Computer Assistance for Wristless People

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ABSTRACT

In today's scenarios world is struggling to develop new technologies for handicap people, so that they can also compete in the modern world. The Main existing solutions are prosthetic devices, voice recognition programs, screen readers, and hand gestures recognition, but developing new technologies faces various problems like time, cost and portability. This system proposes a new perspective by enhancing the existing technology to make it compatible for handicap people (mainly wrist less). This system adds a new ingredient in field of Human Computer Interaction by reshaping the existing computer technology with computer vision and embedded system. The Key notion of our solution is to detect the motion of a wearable tag to operate an entire computer using aggregation and processing of various data.

Keyword: - *Computer Assistance, Wearable tag, Computer Vision*

1. INTRODUCTION

According to WHO report on disability there are more than 100 million people around the globe having some form of functional disabilities. This report also states that the employment rate of such people drops down to the half of people without disabilities. This system proposes a new way of modifying the existing technology in such a way to make it compatible for wrist less people who cannot operate computers. Till now a lot of work has been done in field of HCI to help wrist less people, one of them is voice recognition system. The major drawback of this system is it cannot work in noisy environment and complicated to operate. To overcome these drawbacks our system suggests an approach of using the combination of computer vision and image processing to operate computer entirely in an efficient way.

This system provides computer assistance to wristless people in an efficient way. It uses a tag for hand with a specific color attached to it, a webcam and a core image processing algorithm which uses OpenCV API. As soon as the handicap person put his/her hand inside the tag, the computer system fires the core algorithm and the core algorithms starts taking frame through the webcam. The system results in the simulation of the click movement done by the user are displayed on the screen.

1.1 Project scope and Objectives

The project mainly focuses on development of a computer assistant for wristless people and to use a combined approach by combination of computer vision and image processing to operate computer entirely in an efficient way. Furthermore this project can be built with more specialized cameras for more accurate results. The objectives are as follows

- To provide assistance for handling computer to impaired person
- To detect the object under various circumstances.
- To map the movements accurately to the computer screen
- To detect particular mouse movement and click event

2. SYSTEM ARCHITECTURE

The system architecture is designed in such a way that it capture frame at real time and map to the screen effectively based on the algorithms used.

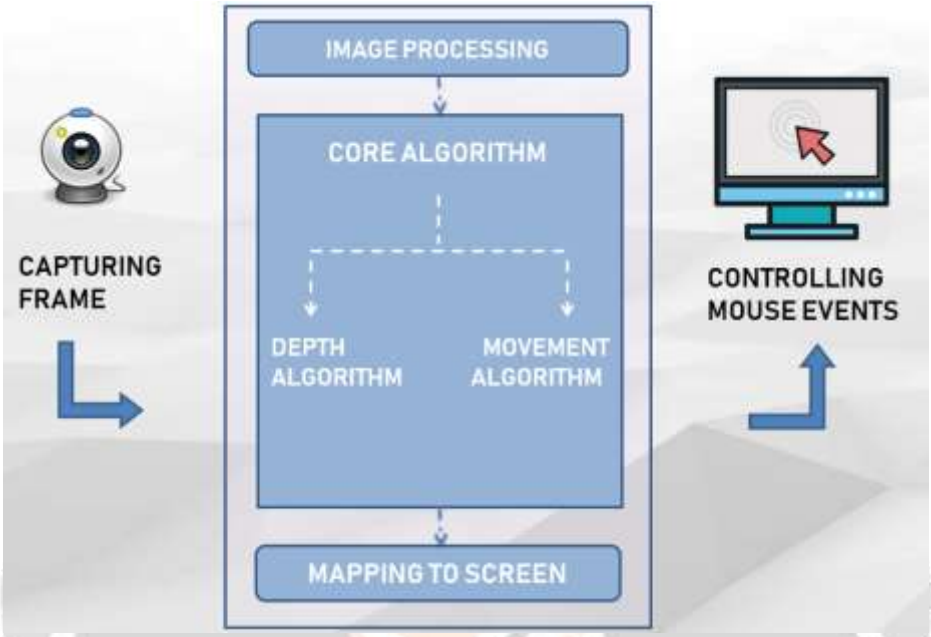


Figure-1: System Architecture

The various components and major Implementations in the system as shown in Figure 1 are as follows

- Image Processing: This module is capable of eliminating all the noise and unwanted objects in a frame image to identify the tag efficiently. This module considers implementations of filtering, blurring, application of openCv.
- Depth Algorithm: Depth algorithm consist implementation of algorithm which identifies the exact orientation of the object for effective identification of when the user is trying to click and when the user is trying to move the cursor.
- Movement Algorithm: Using the camera movements the coordinates are be captured which then mapped to the screen eliminating all false movements and ensuring accurate movement operation.

