# Automating Grab-Cut Selection for Single-Object Foreground Images

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## Abstract

Many photographs consist of a single subject against a background, with the subject located toward the center of the image to provide a focus. Using this knowledge, it should be possible to automate the creation of a selection box for the Grab-Cut algorithm to use for seperating the foreground object from the background.

#### 1. The Problem

Segmentation and outlining is a significant problem in computer vision. A library of properly indexed object, seperated from their backgrounds, is important for building object identification learning sets. Sometimes, human segmentation has been used for this, but automated approaches are obviously perfered. One approach that has shown promise is the Grab-Cut algorithm, pioneered by Rother, Kolmogorov, and Blake (2004), with further work done by others, including Cui, Yang, and Wen (2008). Grab-Cut method requires some human input; the user must place a rectangular outline around the foreground object. This project hopes to automate this process for a subset of images.

Many photographs consist of a single object at the focus of the picture. If one restricts oneself to such images, the geography of the image contents can be used to roughly locate the foreground image, and create the separation lines needed for the Grab-Cut technique to be effective.

## 2. Datasets

The project will use a subset of the Berkeley Segmentation Dataset, with images selected for having a single foreground object. An additional dataset will be assembled from Google, by selecting images from searches for particular types of objects.

#### 3. Method

The proposed method will iteratively take vertical and horizontal pixel slices from the edges of the image. These will be presumed to be background, and will be evaluated by a weighted list of criteria including energy, color and line-density. They will be compared to the remainder of the image, presumed to contain the foreground object, and will be progressively thickened untill they begin to converge with the foreground data. At that point, the rectangular box defined by the slices will be used to run the Grab-Cut algorithm, as defined in the papers listed above. Jahangiri and Heesch (2009), have proposed a modified Grab-Cut for simple images with little variation in background colour and relatively high contrast between foreground and background. The interactive trimap generation central to the original formulation of GrabCut is replaced by a tentative approximation of the background using active contours. I propose instead to use the original Grab-Cut, with automated box location, with the hope of achieving success with more complex backgrounds.

#### 4. Readings

Rother, C., Kolmogorov, V., and Blake, A. (2004). GrabCutinteractive foregrextraction using iterated graph cuts. ACM Transactions on Graphics (Proc. SIGGR2004), 23(3):309314.

Cui, J., Yang, Q., Wen, F., Wu, Q., Zhang, C., Van Gool, ductive object cutout. In IEEE Computer Society Connference on Computer Vision and Pattern Recognition (CVPR 2008), Anchorage, AK.

Jahangiri, M.; Heesch, D., Modified grabcut for unsupervised object segmentation, 2009 16th IEEE International Conference on Image Processing (ICIP), Cairo

#### 4.1. Evaluation

Results will be compared against human-aided Grab-Cut, as well as against the human-segmented data from the Berkeley data set. A numerical error rate calculation will be done, based on the one in Rother, Kolmogorov, and Blake.