

# CHAPTER FOUR

## IMPLEMENTATION AND RESULT DISCUSSION

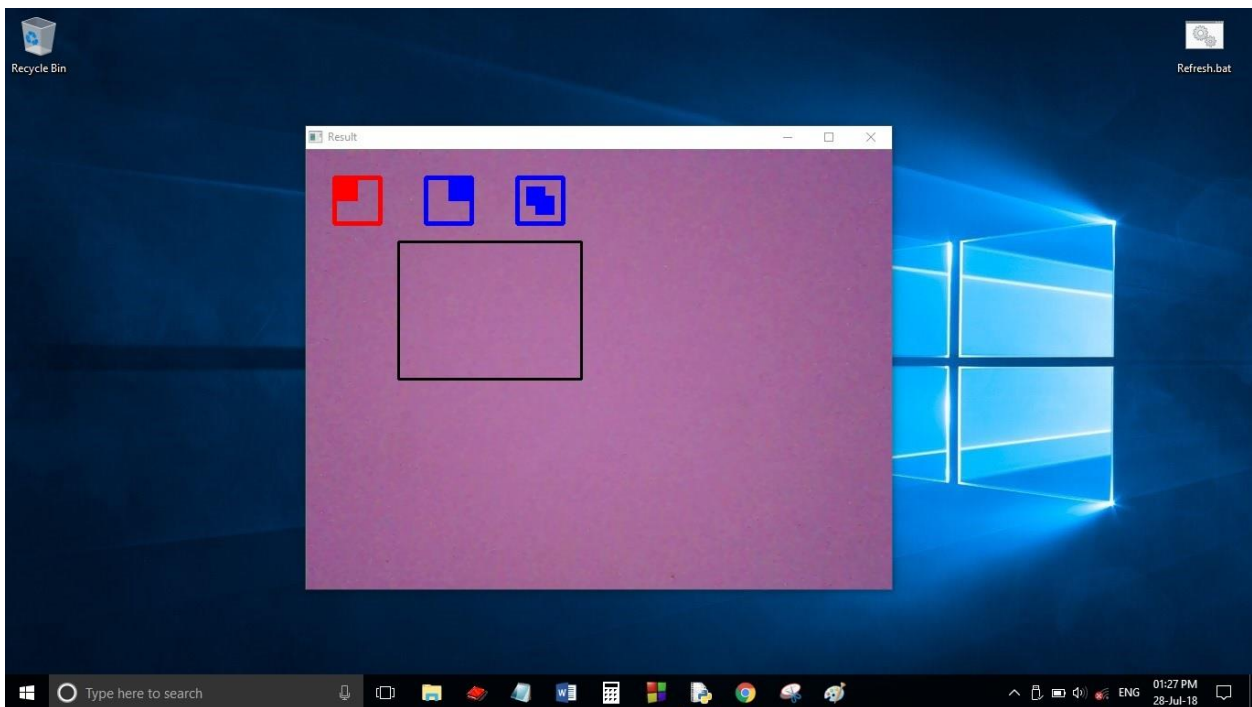
### 4.1 Installation

In our system design and implementation, we use python 2.7.10 and OpenCV 3.0.0. We have 64-bit windows 10 install in our pc to implement this project. At first we install python 2.7.10 in C drive. Then we download OpenCV 3.0.0 from their official website and exact it also to C drive. Then a file named 'cv2.pyd' is need to copy from OpenCV to python 2.7.10. After all this, there need to install necessary python package with help of pip (python install package). Some of our important package is:

- Numpy
- Pynput
- Wxpython

### 4.2 User interface of the system

Our user interface is look like this:

