



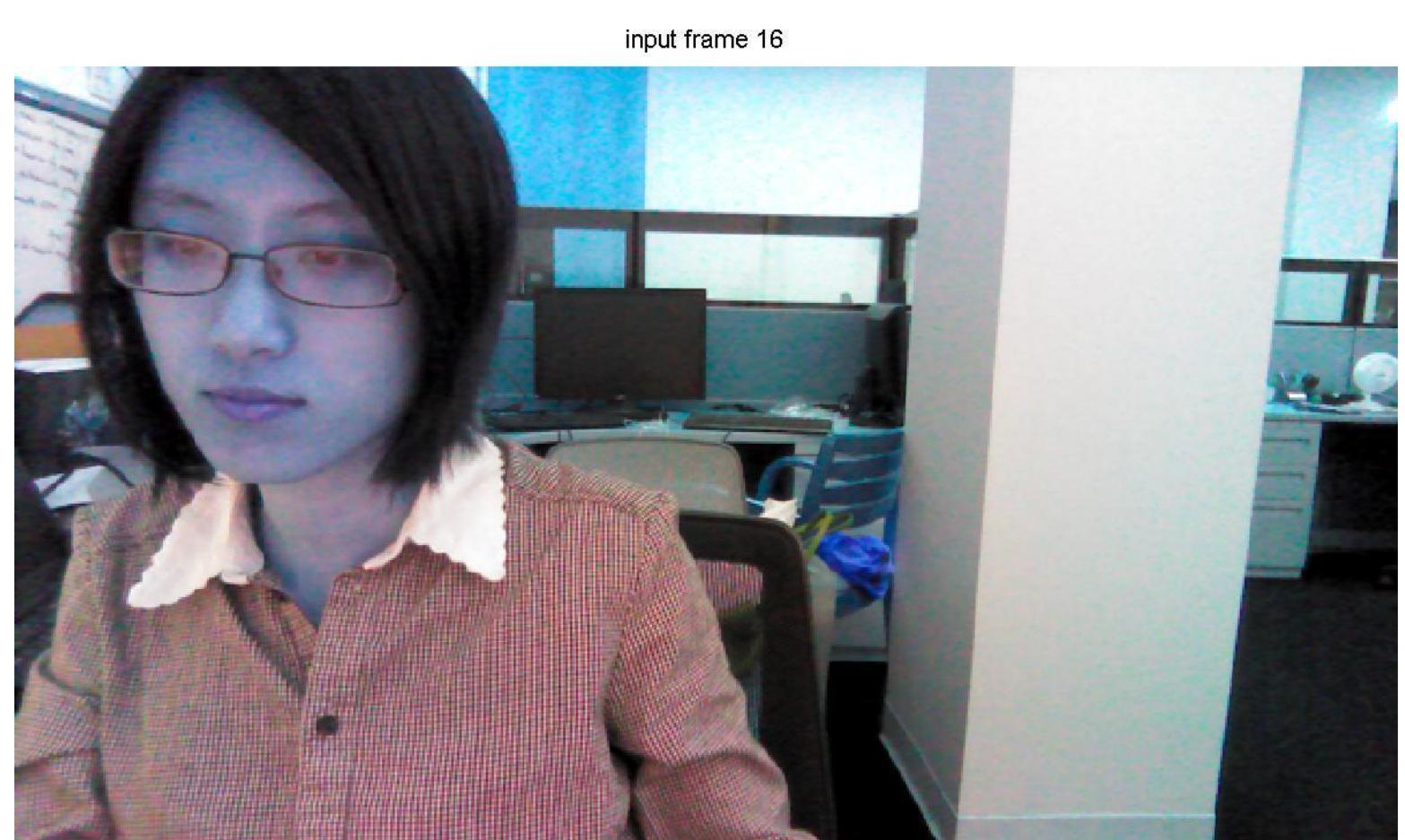
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# Human Upper Body Segmentation with the aid of Color, Depth and Motion information

