

Outlining Objects

for Interactive Segmentation

on Touch Devices

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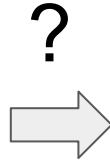
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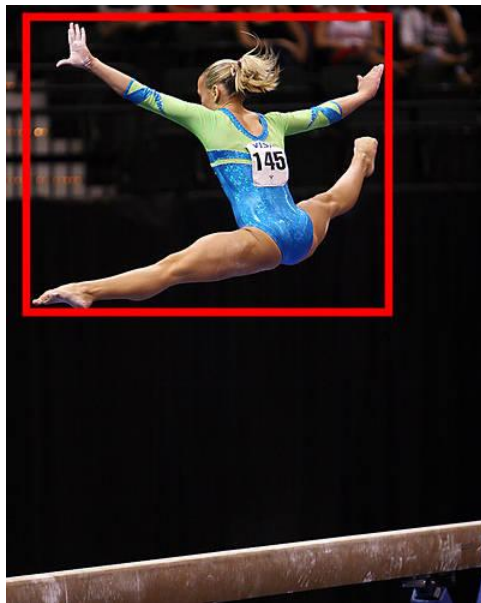
Image Segmentation



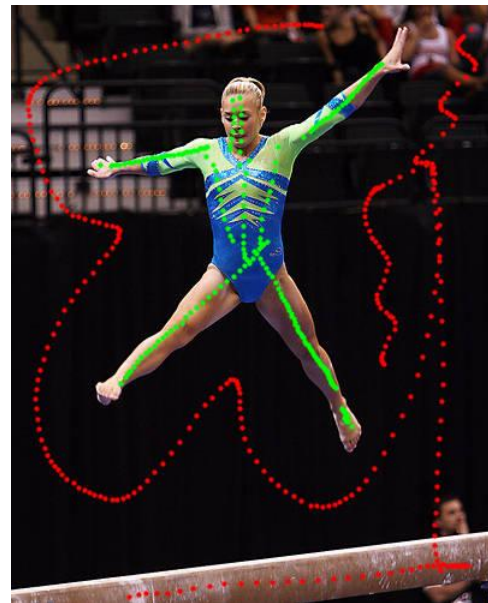
Classic Interactions for Image Segmentation