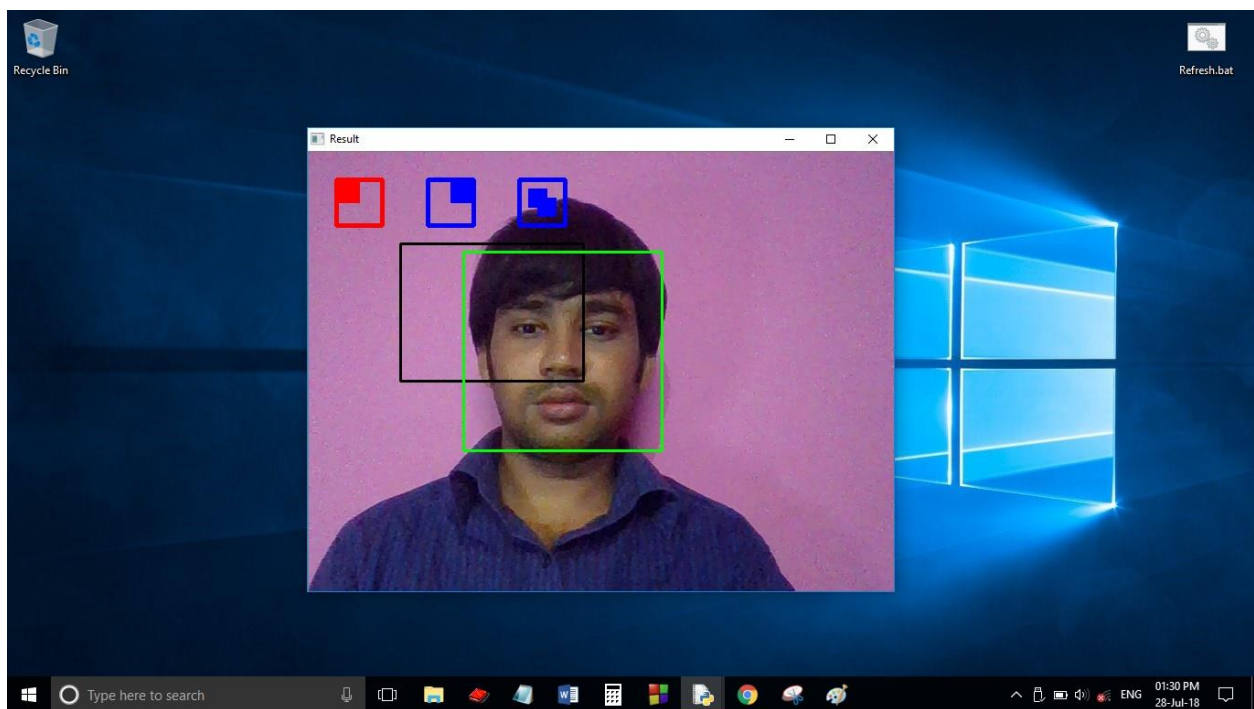


*Figure 4.1: User interface of our system.*

In this figure there is a window in middle point. It is denoted our system and take a still picture from a running video. Video is taken by HP laptop webcam. The black box or rectangle in the middle is use to control the mouse position. When any figure is find in this box, which will be worked as a mouse cursor. If there are more than one face in that box, we take the largest face among them. We take the height and width and calculate the area, by this method we find the largest face.

There are also three green box in top of our system. Then perform different mouse operation. Such as left click, right click and double click. Those box are denoted current status of mouse operation. Leftmost box is stand for left click status, rightmost box is stand for double click status, and middle box is stand for right click status. There are also meaningful icon drawn in those box.

### 4.3 Face detection



*Figure 4.2. Face detection by our system.*

If any face is found in the video frame, then it shown and denoted by a green rectangle. The height and width of this green rectangle is calculated from height and width of shown face. In different frame of video if face is move from its position then this green rectangle also move respectively. This can be called as tracking the face. If there are more than one face in current frame, then largest face is consider to control the mouse cursor.

## 4.4 Controlling mouse



Figure 4.3: Controlling mouse cursor in our system.



After face detection phase, then we can control the mouse pointer. Mouse position is change with the position of face. Notice that there is a black box in our system. If a face detected in upper left corner of this black box, then cursor will be move to upper left corner denoted (0,0) of display screen. And if face is located at bottom right corner of the black box, then cursor also move to bottom right corner of the display screen. The cursor move left to right or top to bottom with a ratio of two different size of display screen and black box size.