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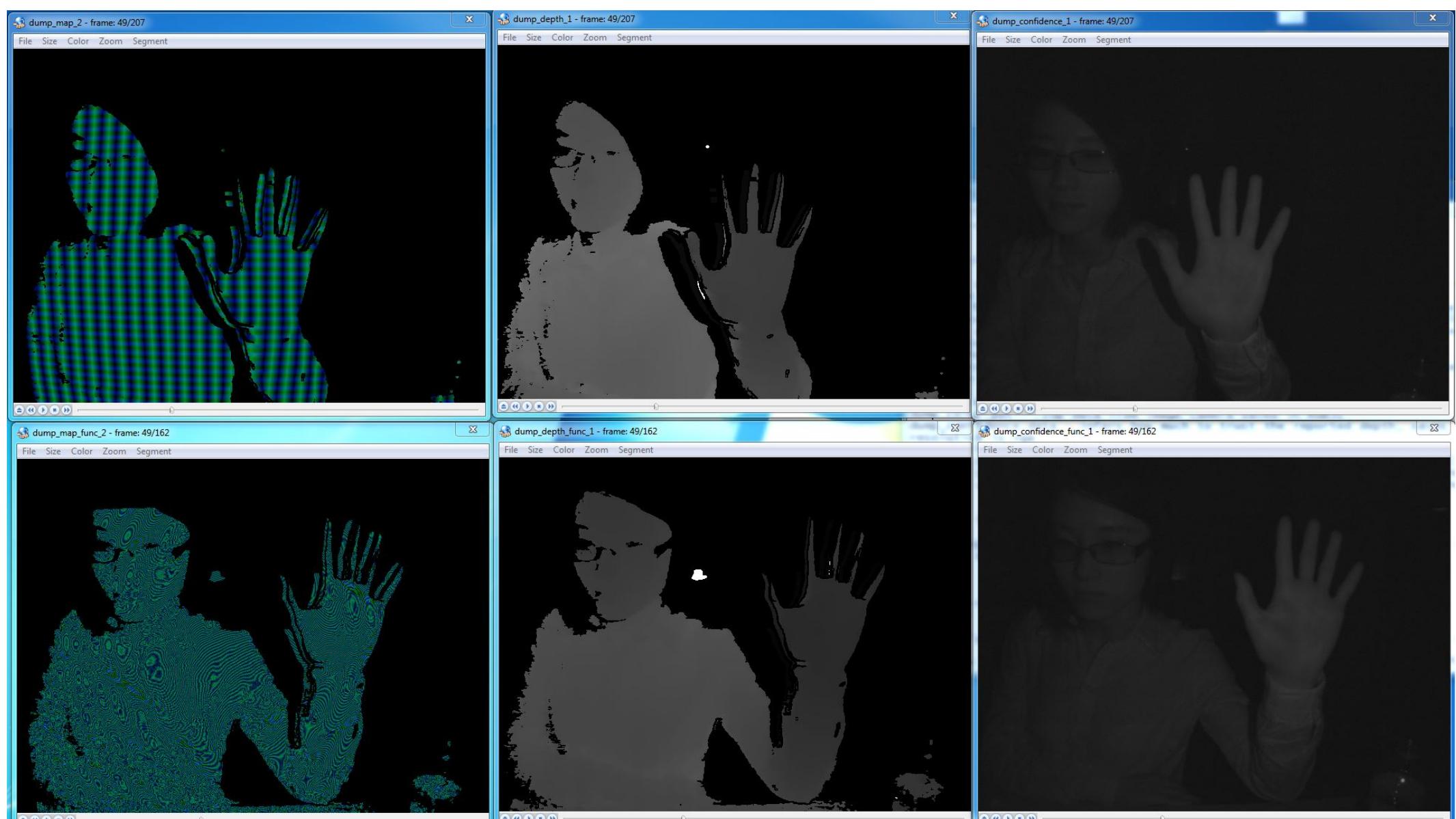
## Motivation