Contour

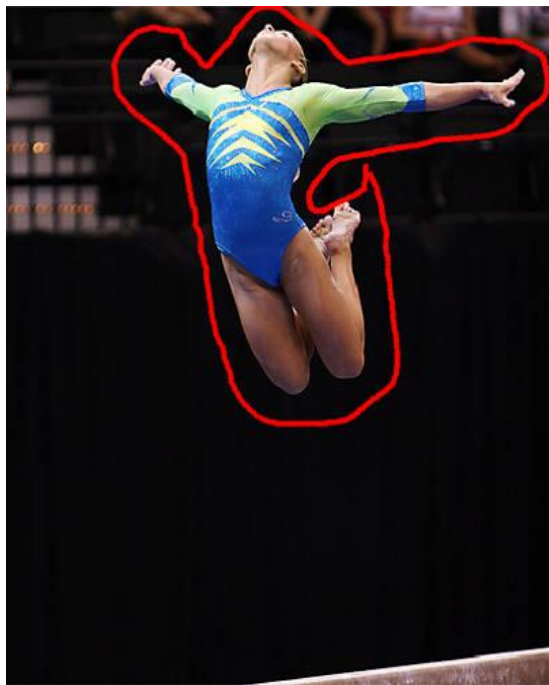


Bounding Box

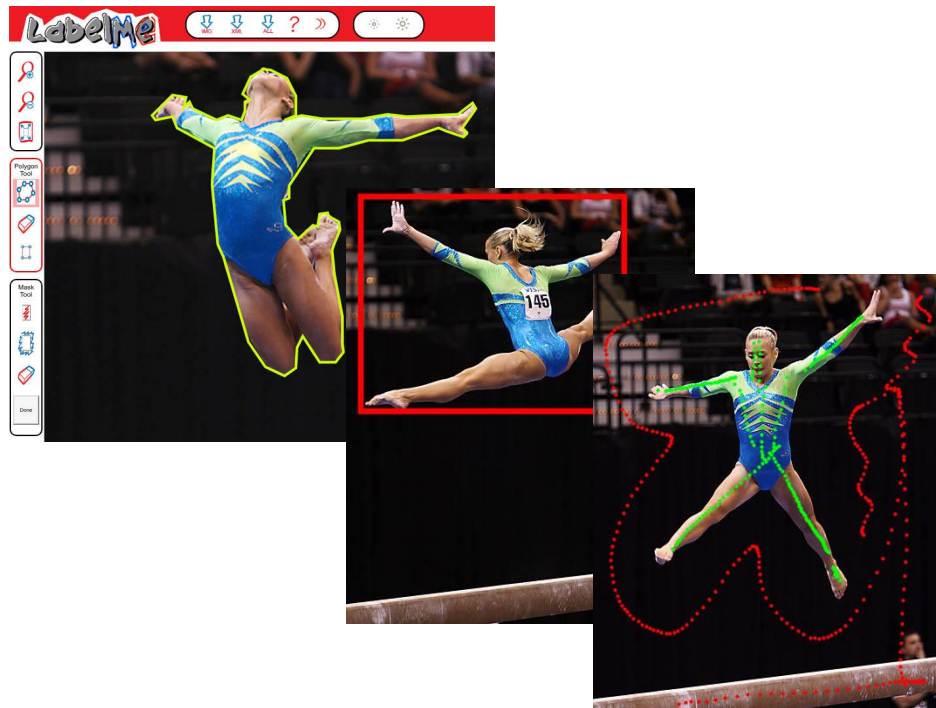


Scribbles

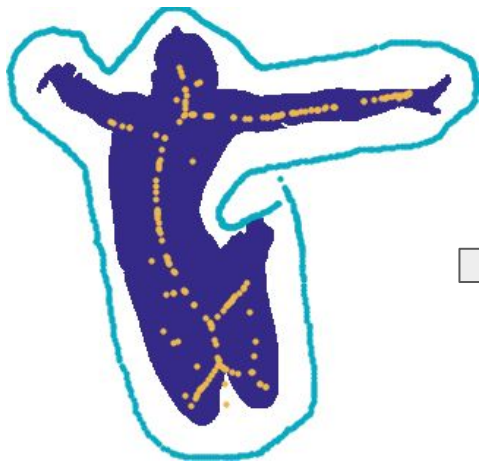
Proposed Interaction: Outlining



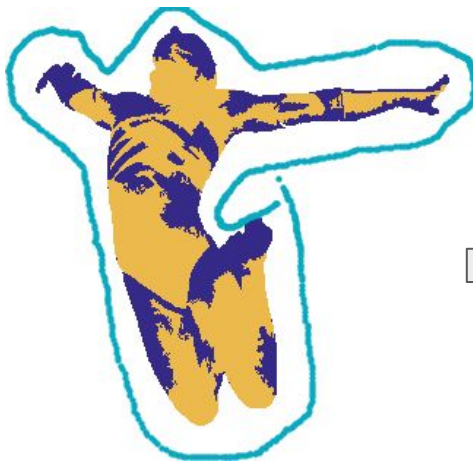
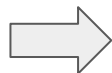
Outlining



Outlining Processing



1. Compute skeleton
segmentation
(Blum medial axis)



2. Extend and correct with superpixels
(mean shift superpixels)

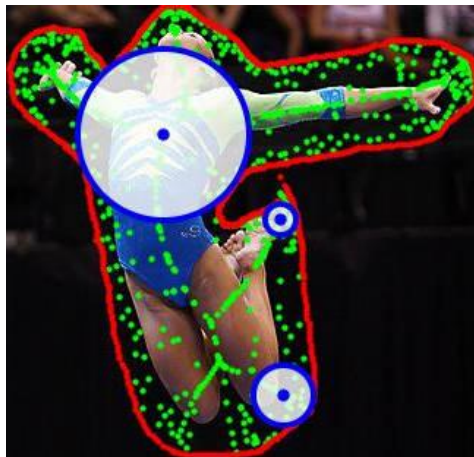
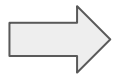


