

Report On

HAND GESTURE RECOGNITION AND VIRTUAL HOUSE

Submitted in partial fulfillment of the requirements of the Mini project in
Semester IV of Second Year Computer Science and Engineering [Data
Science] by

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CERTIFICATE

This is to certify that the Mini Project entitled **“Hand Gesture recognition and virtual mouse ”** is a bona fide work of **“Jayesh Berde 02, Harshkumar Devmurari 10, Deven Kalathiya 27”** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **“Bachelor of Engineering”** in Semester IV of Second Year **“Computer Science and Engineering [Data Science]”**

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Mini Project Approval

This Mini Project entitled” **“Jayesh Berde 02”** by **“Harshkumar Devmurari 10, Deven kalathiya 27”** submitted is approved for the degree of **Bachelor of Engineering** in in

Semester IV of Second Year **Computer Science and Engineering [Data Science]**.

Examiners

1.....
(Internal Examiner Name & Sign)

2.....
(External Examiner name & Sign)

Date:29/04/2022

Place

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Abstract

Hand gesture recognition system received great attention in the recent few years because of its manifoldness applications and the ability to interact with machine efficiently through human computer interaction. There are many type of gestures such as arm, hand, face and many other but hand gestures give more meaningful information than other types of gestures.

The main purpose of gesture recognition system is to develop a useful system which can recognize human hand gestures and used them to control electronic devices.

It allows users to interface with machines without the use of mechanical or physical devices, and even control mouse functionalities.

The operations like clicking and motion of cursor will be performed with different hand gestures. The proposed system will only require a camera as an input device.

The proposed system will avoid COVID-19 spread by eliminating the human intervention and dependency of devices to control the computer.

Acknowledgment

We would like to earnestly acknowledge the sincere efforts and valuable time given by respected teacher Mrs Maya Varghese. The valuable guidance and feedback has helped us in completing this project.

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Introduction

The project proposes an AI virtual mouse system that makes use of the hand gestures detection for performing mouse functions in the computer using computer vision.

The main objective of the proposed system is to perform computer mouse cursor functions using a web camera or a built-in camera in the computer instead of using a traditional mouse device or touchpad.

It allows users to interface with machines without the use of mechanical or physical devices, and even control mouse functionalities.

Image processing technique and data augmentation is used for detection and prediction of the hand gesture.

The model is trained just once and can be used many number of times with different functionalities.

The sytem performs the commands in real time.

Problem Statement

The traditional mouse and touchpad are good but there is a room of improvement in mouse pointer controlling.

As mouse and touchpad are physical device it have wear and tear i.e have maintenance issue.

There are hand gesture recognition system developed by others but have some drawback like they are static or require some coloured gloves for detection of gesture, e.t.c.

Problem here is to design a virtual mouse using realtime (dynamic) hand gesture detection which does not require any external material like gloves and have pretty decent accuracy.

Proposed System

Configured system to meet requirements of our project by installing dependencies and external hardware.

Downloaded the dataset from the web and filtered it as per requirements.

Trained a model using CNN to recognize different hand gestures and output to frame.

Each gesture is trained by images of 64 by 64 pixels each. Model is then validated and tested.

Model has achieved accuracy above 98% on testing data. Using this model, making a mouse controller which uses specific gestures for specific tasks respectively.

Literature Survey

Sr. No	Paper Title	Advantages	Disadvantages
1	Gesture Recognition of RGB and RGB-D Static Images Using Convolutional Neural Networks	2 stage freezing layers for tackling overfitting	It is static
2	Hand Gesture Recognition system for numbers using thresholding	Thresholding concept is applied	Colored glove is requisite
3	Convolutional network and its application in deep learning	Convolutional Neural network tries to learn good features in relatively small dataset	---