- Image Segmentation without user interaction remains not very satisfactory
- Automatic background change can be used in applications such as Video Chat in real time.
- Information other than color data such as depth information and motion information haven't gained their attention

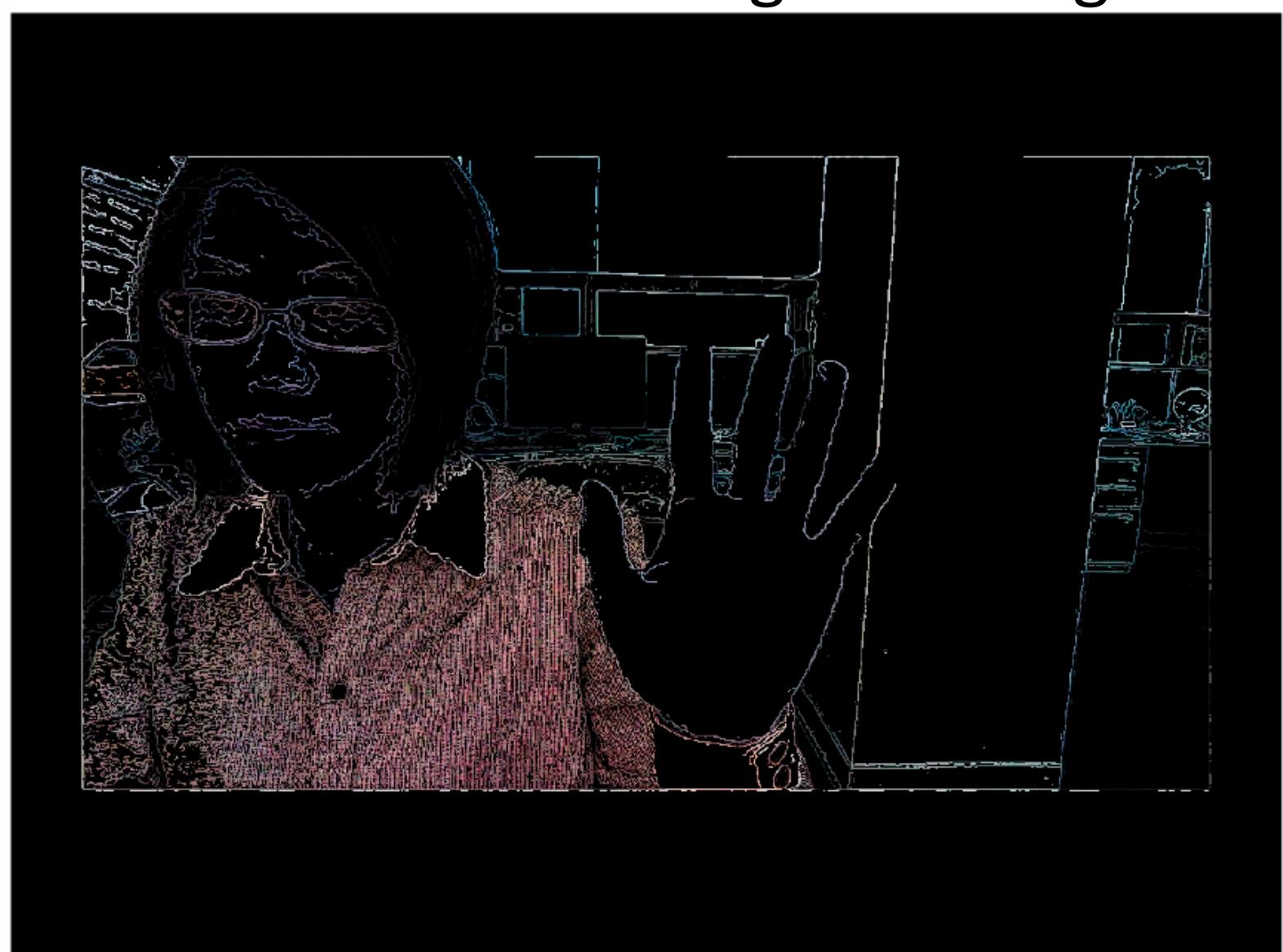


## Techniques

- 1 In this video, we have color information, depth information and the corresponding Confidence frame (given by the camera, indicating the confidence level for the depth. )