3. Compute
(grabcut segmentation)

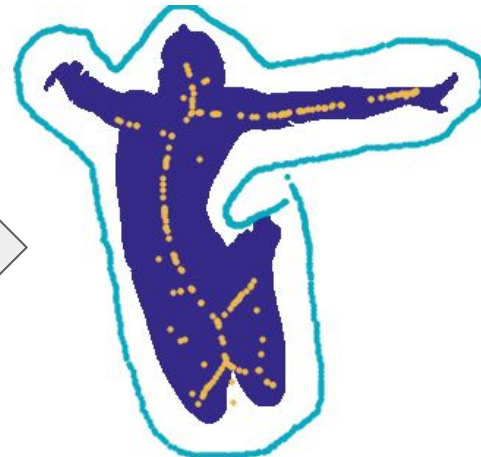
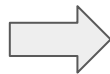
Compute Skeleton



1. Retrieve outline



2. Compute Blum medial axis



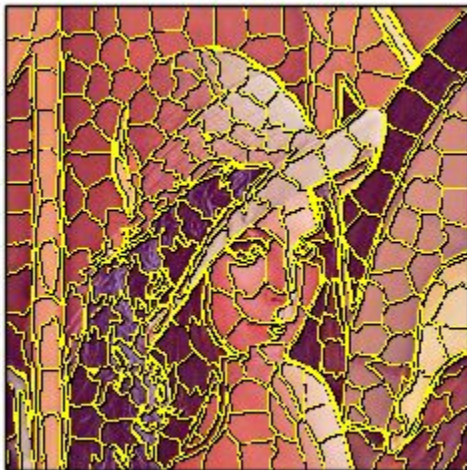
3. Filter out smaller circles

Superpixels

Felzenszwalbs's method



SLIC



Quickshift

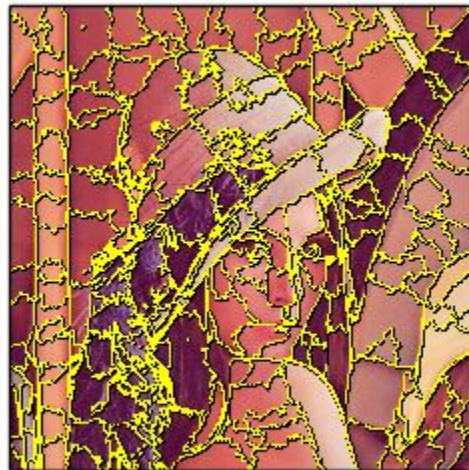
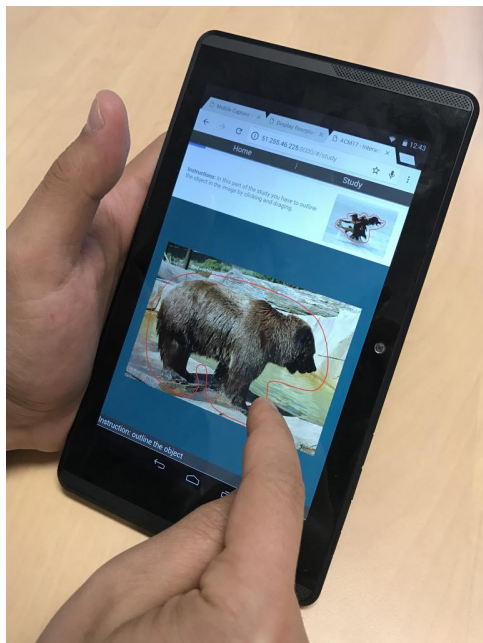