2.1 Mathematical model:

Input: i1;
Where i1=image frame

Functions: f1, f2, f3, f4, f5
Where,
f1=getting input frame
f2=processing input frame
f3=checking the click by the depth of the tag
f4=Stabilize the click movements for fluctuations
f5=simulate the click on screen

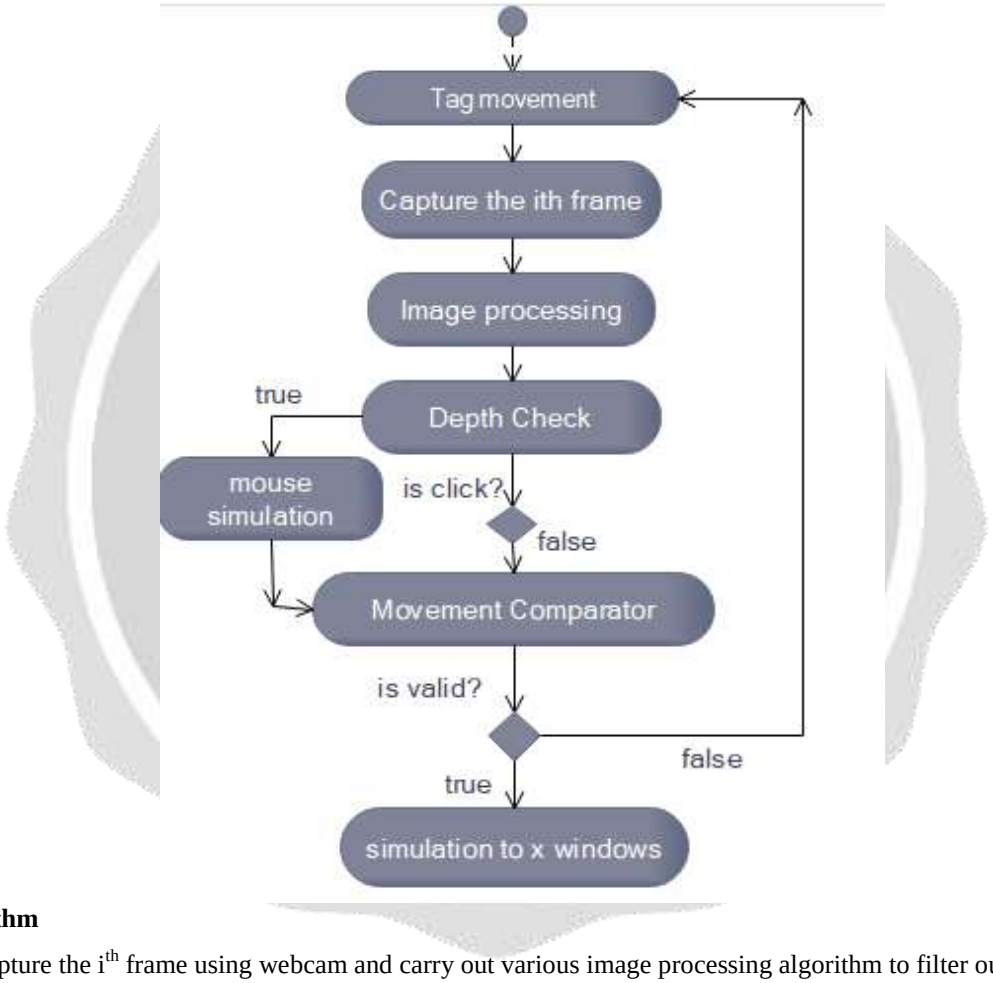
Output: o1

Where, o1 = Click Simulation

Success Conditions: Click simulation, accurate mapping of colour tag to the mouse pointer.

Failure Conditions: Incorrect identification in colour tag, no accuracy in mapping, burning out condition for capturing image (extreme light conditions).

2.2 Activity Flow



2.3 Algorithm

1. Capture the i^{th} frame using webcam and carry out various image processing algorithm to filter out noise.

```
ImageFrame = capture.QueryFrame ();
cvErode(skin, skin, rect_12, 1)
cvDilate(skin, skin, rect_6, 2)
```

2. Finding the cursor movements and performing the preferred click events.

```
biggestContour.GetMoments()
if (Finger_num >= 4)
        {
          DoMouseClick();          // function clicks mouse left button
        }
```

```
if (Finger_num >= 2 && Finger_num<=3)
        {
            DoMouseClick1();            // function clicks mouse left button
        }
```

3. Performing the chosen click operation.

2.4 Application

- Computer Education for the disabled
- Applicable at the time of natural calamities.
- The system is highly useful for people with hand disabilities.
- It will improve the employment rate of disabled people.