2. Color information is used to get the edges for the object.



Clearly, the edges solely from the color information are very noisy and contain a lot of static objects' edges we want to get rid of.

3. Motion information is used to refine the edge results. Since the background is basically static, motion information on the human object can be used to delete some static edges.



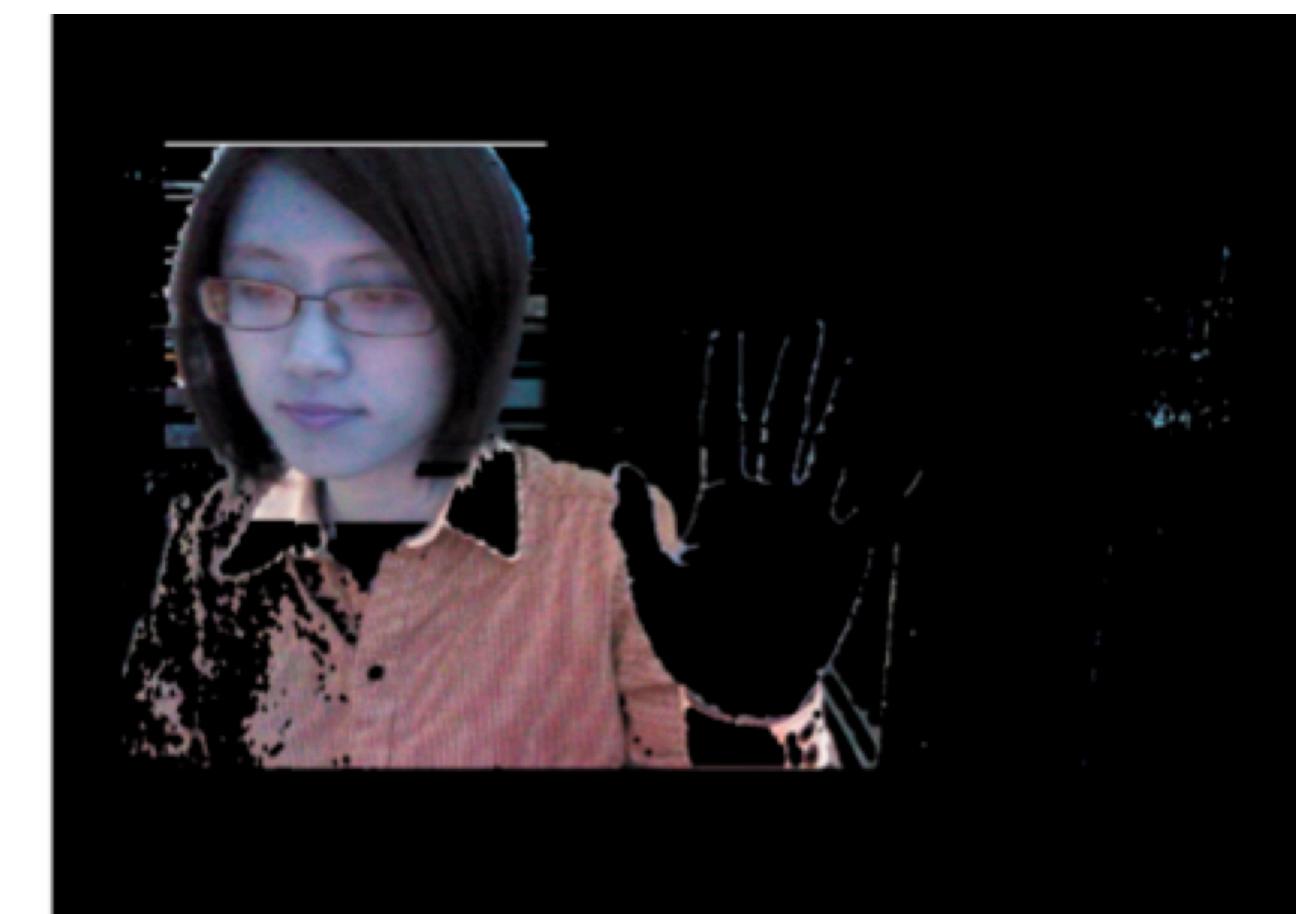
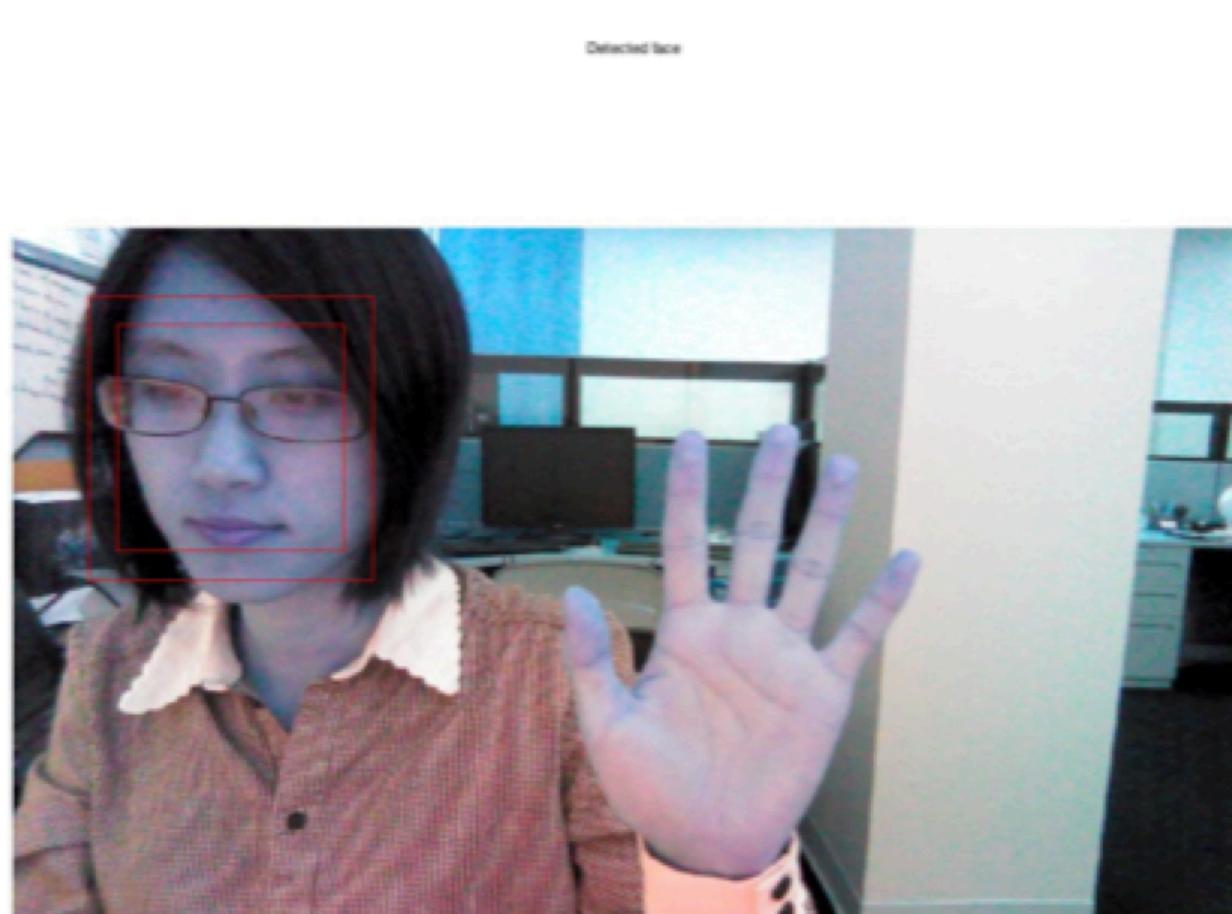
Fig a



