System for disabled people to control mouse through camera.

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Abstract:
Now a days it is difficult to handle computer for a disabled person as it consist of movement operation like mouse movement. In order to counter this a user friendly system to carry out such tasks is needed. We are proposing a system which uses user's face's movement for mouse movement. The system recognizes the face of user and its position. This position is later used to determine the direction in which mouse should be moved. If face is detected in centered area of screen then mouse is not moved at all. If mouse pointer is found to be stable for a given period of time, click operations are performed accordingly. Experimental results shows the system is very efficient in terms moving mouse without any physical connection with computer and user.

Keywords:Camera Mouse, Eye Detection, Pattern Recognition, and Face Recognition.

Introduction

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them.
It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps.

- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and Image enhancement and spotting patterns that is not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

Now, we need to be aware of some concepts related to Desktop application development we use Java Swing component as front-end and back end we use the MySQL database. We use for the image processing. OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.

Problem Definition:

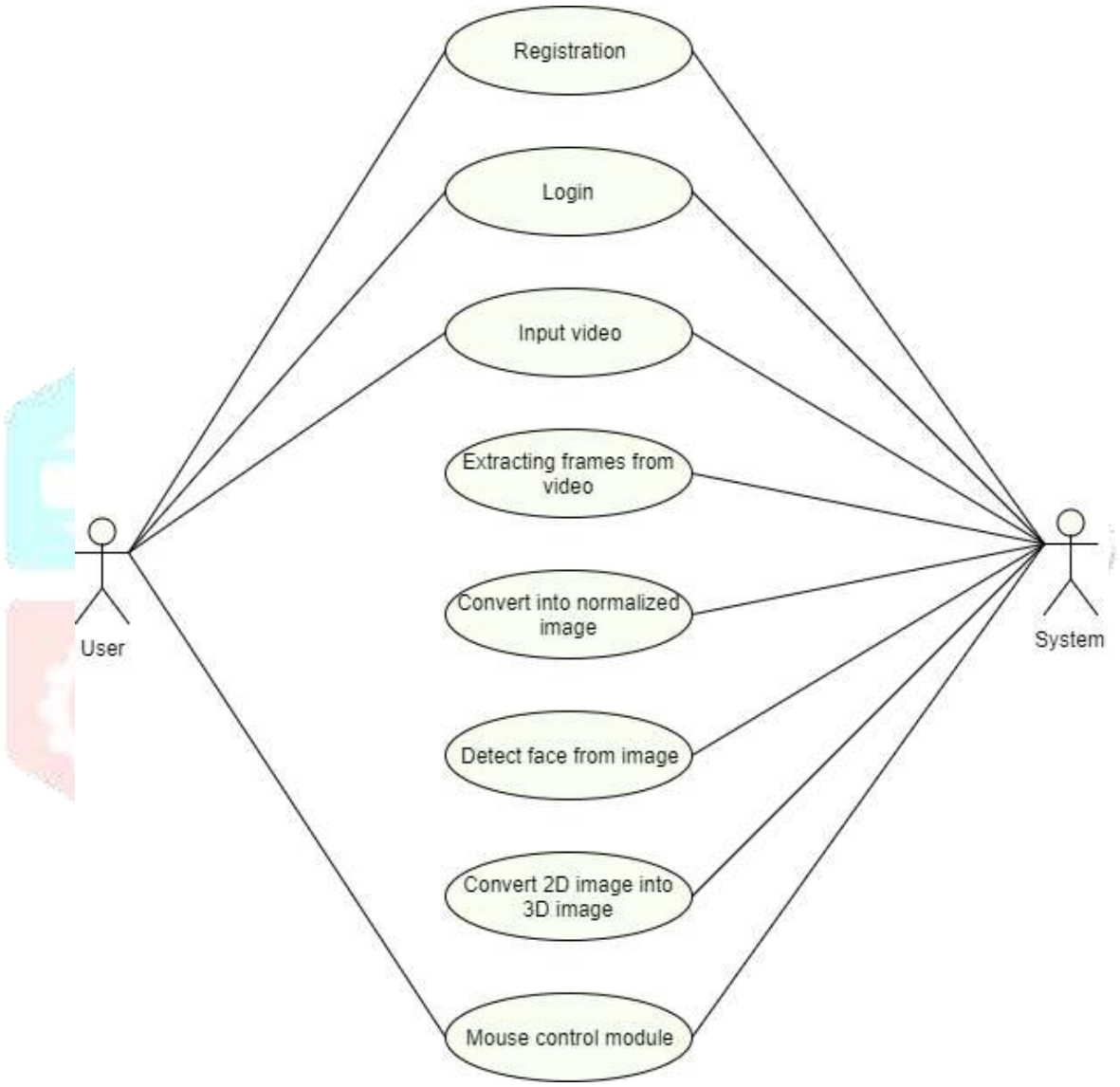
To provide an easy way for disabled people to operate computers by controlling mouse with the help of face movements. This system will mainly focus on the face detection process and position of the face. Based on these important factors direction of the movement of mouse will be decided.

