BMS COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PERSONALISED SECURE GESTURE CONTROLLED GUI AUTOMATION SYSTEM

PROJECT BY-Sahana Bandekar-1BM17EE050, Arati Ganesh-1BM17EE012, Preethi N-1BM17EE043, Anusha Madan-1BM17EE070 ,Manasa P- 1BM17EE031

PROBLEM STATEMENT

To build a personalized secure gesture controlled GUI automation system. It is an interactive interface that interacts with the user with voice notes. It is provided with a two-step security system using facial recognition and gesture controls.
It uses a face detection algorithm which uses the concept of template matching to provide access to specific people. On recognising the person, it directs you to the login page where upon giving where we can navigate through the website by using gestures.

METHODOLOGY

The method is divided into 3 steps-

1)Face recognition-This detects the face using a template matching algorithm

- Template matching is a technique for finding areas of an image that are similar to a patch (template).
- A patch is a small image with certain features. The goal of template matching is to find the patch/template in an image.
- To find it, the user has to give two input images: Source Image (S) – The image to find the template in and Template Image (T) – The image that is to be found in the source image.
- It is a method for searching and finding the location of a template image in a larger image.
- The idea here is to find identical regions of an image that match a template we provide, giving a threshold
- The template image simply slides over the input image (as in 2D convolution)
- The template and patch of input image under the template image are compared
- The result obtained is compared with the threshold.
- If the result is greater than threshold, the portion will be marked as detected.

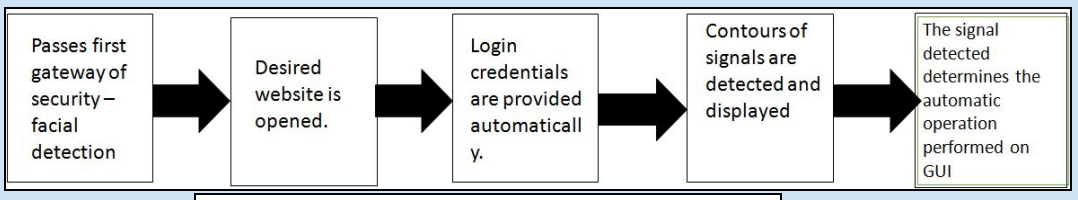
2)Gesture recognition

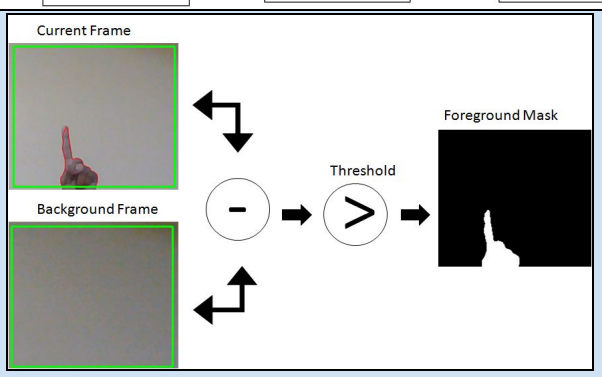
- Segment the Hand region-The first step in hand gesture recognition is to find the hand region by eliminating all the other unwanted portions in the video sequence.
- Background SubtractionAfter figuring out the background model using running averages, we use the current frame which holds the foreground object (hand in our case) in addition to the background. We calculate the absolute difference between the background model (updated over time) and the current frame (which has our hand) to obtain a difference image that holds the newly added foreground object (which is our hand). This is what Background Subtraction is all about.
- Motion Detection and Thresholding-To detect the hand region from this difference image, we need to threshold the difference image, so that only our hand region becomes visible and all the other unwanted regions are painted as black.Thresholding is the assignment of pixel intensities to the 0's and 1's based a particular threshold level so that our object of interest alone is captured from an image.
- Contour Extraction-After thresholding the difference image, we find contours in the resulting image. The contour with the largest area is assumed to be our hand.
- After detection, the GUI automation is done using Python module PyautoGUI.
- The PyAutoGui module has functions for simulating mouse movements, button clicks, and scrolling the mouse wheel.
- After face recognition, it authenticates login into the user's Youtube account,and a video of choice is played.The youtube videos are then controlled by gestures(play,pause,volume control).This automation is done using the PyautoGUI module.

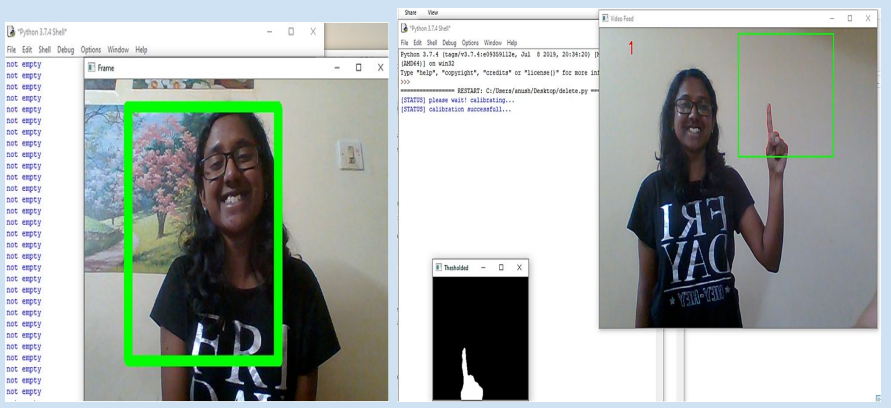
SOLUTION PROPOSED-

OpenCV Python was used for image processing to recognise the PC owner and to login to his YouTube account automatically (using PyAutoGui).
The solution is executed in following steps:
i) Template matching algorithm is used in order to recognise the user by comparing the pre-stored the user's image.
2) On user recognition, it sends speech signal that access is granted (using gTTS python - Google text to speech) and automatically logins to his YouTube account
3) The next part is GUI automation wherein the user can pause, play, forward and play the next video by only using his hand gestures. Here, the person's gesture is recognised (using foreground, background analysis of the live captured video) and the respective task is carried out.

BLOCK DIAGRAMS-







REFERENCES-

[1] ProgrammingKnowledge - Opencv Python basics, Face Detection [https://www.youtube.com/watch?v=kdLM6AOd2vc&list=PLS1QulWo1RIa7D1O6skqDQ-JZ1GGHKK-K]
2) [2]Sentdex - OpenCV python for image processing and video analysis [https://www.youtube.com/playlist?list=PLQVvaa0QuDdttJXlLtAJxJetJcqmqlQq]
[3] Pysource - Template matching (face recognition) [https://pysource.com/2018/03/05/template-matching-opencv-3-4-with-python-3-tutorial-2]
[4] Geeksforgeeks - Convert text to speech [https://www.geeksforgeeks.org/convert-text-speech-python/]
[5] PyAutoGui - Gesture control automation of gui [https://www.youtube.com/playlist?list=PL5tcWHG-UPH1bByt0keEatkATUz7fRN6_]
[6] gogul.dev - Hand Gesture Recognition using Python and OpenCV [https://gogul.dev/software/hand-gesture-recognition-p1]
[7]https://ieeexplore.ieee.org/document/7155970