Image from python scikit documentation

Experimentation

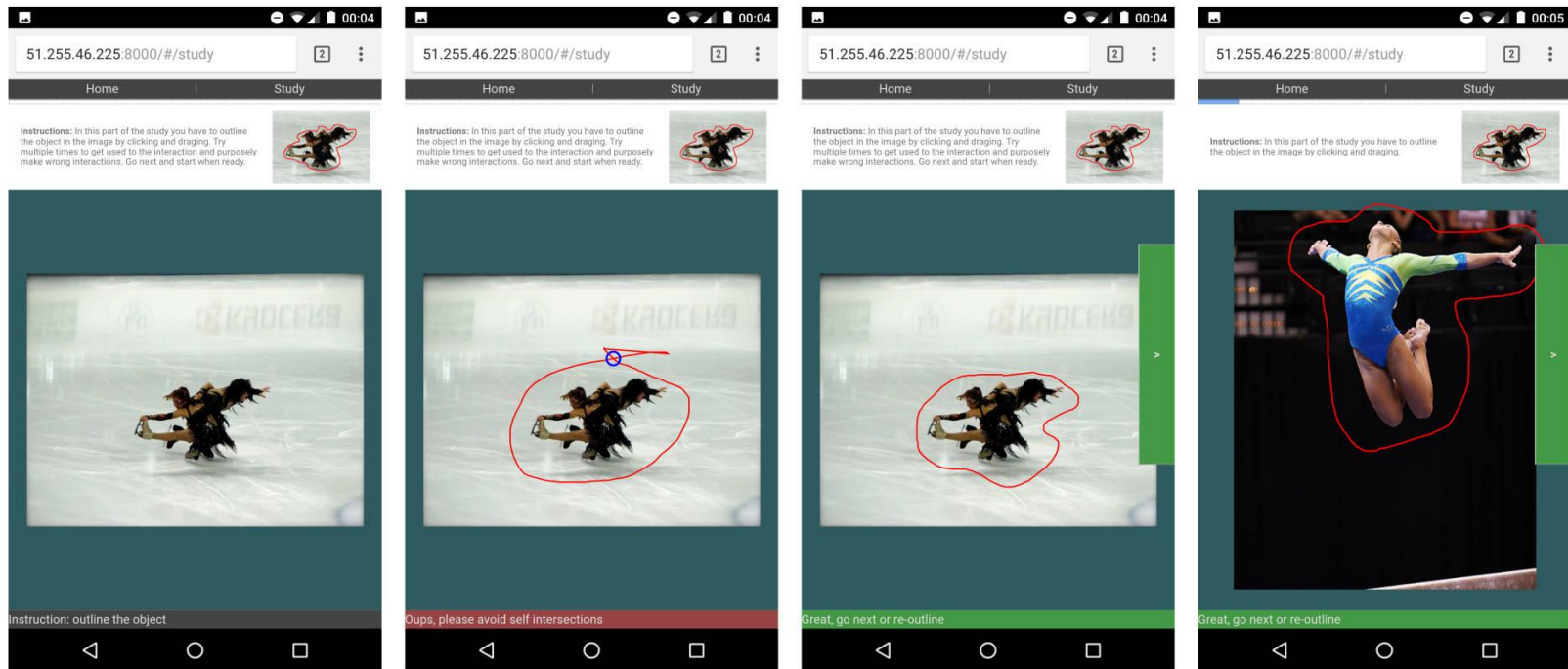


- Twenty users (10 male / 10 female)
- Three tested interactions
 - Bounding box
 - Outline
 - Scribbles
- 11 images per interaction (from iCoseg dataset)
- Regular 8" android touch tablet