Objectives

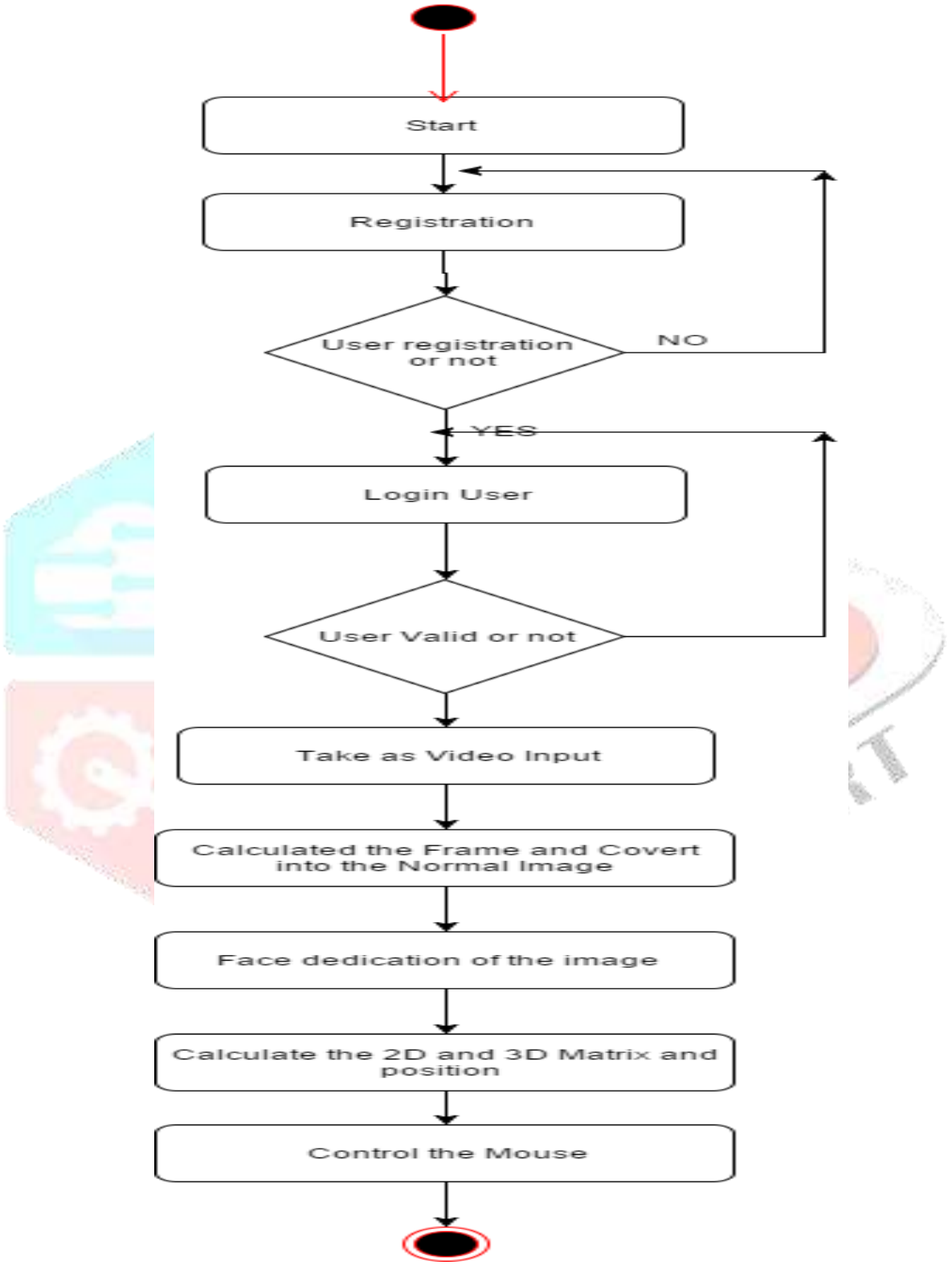
In this system the first step is to catch the live video from the camera then extract the frame and convert it into normal image. From the normal image face is detected and then its position is calculated and integrate the position to the mouse control.