## 4.5 Perform mouse operation

### 4.5.1 Left click

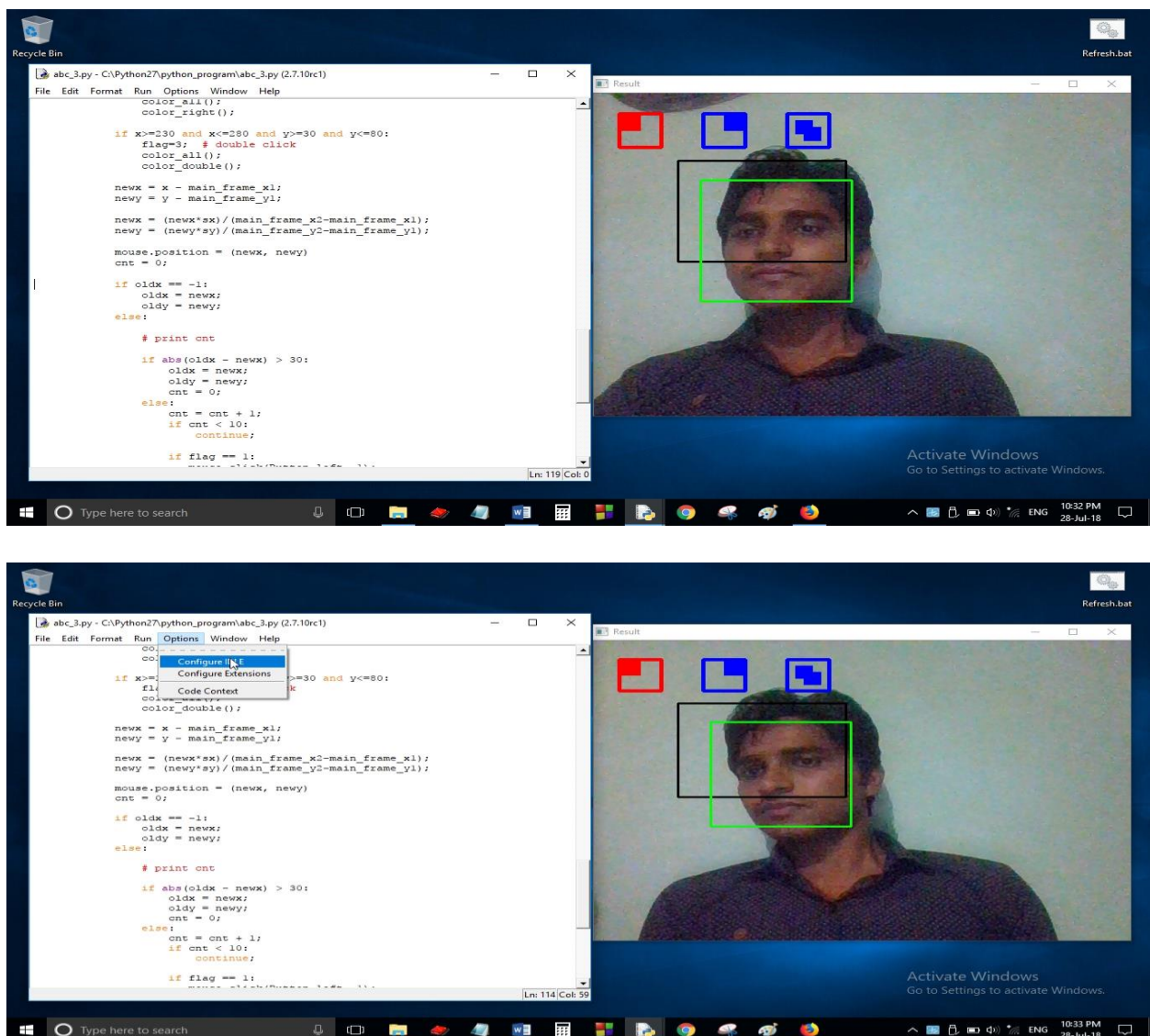


Figure 4.4: Perform left click.

When we want to perform left click, we need to move face to the leftmost box and change the status. If color of the box is blue then left click is not active, if color is red then left click option is on. That's mean if we put the face in one point, in other word if we didn't move face in a certain time (suppose 3 sec.), then point denoted by upper left corner of green box is perform a single left click. Sometimes face is not moving but looks like move, that's why we didn't consider move less than 30 pixel.

