

Project Proposal

Title: Controlling the web browser using hand gestures

Team Member:

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Research Paper Summary

- **Paper Name:** An Interactive Image Segmentation Method in Hand Gesture Recognition
- **Bibliographical Information:**

Chen, D., Li, G., Sun, Y., Kong, J., Jiang, G., Tang, H., Ju, Z., Yu, H., & Liu, H. (2017). An interactive image segmentation method in hand gesture recognition. *Sensors*, 17(2), 253. <https://doi.org/10.3390/s17020253>

- **Background:**

Hand gesture recognition is an important part of Human Computer Interaction (HCI). It has a great impact on controlling the computers, robots, machines etc which may greatly reduce the learning curve of the users and can extend the applications further compared to the traditional input methods, for example, mouse, keyboards, data gloves etc. the data gloves which are sophisticated can identify each movement of the joints by highly effective sensors. Based on computer vision, the hand gesture recognition process is given below in Figure 1.

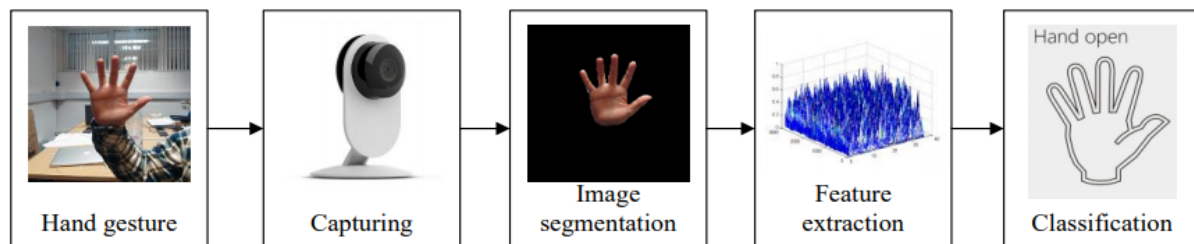


Figure 1: Workflow

- **Summary of the contributions:**

This paper introduces an image segmentation method which improves the detection of hand gestures. For modelling the image, the Gaussian Mixture Model (GMM) has been assigned to

get an overall view of the color distributions of the image. The parameters of the GMM have been tuned through the iteration of Expectation Maximum algorithm. In the image segmentation field a GIBBs random field was applied. To minimize the GIBBs energy Min-cut theorem was used in the image segmentation field for getting an optimized image segmentation.

- **Limitations and Discussions:**

Some essential problems have yet to be solved. Firstly, the vision-driven hand gesture recognition method is highly dependent on the sensibility of image sensors, therefore the relatively poor image quality hinders its development. Secondly, the image processing algorithms are not robust as they are supposed to be, some of which cannot meet the demand to finish the segmentation correctly, while others fulfill the accuracy demands, but require too many human interactions, which are not efficient in real applications.

- **Why this paper:**

In the above figure, the work flow of the paper has been shown. It can be seen, the data was collected by camera and the image was segmented and after that features were extracted and then classified the relevant gesture in the process. The project I am going to implement exactly follows this workflow and that is why this paper has been chosen.

- **Wider research context:**

In future work, this method can be used for higher resolution pictures which will expect a simplified calculation process. In seed selection, the automatic selection method can be improved to overcome various interferences, such as highlights, shadows and image distortion. Other future work will focus on improving the recognition rate by integrating the segmentation algorithm with more advanced recognition methods.

Project Description

- **Main goal:**

The goal of this project is to detect the hand gestures and to apply those in automating computer browsers. This automated system can be used by any type of user. This system will make multitasking easier and save time in a user-friendly manner.

- **Addressed Deep Image Processing / Computer Vision Tasks:**

For implementing this project I will be using Opencv Library and Scikit Image processing to process the input image. The computer vision tasks, I will be using is given below:

- I. Background subtraction method
- II. Edge Detection
- III. Convexity Defect Detection

- **Dataset for completing the task:**

The image data will be taken by the computer webcam.

- **Methodology of image processing:**

For hand gesture recognition, I will be using the following methodologies of image processing:

- I. Background subtraction method
- II. Binary Image Transformation
- III. Edge Detection
- IV. Contour Detection
- V. Convexity Defect Detection

- **Baseline Methodology:**

I will be using “Gaussian Threshold” as the baseline methodology. Gaussian threshold passes a filter which suppresses the high frequency content of the image and leaves only slow spatial variations. This idea helps to find the proper edges which will identify the final shape of the gesture.

- **Evaluation:**

For evaluation, we will validate the outcomes with the actual outputs like: $(\text{total success})/(\text{total tests}) \times 100$