System design:

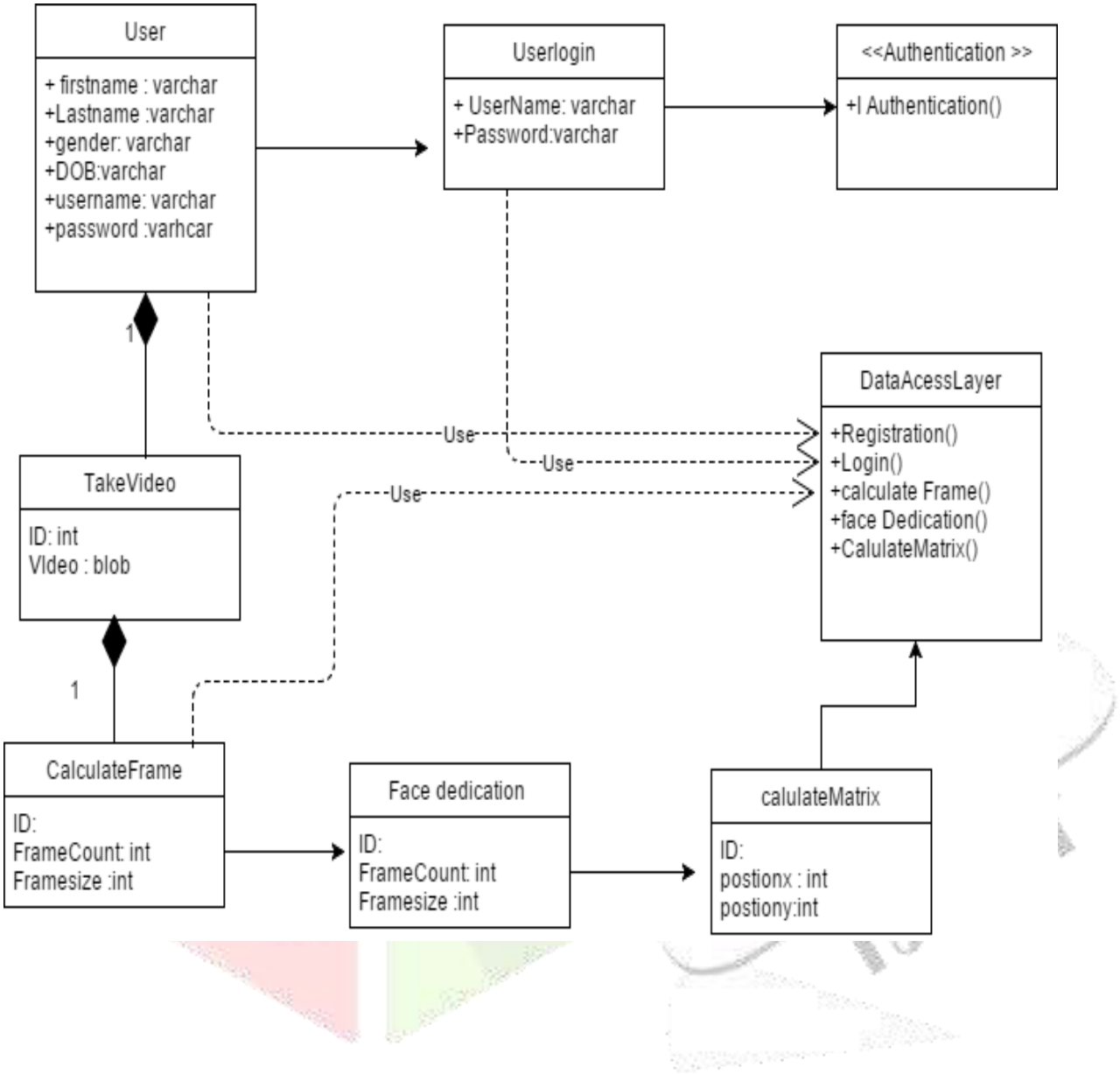
Use Case diagram:



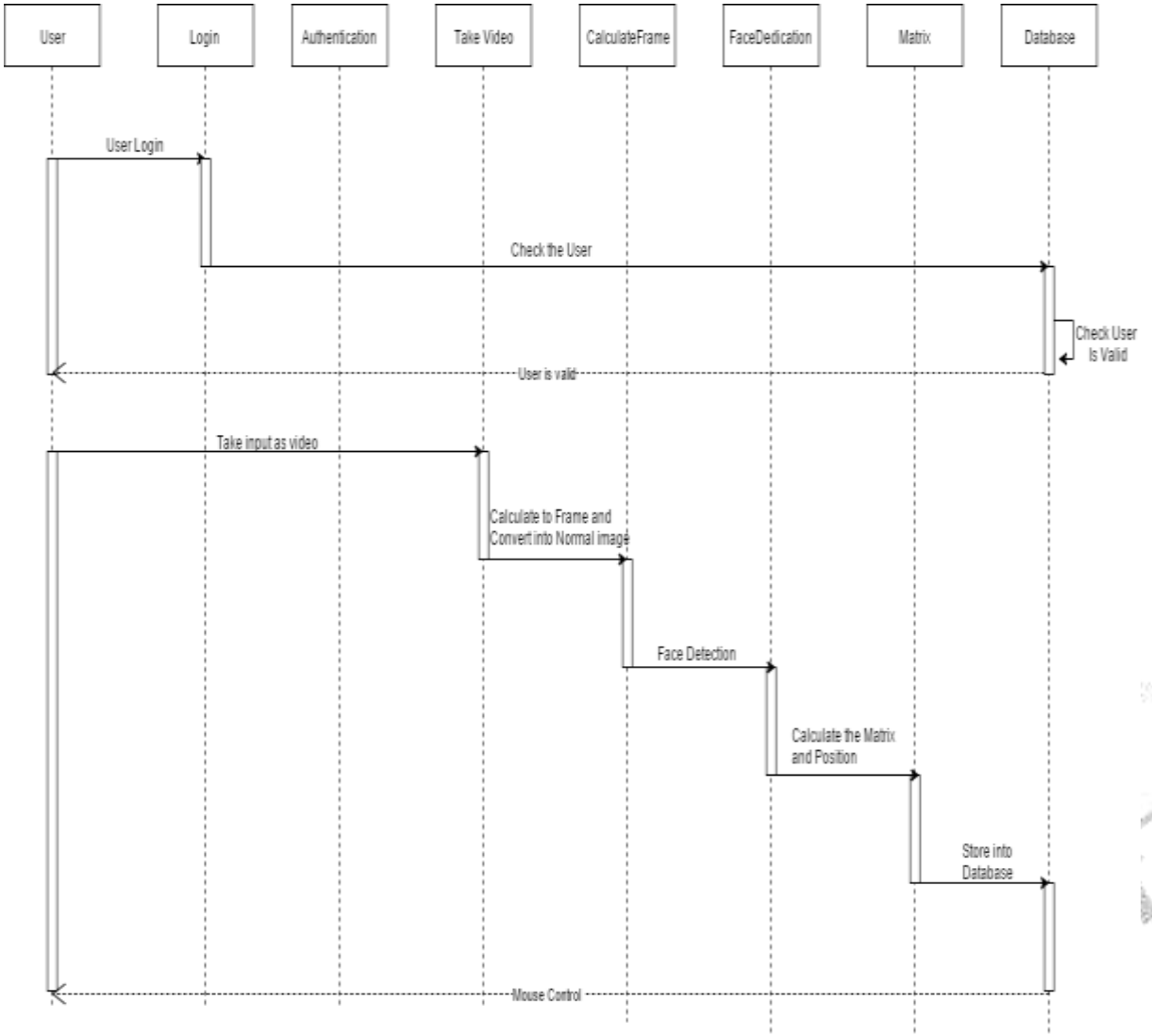
Activity Diagram:



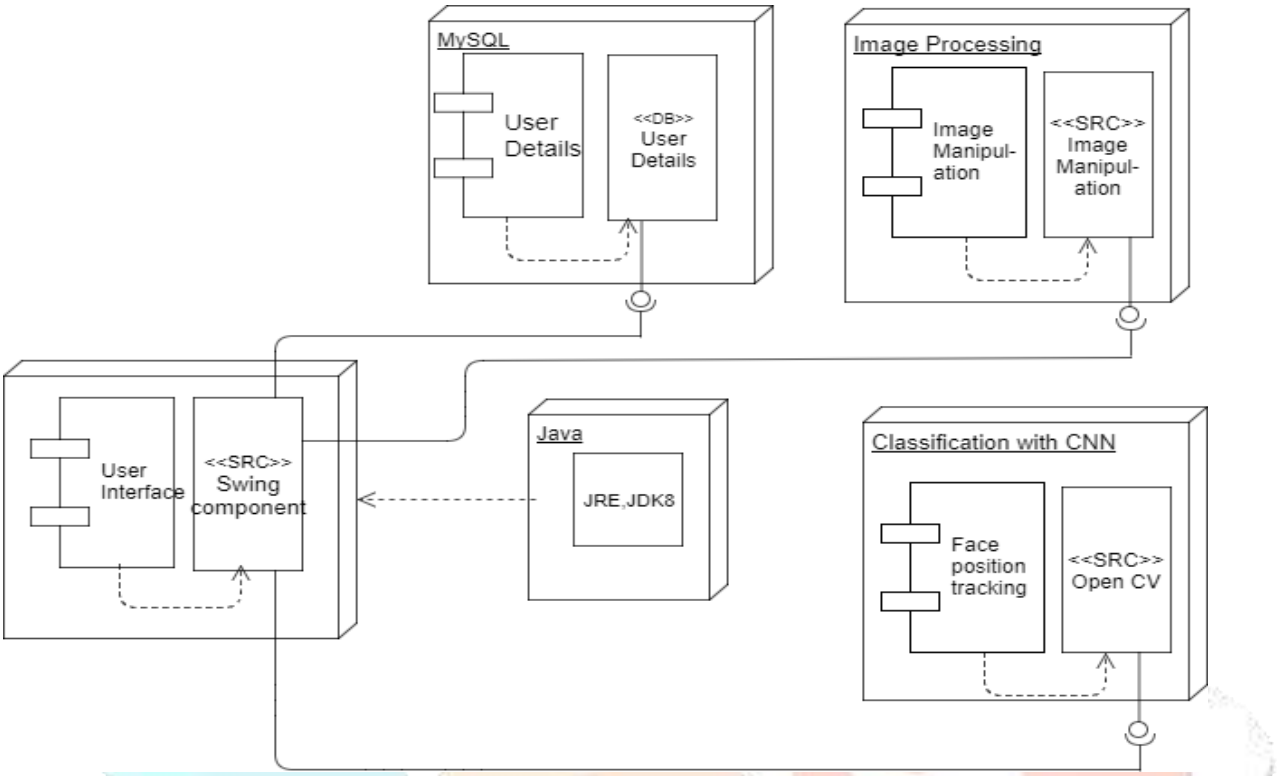
Class diagram:



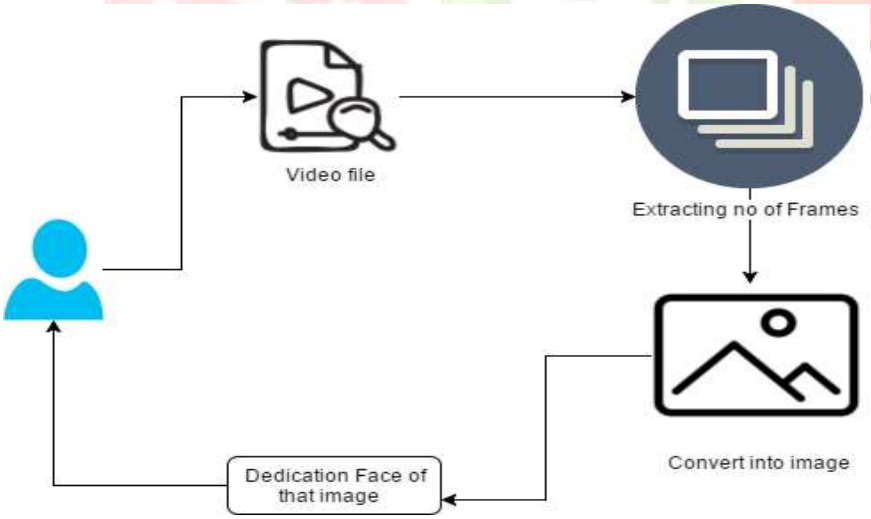
Sequence Diagram:



Deployment diagram



System flow:



In this Propose system first take the capture the video to the webcam then extracted the frame to the video. Frame is the set of the image and converted into the Normal image. By using the OpenCV Technique to detected the face of the normal image. Calculate the Position and dimension of the image and convert into the 2D and 3D dimensional matrix. Combine the result to control the Mouse

Related Works

1. Facial Expression Based Computer Cursor Control System for Assisting Physically Disabled Person the position of the face fixed in the range of rectangular to avoid the effects from any kind of background noises and movements. A set of four luminous stickers are placed at left cheek, right cheek, mouth, and center of forehead on the face. Within the rectangular areas, the system will detect the four circles corresponding to the circular shape markers and its position. Movement markers in X-Y co-ordinates of the circle is detected and sent it to the PC for moving the cursor. If the right cheek marker is moved on right side, the system will increase the value of X coordinate from the current position of X-axis. Hence, the cursor will be moved to right side continuously until the facial expression is stopped.
   Advantage: - this system to find the accuracy to find he x and y coordinates to find the facial expression

2. Designing an intelligent blink analyzer tool for effective human computer interaction through eye. the primary goal is to develop a computer vision system that make computers to perceptive a user's natural communicative signals such as voluntary eye blinks and interpretation of blink patterns for communication between man and machine[. A function "Blink Sense" is a module of the system that uses methods that employ visual information about the motion of eyelids during a blink and the changing appearance of the eye throughout a blink in order to detect the blink event and duration. "Single Key Omni directional Pointing and command System (SKOPS)" an onscreen intelligent pointer navigation tool that works on binary switching triggered by eye blink and interprets the sequence of blinks to move courser and execute intended mouse command at desired location.
   Advantage: - this system uses the eye blink and interprets the sequence of blinks to move course
3. Control of Mouse Movements Using Human Facial Expressions to Real time tracking of eyes is mostly dependent on the location of the area between-the-eyes (BTE) . Hence, in this application SSR filtering technique to extract between eyes in real time is used. This approach is very attractive and the calculation of SSR filter is simple and fast, since it only requires information around the eyes. However, in the case of the entire forehead is covered with hair this method fails. Hence skin tone region is selected as the first face candidate.
   Advantage:- its control the mouse to dictation candidate face using webcam perform operation.
4. Head Mouse System Based on Gyro- and OptoSensors A comparison of accelerometers and gyro sensors revealed that the gyro sensor shows excellent responses to the pitch, yaw, and roll movements of the head. We proposed the head mouse using gyro sensors for head movements and optical sensors for mouse events.
   Advantage:- this system to use the Gyro- and Opto Sensors to control the mouse
5. Implementation of a robust absolute virtual head mouse combining face detection, template matching and optical flow Algorithms in this paper The application framework defined for the proposed virtual head mouse is a personal computer where this virtual tool starts automatically when the computer also starts and where the user can wait in front of the computer for the application to start or appear once the virtual head mouse is running. Therefore, the first task performed by the virtual mouse requires a robust procedure to detect the face of the user using the images acquired by the camera. As described before, this initial face detection procedure is based on the proposal of Viola & Jones and implemented using the optimized OpenCV.
   Advantage: - this system to use the OpenCV Methodology to use dictation to face to use.

Hypotheses

Now a days the disable person don't use the any system. So we proposed this system to guide the disable person to access the system using face position by witch they can access the system. First step to catch the video from the camera then it extracts the frame and converts it into normal image. From the normal image face is detected and then position of the face is determined and according to its position mouse handling and its operation will be performed.

Limitation of the study

The only limitation of the system is that, the system detects multiple faces due to this performance of mouse movement hampers.

Design of the study

Input:-

In this system take input as Video

Function:-

1. X is consider as image

$$g(x,y)=\frac{1}{\sqrt{2\pi\sigma^2}}e^{\frac{x^2+y^2}{\sigma}}$$

Where x and y are horizontal and vertical distance respectively and is standard deviation for Gaussian distribution.