Fig b

Figure a: Motion data got from algorithms such as background subtraction. Figure b: Edge information refined by adding motion data.

3. Using **Face Detection** to improve the edge results. Since hair boundary is too fuzzy and the edge around the head is not connected, we can add face detection result to our edge information.



4. Graph Cut algorithm is used to get the final result. The seed areas are corrected using Depth information.

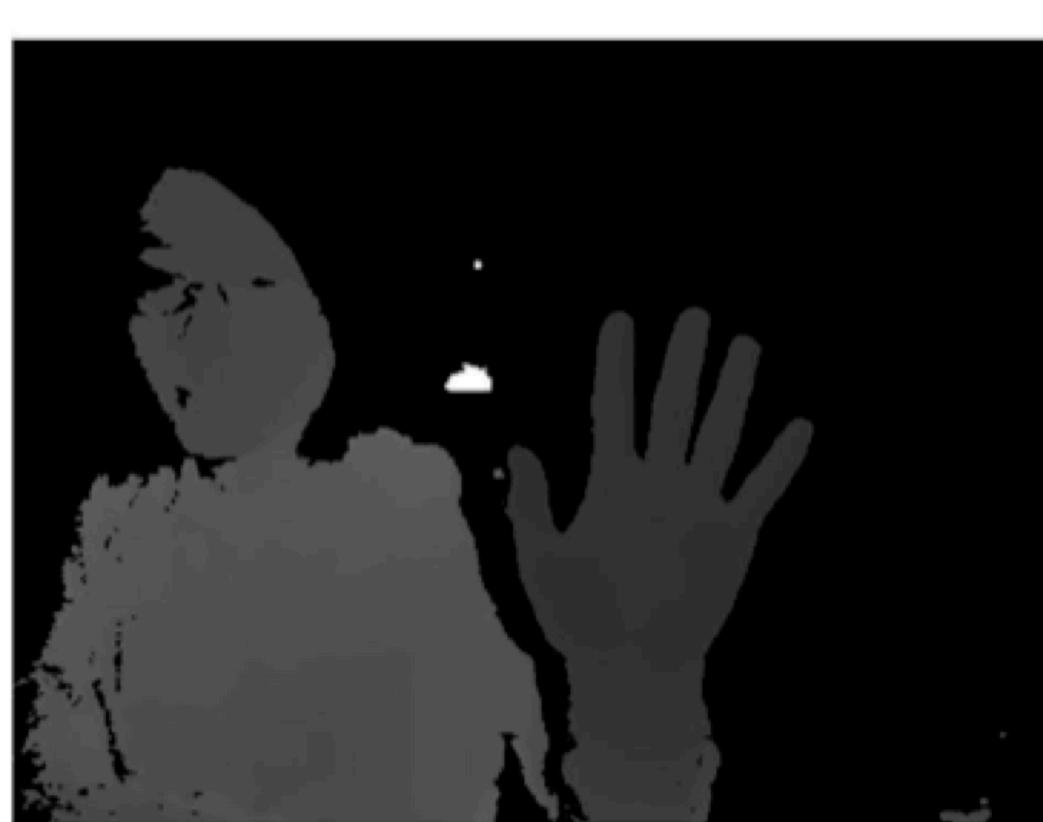


Fig. Depth data



Fig. Foreground and Background seed areas

## Results & Applications

