primary objective of this system is to show how a computer game can be played by using human gestures. The secondary objective of this system is to create an environment that makes a player to play a game without any physical controller. The camera or webcam connected to the system can be used to recognize the human hand gesture. Based on the analysis made by the application done on recognizing the Human Hand Gestures, the operations on the game will be performed with the game's default gaming controls. The existing system is designed for only one game. But our project includes multiple games supporting Gesture controlling.

Keywords *– Machine learning, video gaming.*

1. INTRODUCTION

Computer technology has tremendously grown over the past decade and has become an integral part of everyday life. The primary computer accessory for Human Computer Interaction (HCI) is the keyboard. The most natural and intuitive technique for HCI, that is a viable replacement for the computer keyboard is with the use of hand gestures. Over the past decades there have been significant advancements in HCI technologies for gaming purposes, such as the Microsoft Kinect and Nintendo Wii. These gaming technologies provide a more natural and interactive means of playing video games. Gaming with the Computer accessories like keyboard, mouse, joystick, etc. has always been a repetitive thing for gamers and when for long hours of usage, it becomes a boring task. The ability to use hand gesture for controlling the game is to enhance the gaming experience for the modern generation. In our day-to-day

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activities we actively try to find shortcuts and ways to make our work more efficient. HCI using hand gestures is very intuitive and effective for one-to-one interaction with computers and it provides a Natural User Interface (NUI).

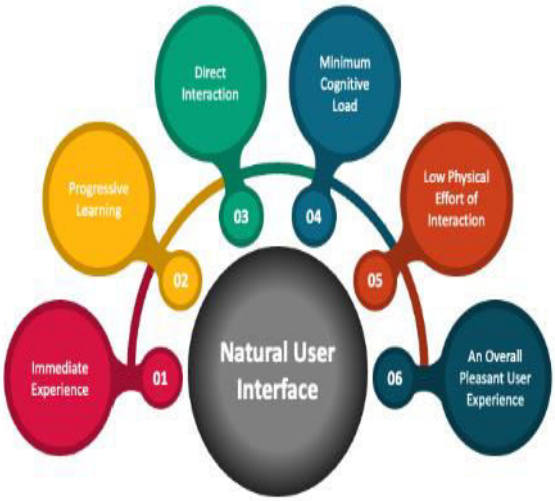

Fig.1: Example figure

There are generally two approaches for hand gesture recognition, which are hardware based, where the user must wear a device, and the other is vision based which uses image processing techniques with inputs from a camera. The proposed system is vision based, which uses image processing techniques and inputs from a computer webcam. The input frame would be captured from the webcam and systems are generally broken down into four stages, Hand Pivot Position Region, Hand Tracking & Gesture Recognition, Hand Position Detection & Cursor Control. The hand position would then be found and used for hand tracking and gesture recognition. Hand tracking would be used to navigate the computer cursor. The scope of the system would therefore be to design a vision-based Computer control (CC) system.

2. LITERATURE REVIEW

Hand Gesture Recognition for Human Computer Interaction: a comparative study of different image features

Hand gesture recognition for human computer interaction, being a natural way of human computer interaction, is an area of active research in computer vision and machine learning. This is an area with many different possible applications, giving users a simpler and more natural way to communicate with robots/systems interfaces, without the need for extra devices. So, the primary goal of gesture recognition research is to create systems, which can identify specific human gestures and use them to convey information or for device control. For that, vision-based hand gesture interfaces require fast and extremely robust hand detection, and gesture recognition in real time. In this study we try to identify hand features that, isolated, respond better in various situations in human-computer interaction. The extracted features are used to train a set of classifiers with the help of RapidMiner in order to find the best learner. A dataset with our own gesture vocabulary consisted of 10 gestures, recorded from 20 users was created for later processing. Experimental results show that the radial signature and the centroid distance are the features that when used separately obtain better results, with an accuracy of 91% and 90,1% respectively obtained with a Neural Network classifier. These to methods have also the advantage of being simple in terms of computational complexity, which make

them good candidates for real-time hand gesture recognition.

Open CV for Computer Vision Applications

The aim of image processing is to help the computer to understand the content of an image. OpenCV is a library of programming functions mainly used for image processing. It provides de-facto standard API for computer vision applications. We can solve many real time problems using image processing applications. In this paper, sample real time image processing applications of OpenCV are discussed along with steps.

Real time finger tracking and contour detection for gesture recognition using Open CV

Gestures are important for communicating information among the human. Nowadays new technologies of Human Computer Interaction (HCI) are being developed to deliver user's command to the robots. Users can interact with machines through hand, head, facial expressions, voice and touch. The objective of this paper is to use one of the important modes of interaction i.e. hand gestures to control the robot or for offices and household applications. Hand gesture detection algorithms are based on various machine learning methods such as neural networks, support vector machine, and Adaptive Boosting (AdaBoost). Among these methods, AdaBoost based hand-pose detectors are trained with a reduced Haar-like feature set to make the detector robust. The corresponding context-free grammar based proposed method gives effective real time performance with great accuracy and robustness for more than four hand gestures. Rectangles are creating some problem due to that we have also implement the alternate representation method for same gestures i.e. fingertip detection using convex hull algorithm.

