

# **Chapter 1 - INTRODUCTION**

The computer world has advanced a lot in the past few years. From huge PC's to small smartphones, innovation has become very important to us. Everyone gets bored of any technology within a few years. Earlier we needed to press buttons. Now it all works with just a touch. Human Computer Interaction has changed the way we interact with computers. It is the study of new methods and technologies needed to ease the human life. It is also meant to reduce the cost of the already present technology. In our project, we plan to create a software which is not only cost effective but easy to use. Using our software, people can carry out multiple mouse functions using hand gestures and without having to actually touch the mouse pad or the screen. The user need not be present extremely close to the system in order to carry out this process. It can be done from a distance. This reduces a lot of human effort.

The greatest challenge is develop an economically feasible application, which is also hardware independent. This is to ensure a person can easily make use of this application without having much difficulty in setting up the physical computer setup. The main objective is to develop an application that can help a person to interact with the computer, and a virtual human computer interaction system, where no physical contact with the device is required and also to provide an easier HCI routine.

This project is targeted to help out the physically challenged people who have very restricted arm movement and wouldn't have to go near their computer every single time they want to move their mouse. Also it would help the people who have very confined working space like in an aircraft or a car and have very limited space to move their entire arm.

## **Tools Used**

### **OpenCV**

OpenCV is an Open Source Computer Vision Library. It contains various functions required for computer vision. It encourages the use of machine perception and gives a platform for computer vision applications.

This library has more than 2000 optimized programs. These programs vary from each other which shows that the library is extensive. The library can be used to detect faces, track camera movement, track the moving object be it a mouse pointer or an image.

### **Anaconda**

Anaconda is an open source software that contains Jupiter, Spyder etc. that are used for large data processing, data analytics, heavy scientific computing. Anaconda works for R and python programming language. Spyder(sub-application of Anaconda) is used for Python. OpenCV for python will work in Spyder. Package versions are managed by the package management system Conda.

## **Python**

Python is an interpreted, general-purpose programming, high-level, language. It is a multi-paradigm programming language. Structured programming and object-oriented programming are supported, and many of its features can include functional programming and aspect-oriented programming. Python interpreters are available for many of the well-known operating systems. CPython, the reference implementation of Python, is an open-source software and has a community-based development model. Python and Cpython are controlled and managed by the non-profit Python Software Foundation.

## **Spyder**

Spyder is a cross-platform open source integrated development environment (IDE) for scientific programming in Python language. Spyder integrates with a number of prominent packages in the scientific Python stack, including NumPy, SciPy, Matplotlib, pandas, IPython, SymPy and Cython, as well as other open source software. Spyder is extensible with first- and third-party plugins, includes support for interactive tools for data inspection and embeds Python-specific code quality assurance and introspection instruments, such as Pyflakes, Pylint and Rope. It is available cross-platform through Anaconda, on Windows, on macOS through MacPorts , and on major Linux distributions such as Arch Linux, Debian, Fedora, Gentoo Linux, openSUSE and Ubuntu.

## **Image Processing**

Digital image processing is the use of algorithms defined by libraries like OpenCV to perform image processing on digital images or the video. An image is analysed as it is clicked. Then the user is given tools to discard that image or process it any way that they want. The image acquisition is done using a web camera in order to lower the budget of our project. For the system to work we need a sensor to detect the movement of the user. Since there are three colours that are being used red, green and blue. The webcam of the computer is used to as a sensor. The webcam capture the real time video at a variable frame rate and resolution which can be easily modified by the user. The quality of the video depends on the hardware capability of the system on which the project takes place. The frame rate and resolution can be modified in the system but it all depends on the budget of the project. A better hardware can provide better results and better frames but it won't affect the result as much as we have to isolate individual colours and not process the actual video. Each colour is individually isolated.