Process Design

The project is divided into 3 modules -

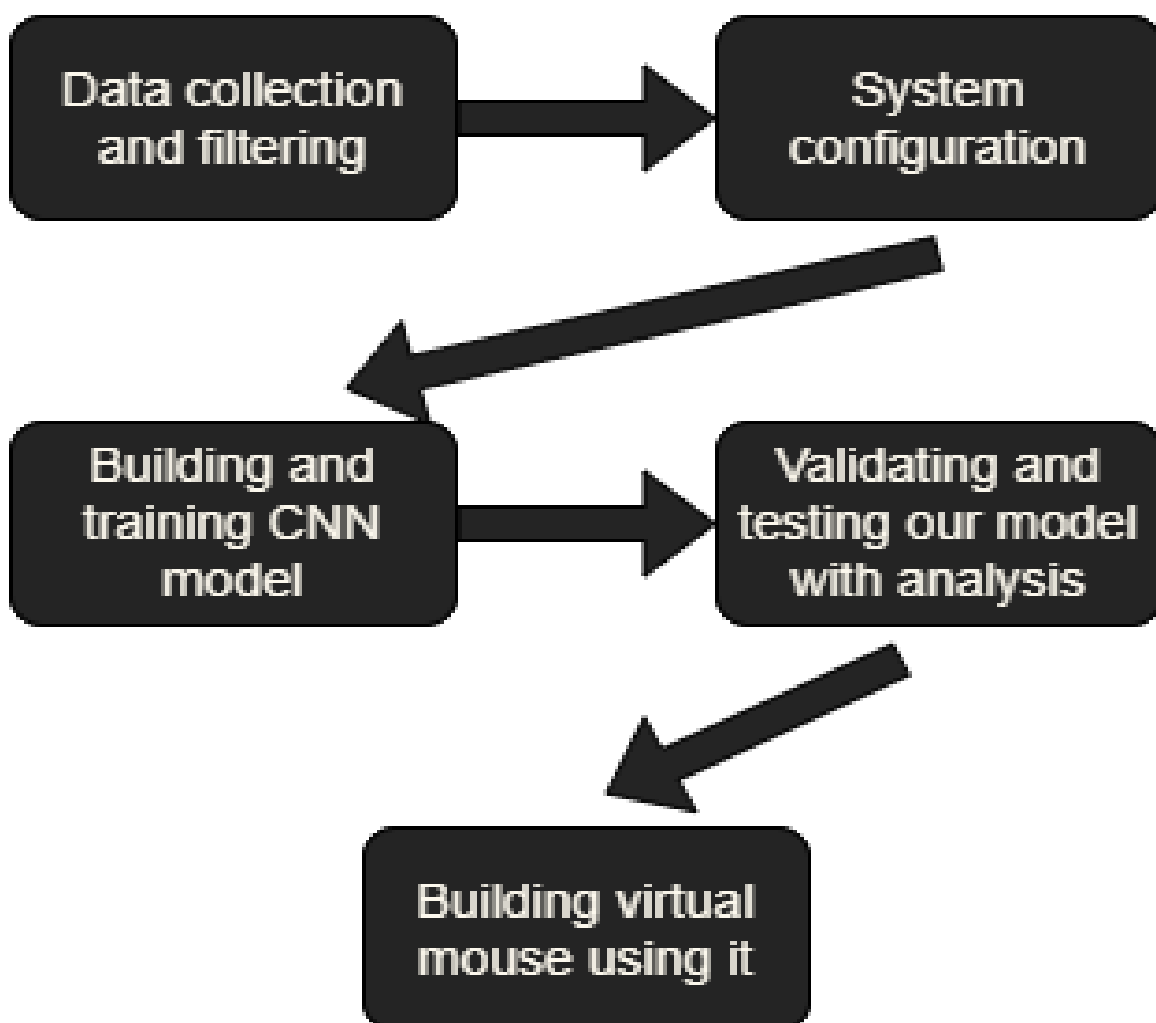
Module 1 - Data collection and filtering : Collecting the data and filtering it according to the project .

System configuration : Configured the system according to the project .

Module 2 - Building and training CNN : Building a CNN that can trains the model and gives the output according to the project .

Validation and Testing with accuracy : Comparing the output predicted by the model with the dataset provided .

Module 3 - Virtual Mouse - Linking the hand gestures with mouse commands .



