

PC Automation using Hand Gestures using Machine Learning

P. Purushotham¹, R Madhu², T. Vinod³, K. Shekar⁴

Assistant Professor, Dept. of Computer Science and Engineering^{1,2,3,4},
MLR Institute of Technology, Dundigal, India

Abstract: *Pattern recognition and Gesture recognition are the developing fields of research. Hand gestures can add another dimension to contactless computer operating. Hence in this project, we develop a software which presents a system prototype that is able to automatically recognize gestures and runs pc commands for particular gestures. We are using python to develop our solution by using the integrated modules like cv2(OpenCV(cv2)-Open source computer vision is a library of programming functions mainly aimed at real-time computer vision.) and Mediapipe(detects hand and fingers data points.)*

Keywords: Mediapipe, OpenCV, Human Computer Interaction(HCI), Fingers, Gestures

I. INTRODUCTION

Technology has finally reached that dimension when our hands will take over the job and replace them by directly communicating with the computer or television. For instance, in order to delete a folder or file from the computer, place your palm on it, and throw it like a paper in a dustbin. Even while using the microwave oven to bake a cake, waving our hands in the air like a magician would serve as a command for the oven. Hand gesture recognition system has evolved tremendously in the recent few years because of its ability to interact with machine efficiently. Mankind tries to incorporate human gestures into modern technology by searching and finding a replacement of multi touch technology which does not require any touching movement on screen. Since the time that the computer revolution started, human computer interaction has always been attempted to improve. Computers have now become an integral part of our lives and hence their usage should be as trouble-free as talking to someone is. Earlier the way humans interacted with this smart machine was either through keyboard or a mouse. But now attempts are being made to make the man-machine interaction as natural as possible. Fulfilling this requirement is the popular touch screen technology which is soon expected to be replaced by the **gesture recognition technology**.

II. LITERATURE SURVEY

The initial approach towards communication with computer employing hand gesture was first projected by Myron W Krueger in 1970. The purpose of the approach was attained and also the mouse cursor control was accomplished using an external webcam. Selecting hand gesture as an interface in HCI will permit the implementation of a good variety of applications with none physical contact with the computing environments. Nowadays, majority of the HCI relies on devices like keyboard, or mouse, however an enlarging significance in a category of techniques based on computer vision has been came out because of skill to acknowledge human gestures in a habitual manner.

TABLE I

S.no	Authors name & Year of Publications	Title name & Journal name	Abstract or Objectives	Techniques used	Limitations
1	J. Yashas Dept of ECE, MCE, Hassan, India-2019	Hand Gesture Recognition	Having reached all the best possible ways for data acquisition like cameras, wrist sensors, hand gloves now these are of less concern. Now the higher emphasis is on feature extraction from the available data, algorithms used to improvise feature extraction	Feature extraction, Gesture recognition, Sensors, Image segmentation, Hidden Markov models, Cameras, Deep learning	The major drawback is that hand gloves is also a peripheral device that should be carried everywhere.
2	Siddharth S. Rautaray -2020	Real Time Hand Gesture Recognition System for Dynamic Applications	Evolution of ubiquitous computing, current user interaction approaches with keyboard, mouse and pen are not sufficient for the still widening spectrum of Human computer interaction. Gloves and sensor based trackers are unwieldy, constraining and uncomfortable to use.	Implemented a technique for real time tracking of hand capturing gestures with the use of a web camera, personal computer and image processing algorithms making it more users friendly.	Due to the limitation of these devices the use-able command set based diligence is also limited.
3	Arpita Ray Sarkar G. Sanyal S. Majumder	Hand Gesture Recognition Systems: A Survey	Human-robot interaction is another area where hand gesture recognition has been successfully used. The use of keyboard and mouse is limited to 2D world, but the controlling of a robot should be in 3D space. Hand gesture is most suitable for such purposes. However for robot control only a few simple commands are being used, such as the hand signal one' refers to 'move	Hand Segmentation. Thresholding. Skin-based. Colour normalization.	Features are the crucial elements for hand gesture recognition. Large number of features, such as, shape, orientation, textures, motion, distance. But these features may neither be always available nor reliable due to

