Software Requirements Specification

For

HAND GESTURE BASED DEVICE CONTROL USING NEURAL NETWORKS

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# Introduction

## Purpose

In the era of VR / AR, interactions with the computer being constrained to the physical and wired devices for performing the desired functionalities in not efficient. Suppose while delivering a presentation every time for changing the slide, going to the mouse and clicking it, doesn’t sound efficient, or while playing a video, every time for volume control, mouse is needed, this isn’t a solution in this era.

So making use of the gestures based controls to perform functionalities like changing the slides of a presentation or volume control, it can reduce human efforts significantly and could be used in as base for the future automation world.

Using the gesture based device control, we can make actions do in a quick and using lesser efforts by just using the hardware which is already present (in this case the Webcam for gesture capturing/detection). So we will get more efficiency with no added costs. This could be used as the starting step towards the more futuristic approach towards the VR and the AR.

## Intended Audience

* Department Head and Staff
* Project Guides and Experts
* Project Members
* Industry Expert / Evaluator

## Product Scope

* As of now, the mouse functionalities are the only target but later development into this can also facilitate replacing keyboard functionalities.
* This idea / project can be used as the foundation for future world of automation as these gestures can be used to trigger various day-to-day life tasks.

## References

* Code project – www.codeproject.com/Articles/498193/Mouse-Control-via-Webcam
* Microsoft Research Paper- <http://research.microsoft.com/enus/um/people/awf/bmvc02/project.pdf>
* Saha, H. N., Tapadar, S., Ray, S., Chatterjee, S. K., & Saha, S. (2018). A Machine Learning Based Approach for Hand Gesture Recognition using Distinctive Feature Extraction. 2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC).
* Hand Gesture Recognition and Cursor Control. Available from: https://www.researchgate.net/publication/280112512\_Hand\_Gesture\_Recognition\_and\_Cursor\_Control

# Overall Description

## Product Perspective

This project was initially developed in OPENCV, but lacked accuracy in the implementation, so the aim of this project is developing it using machine-learning libraries and improve efficiency as well as accuracy.

## Product Functions

* Different actions triggered for respective gesture (It would be according to the association of the action and the gesture).
* Examples:

1. Swipe our hand in front of the Webcam will scroll the page down or up.
2. Play/Pause actions according to the gesture.

## Operating Environment

* Operating System : Windows 10
* Hardware requirements : Webcam
* Pre-requisites: Developed Software installed in the system with permission granted for modifications of the system properties.

## User Documentation

* A manual containing

1. Instructions regarding how to download and install the developed software onto the system.
2. All the gestures pictorially and all the associated actions that will be performed by use of those respective gestures.

# Functional Specifications

## Scenarios

1. Suppose a person Ramesh is watching movie on his laptop. He wants is to lower the brightness of his system.

All he must do is make use of three of his fingers together and swipe them downwards in front of the webcam and automatically the system will perform the required task.

1. In an ongoing picture preview, a person is showing his tour photos to his friends and he wants is to zoom into the picture, or he wants to change it to next picture.

Here all he will need to do so is just swipe his hand in front of the webcam for changing the picture to the next or some pinch actions to zoom in or zoom out.

## System Overview

## 

## Detail Scenario

### Possible user interactions:

* As we are going for gesture control, user interacts with system via gesture only.

### Common mistakes / errors:

* Use of two hands for the gesturing purpose.
* Use of just the hand without the person in the frame.
* Some invalid actions swipe or movements of the defined hand pattern.

### Expected messages:

* If user performs any invalid or unknown gesture, he should get informed by some pop up message.

### Way to retry:

* If any error occurred, action recognition should start from start or begging of new action motion.

# External Interface

## Hardware Interface

* This project will need any laptop which does contain webcam and computational power as mention.

## Database

* We are going to use gesture database for training machine learning model.

# Technical Specifications

## Language

* Python
* Java

## Type of Application : Stand-alone Application

## Performance Constraints

* This project will need a good light room or workspace condition.
* Single-handed use for gestures.
* Background of the gesture space must be of different color than that of the hand.

## Memory / Hardware

* Webcam for the gesture detection.
* Any machine with min 2GB of ram and 200MB hard drive space.