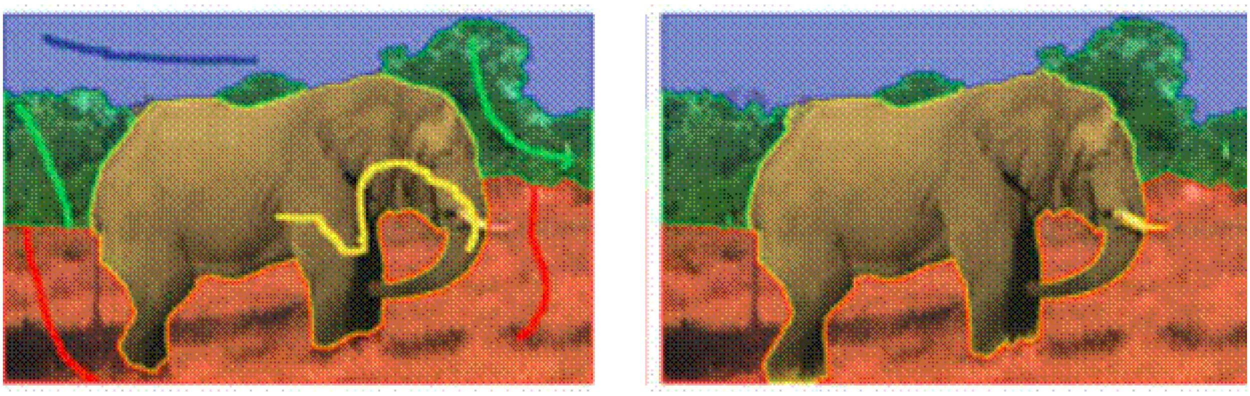
CV Homework Set #1 – Interactive Segmentation

Due: 28/3/16

Submission: 1) HW will be tested interactively with the checker. Times will be posted.

2) HW code should be submitted to HW checker either via DOK or by email to: imageprocessinghaifau@gmail.com



Goal: Write an interactive program that performs segmentation using the graph-cut approach. Segmentation of up to 4 segments is performed on a given input image
based on user inputs in which sets of pixels are marked as seeds for each of the segments.

General: You will be using the Computer Vision Open Source library **OpenCV**.
You may choose the programming code of your choice (C++, Java, Python, Matlab) to interface with the OpenCV code.
Unfortunately, no technical support will be given in this course. A discussion forum has been opened in the Moodle site for this course.

Grading: Grade will be given based on actively running the program on images.
Some example images you will be tested on will be available for you to test on.
Additional new images will be used for testing as well.
Grade will be based on quality of segmentation, as well as convenient interfacing, organization and documentation of code, ext.

Submission:

Submit all necessary files to run the code.
Submit a **Readme file** explaining how to compile, make, and prepare the code (including
Makefile if necessary).
Submit **Instructions file** explaining how to run the program, (explain inputs, interface,
howto, etc).
Do not forget to put Names and Student I.D. in all files.

HW1 Instructions:

Implement interactive segmentation based on graph-cut.
Write code that implements the following:

User marks pixels in image such that up to 4 different pixel classes are marked (example by using different colors). Code will then segment the image into 4 segments using the marked pixels as seeds. Resulting segmented image is displayed. Segmentation is shown either by transparently painting the segments over the original image (so that the original image is seen under the segment color) OR segments are marked by painting the border edge pixels between segments,

Input: 1) Input image name/path of image to be segmented.
2) Output file name for segmented image
3) Output file name for resulting segment mask
Inputs names may be given as parameters, on command line or an interactive window may be opened which allows to navigate and choose a file.
Input image is an RGB image and can be of any size >0 (do not assume square).

Output: 1) The segmented image (which is also displayed to the user during program,
run) – an image the size of input image with the segments marked.
2) Segmentation mask - an image the size of input image with each pixel colored the color of its segment. Segment colors are consecutive numbers
starting with 1.

Method:

Use Graph-cut/Grab-cut (max flow/min cut) algorithm. You may use a readymade code

for graph-cut (max flow/min cut) or grabcut e.g. the code in OpenCV.
Note: code is for 2 classes, extend the method to deal with up to 4 classes (by spectral
clustering, cascading, multi-voting etc).

Helpful sources:

Graph cut papers:

Interactive Graph Cuts for Optimal Boundary & Region Segmentation of Objects in N-D Images.
Boykov & Jolly, ICCV 2001
http://www.eecs.berkeley.edu/~efros/courses/AP06/Papers/boykov-iccv-01.pdf

GrabCut — Interactive Foreground Extraction using Iterated Graph Cuts.
Rother, Kolmogorov & Blake, SIGGRAPH 2004
https://cvg.ethz.ch/teaching/cvl/2012/grabcut-siggraph04.pdf

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OpenCV-Grabcut

http://docs.opencv.org/3.1.0/d8/d83/tutorial_py_grabcut.html#gsc.tab=0

UWO Segmentation Code

http://vision.csd.uwo.ca/code/

Videos - GraphCut

Graph cut video (Guillermo Shapiro) - very simple:
https://www.youtube.com/watch?v=HMGX8HXskKk

Graphcut video II:
https://www.youtube.com/watch?v=aOqOwM-Qbtg&list=PLo1wvPF7fMxT3Ha3Tg9CfnhxS4akBaYJ_

https://youtu.be/aOqOwM-Qbtg?list=PLo1wvPF7fMxT3Ha3Tg9CfnhxS4akBaYJ_

Tutorials on GraphCut

http://www.morethantechnical.com/2010/05/05/bust-out-your-own-graphcut-based-image-segmentation-with-opencv-w-code/

http://www.csd.uwo.ca/faculty/yuri/Abstracts/pami04-abs.shtml