Real-Time Hand Gesture Detection and Recognition Using Simple Heuristic Rules

This paper presents a novel and real-time system for interaction with an application or videogame via hand gestures. Our system includes detecting and tracking bare hand in cluttered background using skin detection and hand posture contour comparison algorithm after face subtraction, recognizing hand gestures via bag-of-features and multiclass support vector machine (SVM) and building a grammar that generates gesture commands to control an application. In the training stage, after extracting the keypoints for every training image using the scale invariance feature transform (SIFT), a vector quantization technique will map keypoints from every training image into a unified dimensional histogram vector (bag-of-words) after K-means clustering. This histogram is treated as an input vector for a multiclass SVM to build the training classifier. In the testing stage, for every frame captured from a webcam, the hand is detected using our algorithm, then, the keypoints are extracted for every small image that contains the detected hand gesture only and fed into the cluster model to map them into a bag-of-words vector, which is finally fed into the multiclass SVM training classifier to recognize the hand gesture.

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3. METHODOLOGY

We propose a real-time hand gesture recognition system using a camera. Existing systems use hand detection primarily with some type of marker. Oursystem, however, uses a real-time hand pose estimation system. We use Mediapipe for detecting the gestures.

Our hand tracking solution utilizes an ML pipeline consisting of several models working together:

- A palm detector model (called BlazePalm) that operates on the full image and returns an oriented hand bounding box.
- A hand landmark model that operates on the cropped image regiondefined by the palm detector and returns high fidelity 3D hand key-points.
- A gesture recognizer that classifies the previously computed key-point configuration into a discrete set of gestures.

The goal of this project is to train a Machine Learning algorithm capable of classifying images of different hand gestures, such as a fist, palm, showing the thumb, and others.

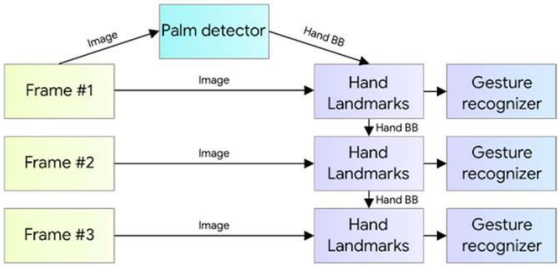

Fig.2: System architecture

4. IMPLEMENTATION

Machine learning:

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

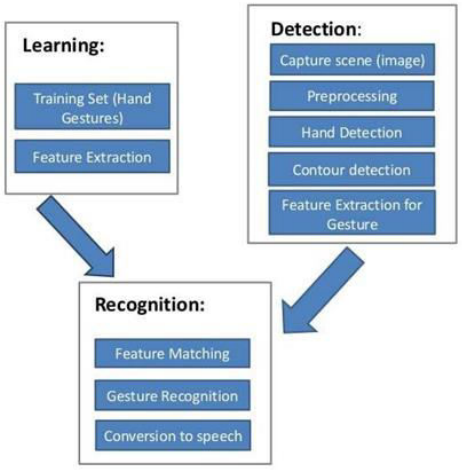

Fig.3: Machine learning model

Machine learning (ML) algorithms are broadly categorized as either supervised or unsupervised. Supervised learning algorithms have both input data and desired output data provided for them through labeling, while unsupervised algorithms work with data that is neither classified nor labeled. An unsupervised algorithm might, for example, group unsorted data according to similarities and differences.

However, many ML approaches, including transfer learning and active learning, involve what are more accurately described as semi-supervised algorithms. Transfer learning uses knowledge gained from completing one task to help solve a different but related problem, while active learning allows an algorithm to query the user or some other source for more information. Both systems

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are commonly used in situations where labeled data is scant.

Reinforcement learning, sometimes considered a fourth category, is based on rewarding desired behaviors and/or punishing undesired ones to direct unsupervised machine learning through rewards and penalties.

5. EXPERIMENTAL RESULTS

Fig.4: Output for Hill Climb Racing

Fig.5: Fist is detected and brakes is applied

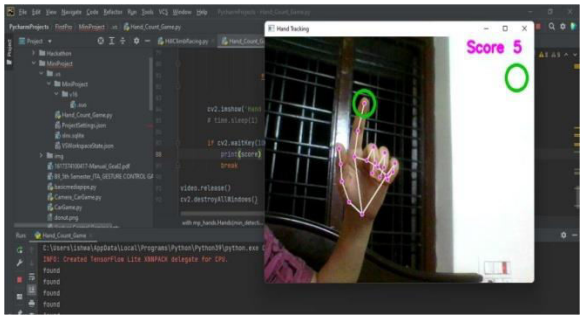

Fig.6: Output for Tip-Tap Game: Tip f the index finger detected successfully

6. CONCLUSION

The machine vision-based keyboard cursor control using hand gesture system is developed in the Python language, using the Open CV library. The system is able to control the movement of a keyboard cursor by tracking the user's hand for playing a game. The keyboard cursor functions will perform by using different hand gestures. The system has the potential of being a viable replacement for the computer keyboard.

7. FUTURE WORK

The application built has some constraints. It cannot completely replace the computer keyboard. The accuracy of the hand gesture recognition can be improved. Different games have different actions to perform, for which we need to include different gestures, which is a challenging task to accomplish.

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