#### 4.5.2 Right click

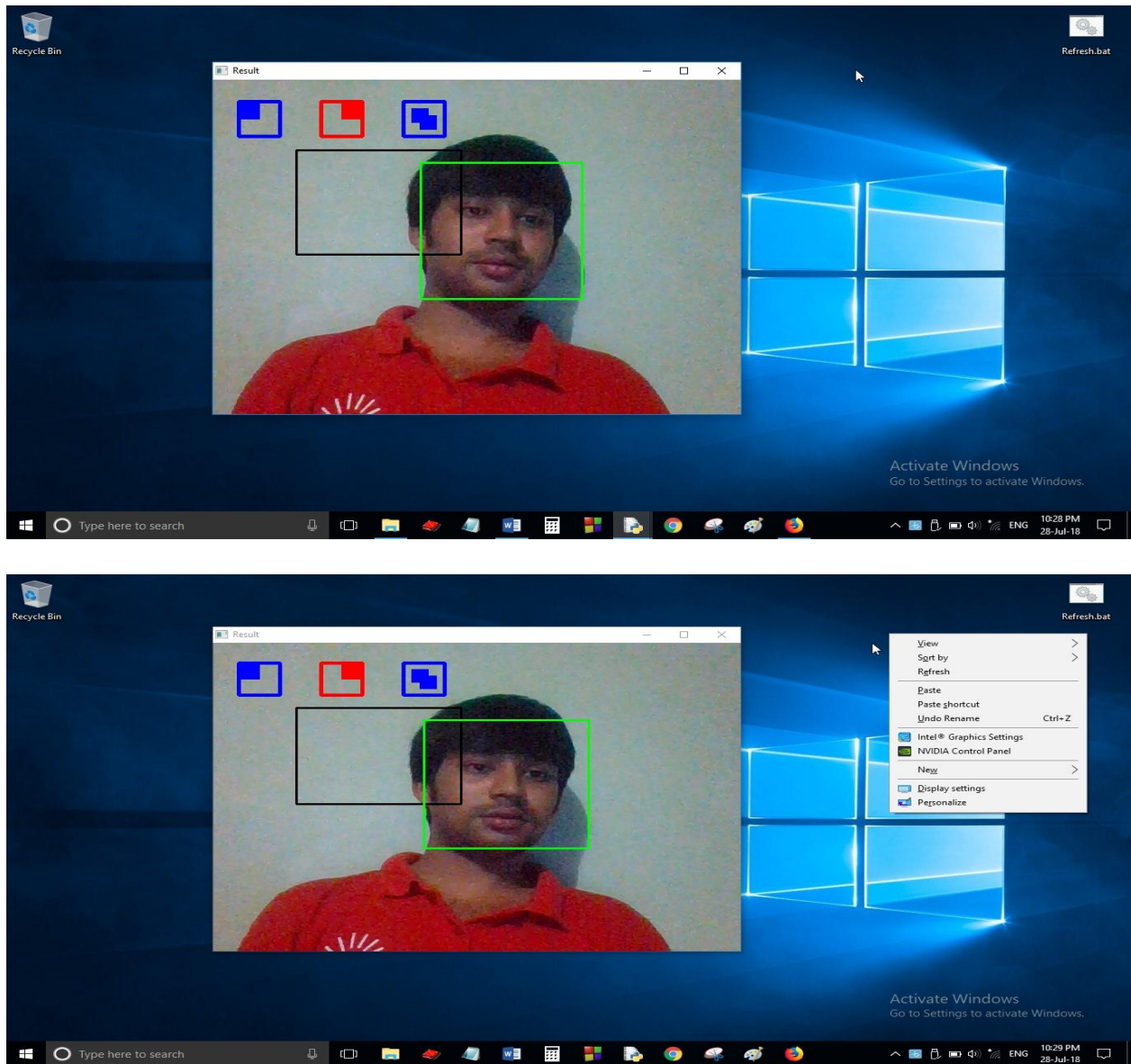


Figure 4.5: Perform right click.

Again if we want to perform right click, in this time we need to move face to the middle box and change the status. If color of the box is red then right click option is on otherwise not active. That's mean if we put the face in one point, in other word if we didn't move face in a certain time (suppose 3 sec.), then point denoted by upper left corner of green box is perform a single right click. Sometimes face is not moving but looks like move, that's why we didn't consider move less than 30 pixel. We calculate the absolute difference between original co-ordinate and current co-ordinate.

