Introduction

Hands are certainly the most deformable parts in the body and their segmentation can become challenging in real conditions. Yet, it is a very active research area in computer vision, an interesting method has been introduced for single hand segmentation in [1], the project aims at implementing it, improve it and adapt it to interacting hands segmentation.

Method

Single hand segmentation:
The original method in [1] is a per-pixel one. For a given pixel from a depth image, depth differences with a group of offset pixels are used as features in a random forest classifier.

The various offsets are defined by a radius $R$ and an angle $\theta$. A depth normalization of radius is applied and best offsets are selected using the variation of the out-of-bag error.

Interacting hands segmentation:
First the single hand method was tested on depth images of interacting hands. Then, use of geodesic distance between a given pixel and offsets, which can be understood as the distance of the minimal path that cannot cross edges of the hands, as additional features was studied. Some additional global features such as area, perimeter, orientation of the fittest ellipse of the mask of both hands were also tested.

Finally, segmentation was tried on sequences of successive frames using optical flow to detect movement of hands and retrieve the label of an area of pixels from the previous frame.

Results

Single hand:
Score is proportion of px right classification between hand and rest of the body

Oversegmentation leads to a reduction by a factor 8 of computation time with similar segmentation results.

Interacting hands:
Score is proportion of px right classification between both hands

Optical flow method didn’t show any improvement compared to the other method.

Conclusion

Single hand segmentation shows very good performance and thanks to oversegmentation could be run in real time.

Interacting hands are more challenging but good classification on average is reached.

Acknowledgments

This project has been realized under the supervision of Anastasia Tkach and Prof. Mark Pauly at LGG, EPFL.

References