			forward' , 'five' refers to 'stop' and so on.		occlusions and illuminations . Some non-geometric features (such as colour, silhouette, texture) are also available for recognition. But they are inadequate for the purpose
4	Guillaume Plouffe. Ana-Maria Cretu	Static and Dynamic Hand Gesture Recognition in Depth Data Using Dynamic Time Warping.	This paper discusses the development of a natural gesture user interface that tracks and recognizes in real time hand gestures based on depth data collected by a Kinect sensor. A novel algorithm is proposed to improve the scanning time in order to identify the first pixel on the hand contour within this space. Starting from this pixel, a directional search algorithm allows for the identification of the entire hand contour. The k-curvature algorithm is then employed to locate the fingertips over the contour, and dynamic time warping is used to select gesture candidates and also to recognize gestures by comparing an observed gesture with a series of prerecorded reference gestures.	Directional search algorithm. A novel algorithm. K-curvature algorithm.	Large number of features, such as, shape, orientation, textures, motion, distance. The use-able command set based diligence is also limited.

5	Khushal Jhetava -March 02,2022	Mouse and Keyboard automation using Python	Python automation is a process to transform a manually performed computer action into one that happens automatically. For automatic things like mouse and keyboard, we need to understate the axis of the monitor because the axis will directly help users move the mouse using coordinates.	Pyautogui is a library that allows you to control the mouse and keyboard to do various things.	The program needs to be executed every single time once the required action is done.
6	Martin Lees	How to control the mouse and keyboard using python automation		Pyautogui is a library that allows you to control the mouse and keyboard to do various things.	The program needs to be executed every single time once the required action is done.
7	U Sairam Dharani Kumar Reddy Gowra SaiCharanKoppa pu 07 June 2022	VirtualMouse using Machine Learning and GUI Automation	An input module, such as a virtual mouse that uses Object Detection, Object Tracking and Gestures to assist us in communicating, could be a viable replacement to the traditional touch screen and hardware mouse. The system design proposed is a TensorFlow-based mouse controlling system, which uses hand gestures that are captured through a webcam using an RGB color scheme.	This solution permits users to control the system cursor using their hand, that the computer webcam tracks and perform mouse operations like Left click, Right click, Scroll, Drag, Move using different hand gestures. Python, TensorFlow and OpenCV libraries are used for real time computer vision to implement the system.	This system only provides virtual mouse feature and no other features are provided.

2.1 Existing Systems

The concept behind the project is very simple. We will place two Ultrasonic (US) sensors on top of our monitor and will read the distance between the monitor and our hand using Arduino, based on this value of distance we will perform certain actions. To perform actions on our computer we use Python pyautogui library. The commands from Arduino are sent to the computer through serial port (USB). This data will be then read by python which is running on the computer and based on the read data an action will be performed.