Source code: github.com/mpizenberg/otis

Online demo: mm17-otis.pizenberg.fr

Screenshots from User Study



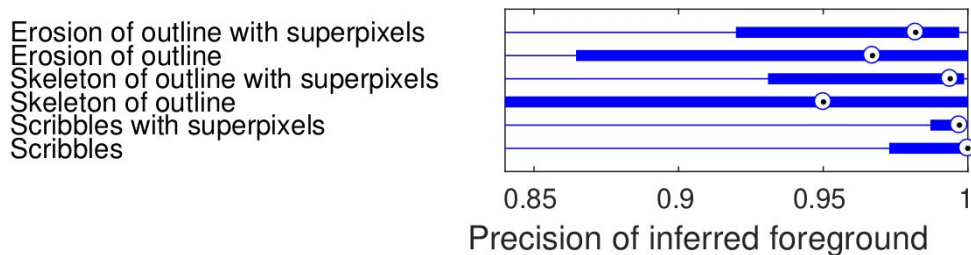
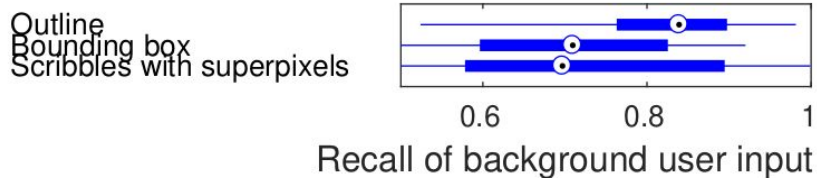
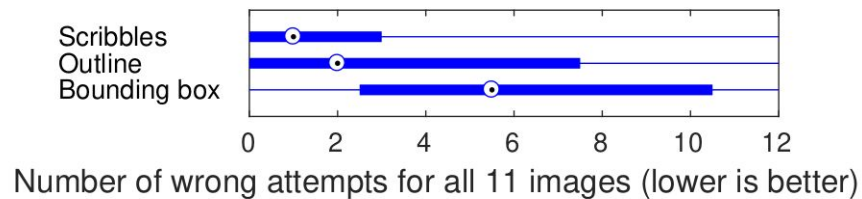
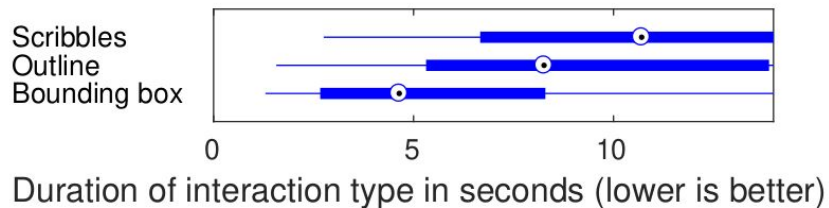
Training phase for outlining interaction

Non training

Results of the Questionnaire

Method	Bounding box	Outline	Scribble
Ease	2.1 ± 0.62	2.65 ± 0.74	2.1 ± 0.61
Time	2.35 ± 0.69	2.5 ± 0.67	2.6 ± 0.70
Rank	1.95 ± 0.43	1.90 ± 0.32	2.15 ± 0.37