3. RESULT

The Figure 2 shows the results while testing a red colour tag for identifying it and then mapping the movement to the screen. The top left image shows the image captured by the camera, top right image shows the object that is identified, bottom left shows the noise elimination, and the bottom right image shows the actual point of the screen.

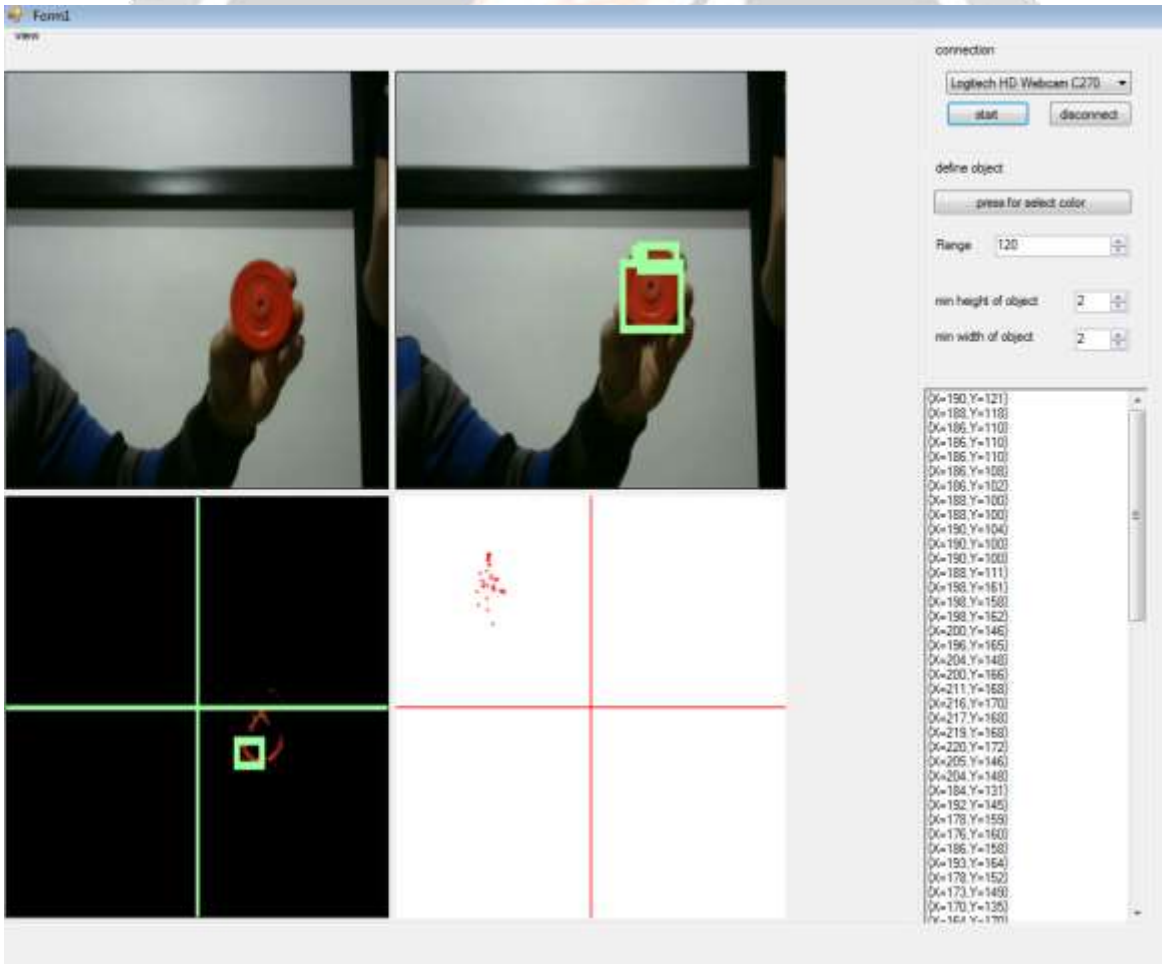


Figure:-2 Testing Results

4. CONCLUSIONS

Our approach tries to utilize the technology for helping the humanity. By this thousands of handicap people will be benefited. Choosing OpenCV as our computer vision aid enable us to implement our project on less resources and Which makes this project cost effective. As discussed in experiment section regarding HSV control panel this makes our system adjustable according to environment. By this panel it can generate very efficient output in a noisy environment. The strength of this paper is that the given approach is perfectly immune to sound noise in comparison to voice recognition systems. The operating algorithm of this project is no single one beside algorithm is containing some sub algorithm which make this easy to debug and implement. This project is huge opportunity for further development.

5. REFERENCES

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