Above the Equation calculate the Frame and convert into Normal image using Gaussian Blur equation

2. Face detection :

   In the second step Detection Face in normal image.

$$F_T(x)=\sum_{t=1}^{T} f_t(x)$$

   F(x) = face detection of Image

   T = Maximum Time

   Above the Equation to Detection face of Normal Equation by using the OpenCV technique

3. Convert the two dimensional (2D) image to Three Dimensional (3D) image

$$[X_w Y_w Z_w 1]^T = T_{wf}[X_f Y_f Z_f 1]^T$$

$$T_{wf}=\begin{matrix} r_{11} & r_{12} & r_{13} & T_x \\ r_{21} & r_{22} & r_{23} & T_y \\ r_{31} & r_{32} & r_{33} & T_z \\ 0 & 0 & 0 & 1 \end{matrix}$$

   Xw,Yw,Zw = Coordination of Webcam Frame

   Xf,Xy,Zf = Coordination of Detection face

   Tx,Ty,Tz = is used to represent the translation between two coordinate systems

4. Combine the Coordination from step 2 and step3 for mouse

$$x_m = XS.\frac{(x_n - x_c - o_x)}{2.O_x}$$

$$y_m = YS.\frac{(y_n - y_c - o_y)}{2.O_y}$$

   XS and YS = pixel of the image

Xm and Ym = Position of Mouse
Ox and Oy = Predefine value for Xh, Yh
Above equation to calculate the Position of the Mouse,

Output:-
Control of the Mouse through the face. Its use the OpenCV Technique

Sample of the study

System calculate the all location and create Matrix and Providing location as input the Mouse then Mouse use that Location to movement on the screen. Mouse Movement speed its depend on camera Capture video.

Tools used

Software Requirement:

- Operating System : windows 8 and above.
- Application Server : Tomcat5.0/6.X
- Language : Java
- Front End : HTML, JSP
- Database : MySQL

Hardware Requirement: The hardware design of the system includes designing the hardware units and the interface between those units.

- Processor - Pentium –III
- RAM - 1 GB (min)

Hard Disk - 20 GB

Statistical technique used

We have developed Login and Registration which manages the user profiles, so that the users can login to the system and control the mouse through camera. Database stores the information of all users. OpenCV library is used for face detection and calculation of face coordinates. Based on these values mouse will move to particular position. Also different mouse control operations will be performed based on the position of mouse.

Experiment Result:

Based on the experiments result found out is that the system is able to detect face, calculate position of face in run time, moves according to position, also system is able to perform click operations based on time intervals.

Future scope:

In future, we are planning to perform click events with the help of wink of left or right eye.

Acknowledgment:

The satisfaction that accompanies the successful completion of this report would be incomplete without mentioning of the people who made it possible, without whose constant guidance and encouragement would have made efforts go in vain. I consider myself privileged to express gratitude and respect towards all those who guided me throughout the completion of this seminar report.

Firstly, I would like to sincerely thank my guide Prof. Prakash kshirsagar for guiding me regarding this project. My multiple discussions with her were extremely helpful for me. It is my privilege to acknowledge the kind of guidance I received in preparation of this report. I would not be able to prepare this report without her valuable

cooperation .I am grateful to Dr. Prasad S. Halgaonkar, Head of the Department Computer Engineering for giving me the support and encouragement that was necessary for the completion of this project.

I whole heartedly thank to record our sincere gratitude to Management of this college and to my Principal, Dr. A. M. Kate , Principal, Zeal College of Engineering Research, Pune for his constant support and encouragement in preparation of this report and for making available library and laboratory facilities needed to prepare this report. Last but not the least, I wish to thank my parents for financing my studies in this college as well as for constantly encouraging us to learn engineering. Their personal sacrifice in providing this opportunity to learn engineering is gratefully acknowledged.

Conclusion:

In this system we are providing camera mouse for disabled person. This paper uses the OpenCV for face detection of the disabled people to speak with family, companions, and other consideration suppliers. The mouse pointer moves according to position of user's detected face for e.g. if face is detected in left region the mouse is moved leftward and so on. Also, if face is found to be in centered region mouse doesn't move. If position of mouse pointer remains the same for specific time, different click operations are performed.

Reference:

- Facial Expression Based Computer Cursor Control System for Assisting Physically Disabled Person http://ieeexplore.ieee.org/document/6380800/
- Head Mouse System Based on Gyro- and Opto-Sensors http://ieeexplore.ieee.org/document/5639399/
- Camera-based eye blinks pattern detection for intelligent mouse https://link.springer.com/article/10.1007/s11760-014-0680-1
- Designing an intelligent blink analyzer tool for effective human computer interaction through eye http://ieeexplore.ieee.org/document/6481806/
- Control of Mouse Movements Using Human Facial Expressions http://ieeexplore.ieee.org/document/4544773/