Quantitative Results Analysis

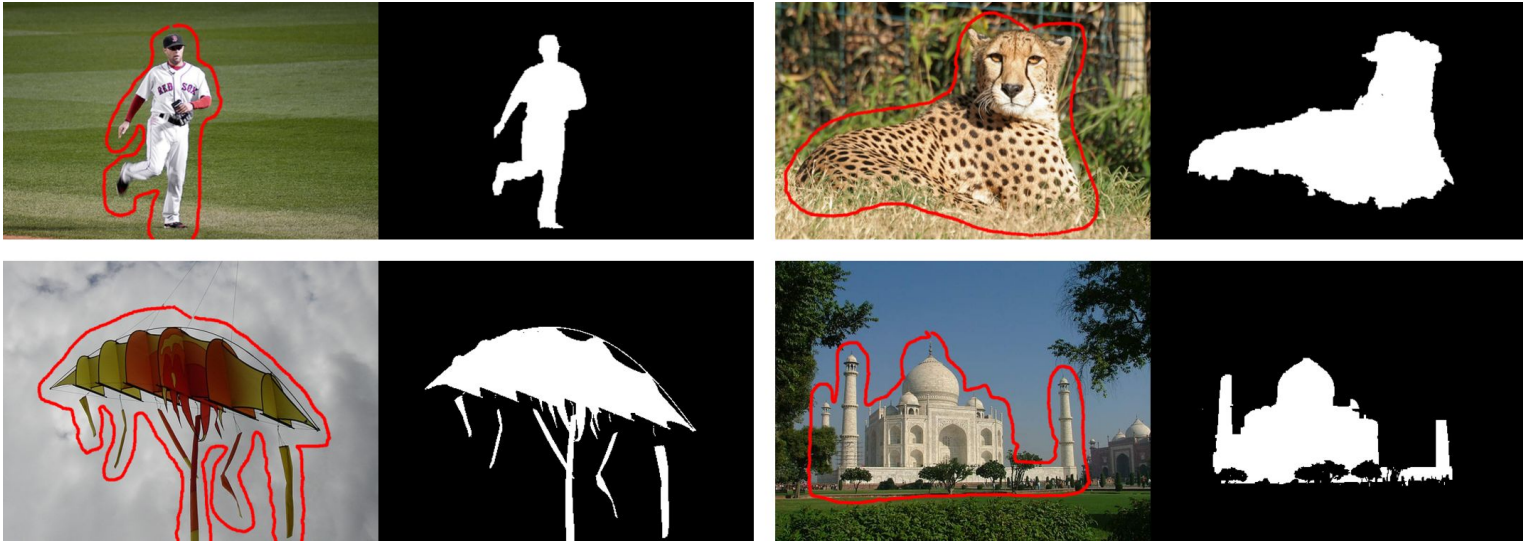


Visual Segmentation Results



Bounding boxes

Visual Segmentation Results

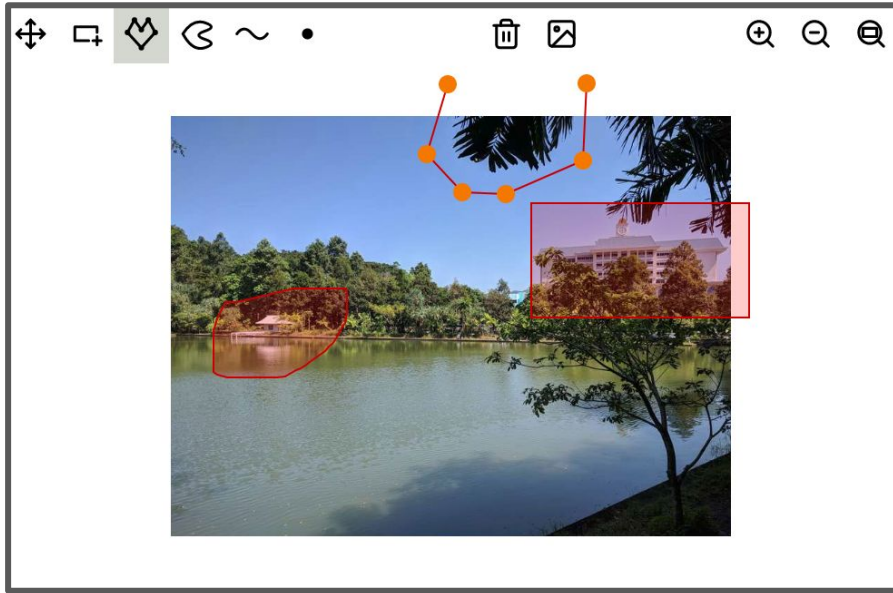


Outlines

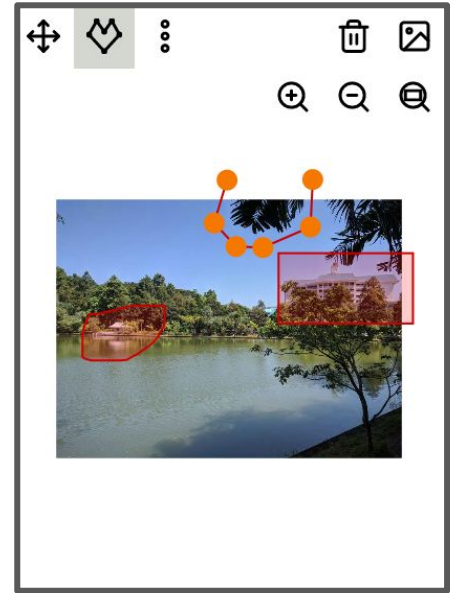
What's Next?

An annotation platform?

Example demo at: elm-image-annotation.pizenberg.fr



on desktop



on phone