### 4.5.3 Double click

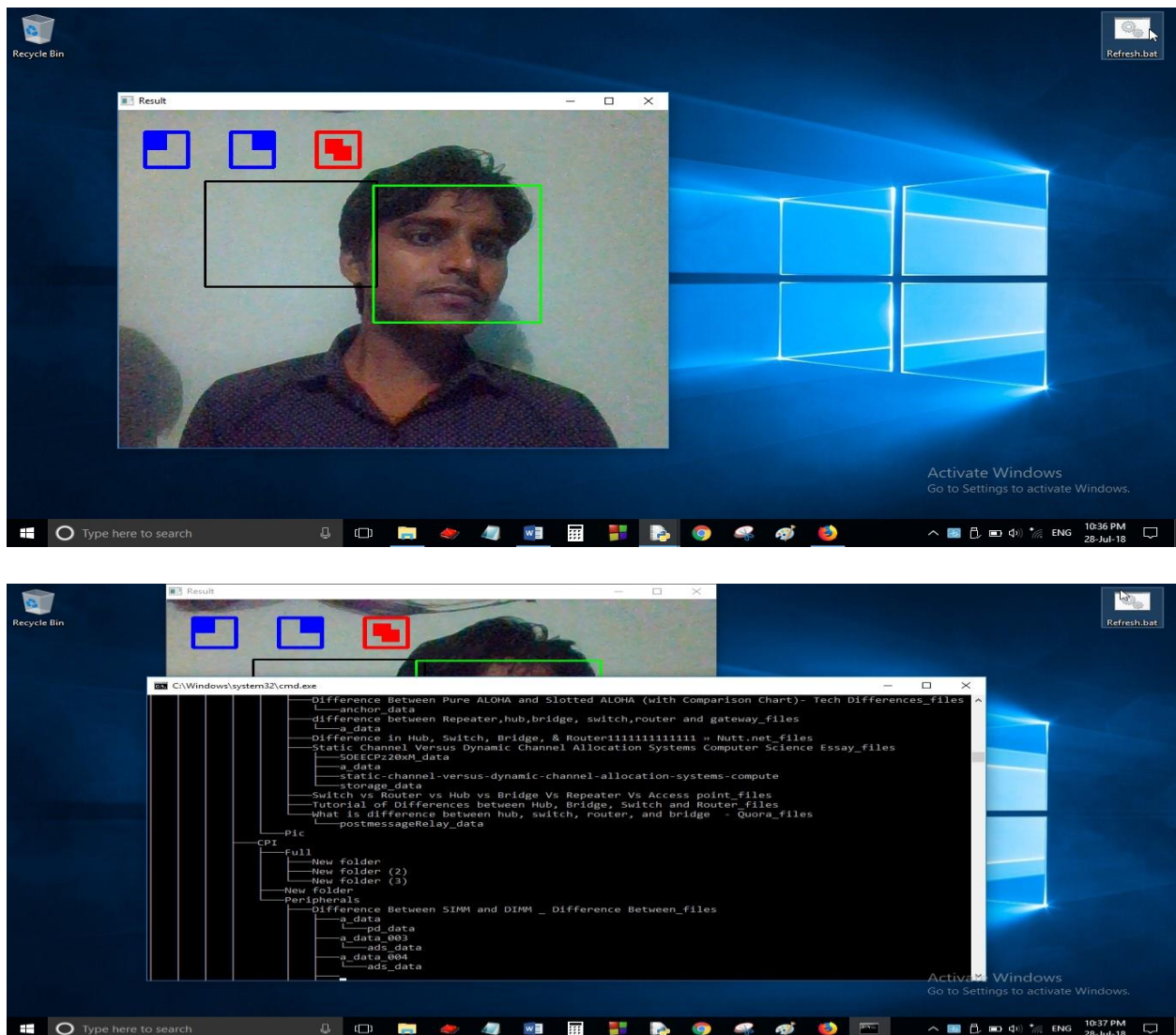


Figure 4.6: Perform double click.

Again when we want to perform double click, now we need to move face to the rightmost box and change the status. If color of the box is blue then double click is not active, if color is red then double click option is on. That's mean if we put the face in one point, in other word if we didn't move face in a certain time (suppose 3 sec.), then point denoted by upper left corner of green box is perform a double left click. Sometimes face is not moving but looks like move, that's why we didn't consider move less than 30 pixel.