Details of Hardware & Software dependencies_

SOFTWARE-

VS code

Python3.5 and
above

Dependencies_

Opencv == 4.5.4.58

Numpy == 1.21.4

Tensorflow == 2.7.0

Keras == 2.7.0

PyAutoGUI == 0.9.53

HARDWARE-

Intel core i5-2430M,
3.00GhZ

Ram : 8 gigabytes

Webcam : 12 megapixel

Graphic card : Intel integrated

graphics

64 bit architecture operating system

Experiment and Results :-

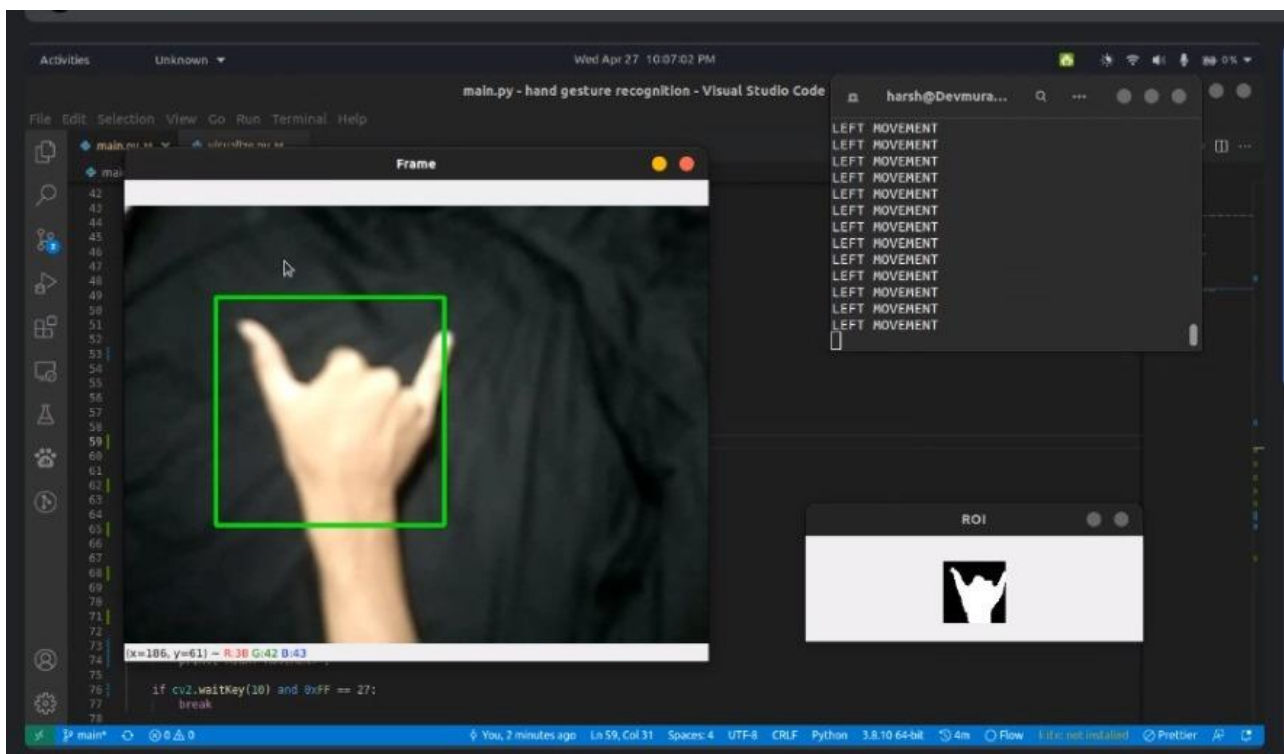
First the input image is taken from the camera and it is preprocessed

In precessing RGB image of three channel is first converted into Grayscale of one channel then it is thresholded to Black and white

The image is then feed to model on which it predicts gesture

Predicted gesture is then converted into corresponding mouse controls.

The screenshot below is of left movement, right movement and up movement for reference_



Accuracy

Validation accuracy of the model is above 98%.

Model is first trained on trained dataset and then validated on validation directory of dataset.

Validation accuracy is calculated by model automatically using validation dataset.

Accuracy calculates the percentage of predicted values that match with actual values. For a record, if the predicted value is equal to the actual value, it is considered accurate. We then calculate accuracy by dividing the number of accurately predicted records by the total number of records.

Accuracy is calculated using built-in parameter of fit method.

Analysis

	Existing System	Project Model
Hardware requirements	Required hardware like mouse and touchpad	No hardware required
Wear and tear	Mouse or touchpad is damaged after use	Its has no wear and tear factor
Power requirements	Power from cell or laptops charging	No power is required
Handy	Need to carry mouse for work, so less handy	No need of carrying, so handy
Maintainance	Maintainace is required	No maintenance is required.

Conclusion

Making an accurate model which along with analyzed information , detects hand gestures with accuracy above 98% after validation, testing model on both images from the dataset and real-time webcam's captured feed.

The model is expanded to “Virtual Mouse” which in real-time operates and performs specific tasks based on detected gestures. 6 gesture out of 20 correspond to predefined functionality and the user is able to control their system's mouse

References

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