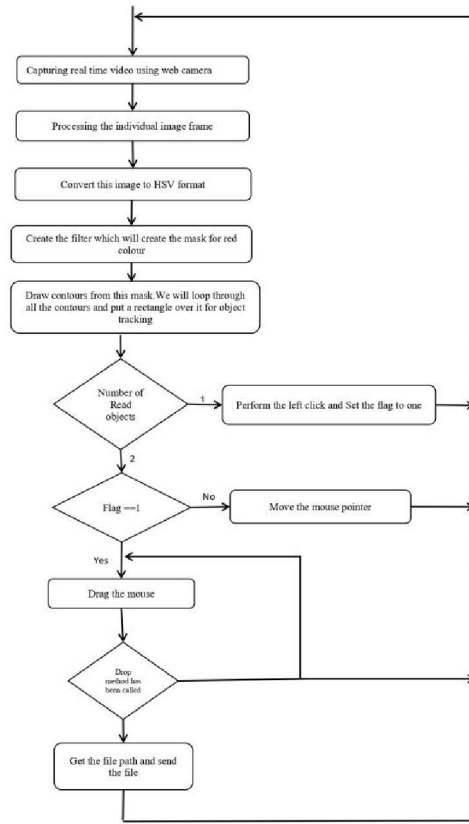


Fig.1: Flowchart of existing system

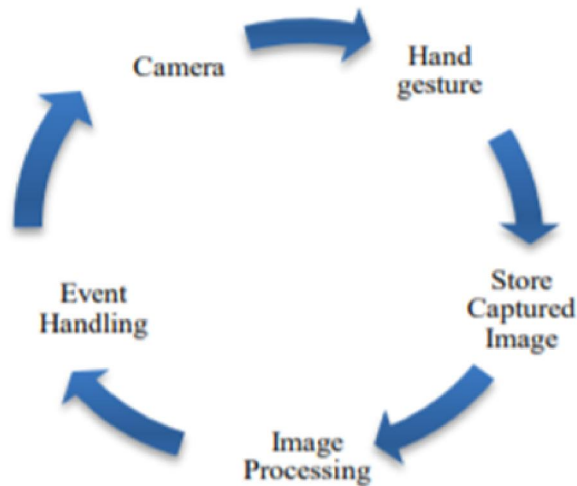


Fig 2: Workflow of existing system

2.2 Proposed System

Pattern recognition and Gesture recognition are the developing fields of research. In many, few existing systems have the mandatory use of exterior devices where as in our project we can use the web cam. So we are developing a prototype which gives an instantaneous response without any processing delay.

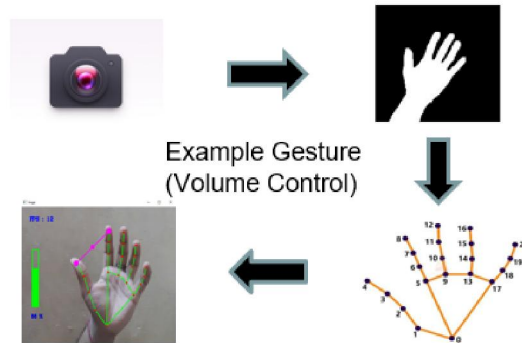


Fig3: Workflow of proposed system

Sample gestures:

Action 1 : Two finger gestures

Right hand index and thumb fingers:

Based on the distance between these two fingers, we can control the brightness level of the display/monitor.

Left hand index and thumb fingers:

Based on the distance between these two fingers, we can control the volume level of the speakers.

Action 2 : Five finger gestures:

Five finger gestures are used to shutdown/sleep/restart the computer.

III. CONCLUSION

For most of the commonly employed techniques for gesture recognition we use gloves as an exterior device where the glove is equipped with variety of sensors to provide information about accurate hand position, orientation and flex of fingers. And when it comes to our prototype distance is the only factor which can effect the accuracy of the output. Though gloves provide accurate measurements of hand shape, they are cumbersome to wear and connected through wires whereas we only need web camera for the input. Hence this system acts like a interface during the communication between people and the computer. It only require web-camera to capture I/P image. This would lead to a new generation of human computer interaction(HCI) in which no physical contact with device is needed.

REFERENCES

- [1]. J. A. Anderson, "An Introduction to Neural Network", 3rd Ed. Library of Congress Cataloging in publication Data, pp. 651, 1997.
- [2]. R. P. Sharma and G. K. Verma, "Human computer interaction using hand gesture", *Procedia Computer Science*, vol. 54, pp. 721-
- [3]. T. Vuletic, A. Duffy, L. Hay, C. McTeague, G. Campbell and M. Grealy, "Systematic literature review of hand gestures used in human computer interaction interfaces", *International Journal of Human-Computer Studies*, vol. 129, pp. 74-94, 2019.727, 2015.
- [4]. F. Zhang, V. Bazarevsky, A. Vakunov, A. Tkachenka, G. Sung, C.-L. Chang, et al., "Mediapipe hands: On-device real-time hand tracking", 202
- [5]. C. Lugaresi, J. Tang, H. Nash, C. McClanahan, E. Uboweja, M. Hays, F. Zhang, C.-L. Chang, M. G. Yong, J. Lee et al., "Mediapipe: A framework for building perception pipelines", 2019.0.
- [6]. J. P. Wachs, M. Kölsch, H. Stern and Y. Edan, "Vision-based hand-gesture applications", *Communications of the ACM*, vol. 54, no. 2, pp. 60-71, 2011