#### 4.6 Result/Comparison

Left Click		
Gesture made	Gesture Recognized	Successful Rate
15	14	94%
15	12	80%
Right Click		
Gesture made	Gesture Recognized	Successful Rate
15	13	87%
15	12	80%
Double Click		
Gesture made	Gesture Recognized	Successful Rate
15	12	80%
15	11	74%

*Table 4.1: Accuracy rate.*

In our system is left click operation mostly correctly perform. In first time we made 15 gesture and our system recognized 14 gesture. That's mean 94% accuracy level. Then we made again 15 gesture and system recognized 12 gesture with 80% accuracy level. Secondly accurate operation is right click. Again first time we made 15 gesture and our system recognized 13 right click gesture. That's mean 87% accuracy level. Then we made again 15 gesture and system recognized 12 gesture with 80% accuracy level.

At last we made 15 new gesture for double clicking and our system recognized 12 gesture, with 80% accuracy level. Then we made 11 new double click gesture and system recognized 11 gesture.

Overall Accuracy level of our system is 82.5%. We also show those value in a bar chart. This chart is given in next page:

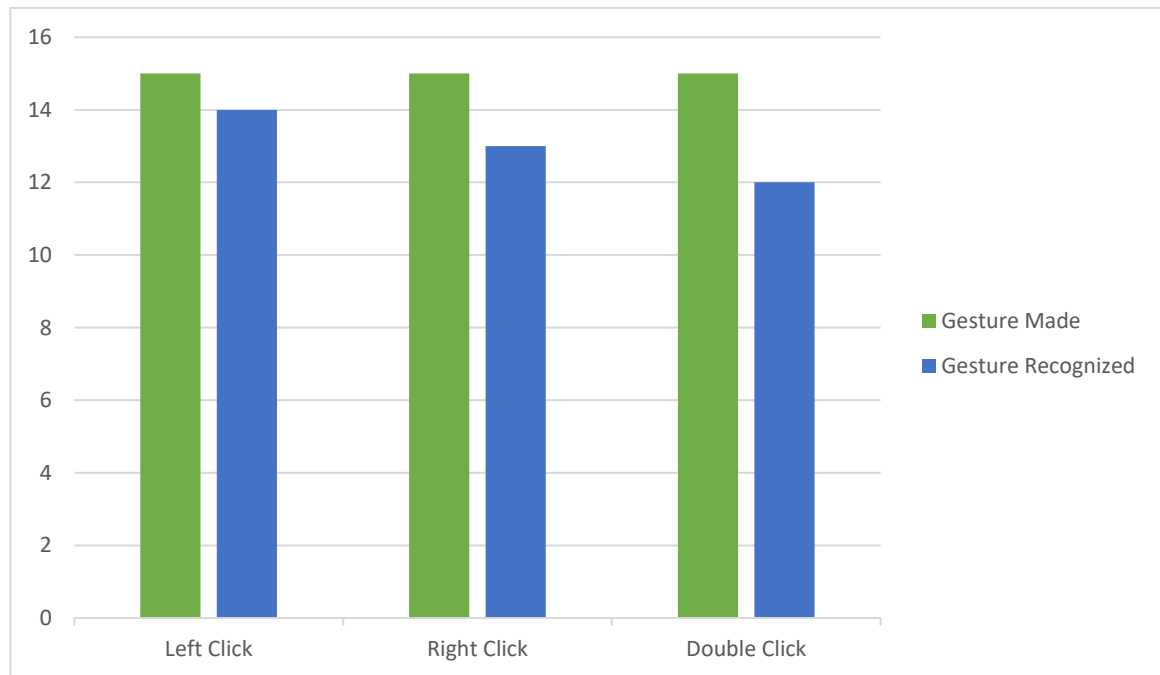


Figure 4.7: Accuracy level.

## 4.7 Chapter summary

In this chapter we discuss about our developed system. We briefly explain our full system with proper figure and diagram. We have shown our overall view of our system. Then face detection phase, mouse controlling phase. Three mouse clicking operation is discuss with their overall process. At last we calculate our system performance level. We listed our total gesture made and gesture recognized in a table.