Cropping Assistant
A first step towards computer-supported automatic generation of photographically interesting cropping suggestions.

by

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ABSTRACT
The abstract goes up here…..

INTRODUCTION
The motivation for this project came from my own experiences in editing photographs. I often take pictures that have "extra" room on all four sides so that I can catch the shot I want when I see it rather than take the time to try to frame it correctly and risk missing the shot, and then frame it correctly at a later date. What I found was that I was often obeying the Rule of Thirds [refs] in composing the cropped version of my photographs, and I began to long for a tool built to support this behavior.

The current version of Cropping Assistant uses the spirit of the Rule of Thirds to generate an array of cropping suggestions for the user. The user need only click on what they consider to be the point-of-interest in their photograph, and the application then presents either 4 or 6 previews of a cropped version of their original image. The user can then change the zoom level of the cropping suggestions, and select one preview to be saved as a full-sized cropping. The general idea of presenting multiple preview images, and allowing the user to affect them all in parallel was inspired by Elizabeth Mynatt and Michael Terry's SideViews [ref] at Georgia Tech.

The long-term goal of this project is to eventually use a variety of composition rules, along with image processing techniques such as facial recognition [refs], torso recognition [refs], and saliency maps [refs], to generate a robust set of possible cropings from which a novice photographer can select.
THE RULE OF THIRDS
Making an interesting photograph can be a matter of having an interesting subject, composing a scene in an interesting manner, or a combination. For composing a scene in an interesting manner, one suggestion is to follow the Rule of Thirds. To accomplish this, you imagine a pair of vertical lines, each 1/3rd away from the sides of the image, and a pair of horizontal lines, each 1/3rd away from the top and bottom of the image. You then try to do one of the following: (a) place your object of interest on a point where two of the lines intersect (I refer to these points as the crosshairs of the Rule of Thirds), (b) place a vertical object along a vertical line, (c) place a horizontal object (or border such as the horizon) along a horizontal line.

It is important to note that the decision of how to use this rule of thumb is very dependant on the image itself. There might be more than one point of interest, there might be several vertical or horizontal elements, for any given point of interest, the context and content might affect upon which crosshair you would want to place that item. For example, if you had an image of a dog, and the dog was looking from left-to-right, an observer of the image might feel that the use of the SW crosshair would be right, while if the dog was looking from right-to-left, the same observer might prefer the use of the SE crosshair.

It is because of issue such as these that this project endeavors to present multiple cropping candidates, shown simultaneously, from which the user may select the one that feels most appropriate within the given context.

THE CROPPING ASSISTANT ALIGNMENTS
There are currently two sets of previews available to the user. The first is a set of four previews of possible croppings created using the four "Rule of Thirds" crosshairs to position the point-of-interest [Figures 2.1-2.4]. The second is the same set as the first, augmented with two central croppings; one where the point-of-interest appears centered horizontally [Figure 2.5], but on the
upper rule-of-thirds line, and one where the point-of-interest has been fully centered in the frame [Figure 2.6]. With both variants, the user is able to adjust the zooming level for the cropping while keeping the point-of-interest in the same relative position in the frame.

![Figure 2.1: On NW Rule of Thirds crosshair.](image1)

![Figure 2.2: On NE Rule of Thirds crosshair.](image2)

![Figure 2.3: On SW Rule of Thirds crosshair.](image3)

![Figure 2.4: On SE Rule of Thirds crosshair.](image4)

![Figure 2.5: Central upper Rule of Thirds line (CT).](image5)

![Figure 2.6: Dead Center in frame (CC).](image6)

The notion for introducing the two central cropings came from informal user studies performed by Steve Wass, an undergraduate student at Maryland, as part of a general exploration of user cropings and the Rule of Thirds. There appeared to be a trend towards desiring the point-of-interest to appear in the center of the frame.

**USING THE CROPPING ASSISTANT**

To use the Cropping Assistant, the first step is to load an original, hi-resolution, image into the program [Figure 3]. This can be done by dragging an image to the application’s canvas, or via
the File menu. Once the image has been loaded, the user clicks on their point-of-interest within the image.

![Image](image.png)

Figure 3: An image that we want to crop based on the position of a particular point-of-interest loaded into the Cropping Assistant.

Once the point-of-interest is selected, the application will present previews of possiblecroppings, one for each of the four possible placements of the point-of-interest on a "Rules of Thirds" intersection point [Figure 4], and in the case of the second option, one for each of the two center-based placements [Figure 5].

![Image](image.png)

Figure 4: The four preliminary Rule of Thirds croppings.
Once the point of interest has been selected and the preliminarycroppings presented, the user can move the slider below the images to alter the zoom level of the images [Figures 6.1-2]. This will maintain the position of the point-of-interest while changing the framing of the shot.

Figure 5: The Rule of Thirds croppings with the two centralized croppings.

Figure 6.1: View after zooming in some more relative to the original previews.
Notice that in three of the four previews in Figure 6.2, there is not "enough" original image available to fill the frame of the cropping so a rose-colored edging is displayed. If one of these cropings is selected, the "out-of-bounds" area will actually appear black in the output file. The user may select any color they wish to indicate the "out-of-bounds" area via the Settings dialog under the File menu.

Once the user is satisfied with one of the cropping previews, they simply click on that preview to save it at the selected output size. The user can select (again, via Settings) for a save dialog to appear, pre-populated with the original filename appended with a cropping code (NW, NE, SW, SE, CT, CC) or for the indicated image to be automatically saved using the original filename appended with the cropping code. The user is also able to “drag-and-drop” from a preview image to specify a destination for the full-size version of that cropping.

Several common output sizes are available in 4:3 and 3:4 aspect ratios, and one common output size is available in each of 4:6 and 6:4 aspect ratios for traditional photo printing. The orientation (portrait or landscape) of the original image is used to determine the initial orientation of the cropped version, but the user can toggle this (as well as the actual size of the saved file) at any time via the OutputSize menu.

The idea of having multiple previews of the cropings, all being controlled by the same zoom slider, was inspired by SideViews, developed by Elizabeth Mynatt and Michael Terry at Georgia Tech. In my own cropping pursuits, I often found myself comparing several different cropped versions on an image side-by-side after the fact, and remembered seeing their video from UIST 2002 showing that you could support this behavior within the selection process itself. As additional composition rules are incorporated in later versions of this tool, the display space might not be sufficient to provide the desired level of detail in a preview. If this proves to be the case, we will incorporate an idea used in PhotoMesa (a suggestion attributed to Mark Stefik
from Xerox PARC) of temporarily displaying an enlarged preview of any individual cropping by mousing-over that preview.

FUTURE WORK
This is hopefully an initial stage in a project to automatically generate croppings without the user being required to manually identify the point-of-interest in an image. There are two different, but related, issues for this future work. The first is to automate the process of selecting a point-of-interest in a photograph. A direct approach to take would be to detect any face or faces in the image [refs], and then use the center of those as possible points-of-interest. A related approach would be to detect torsos in the image [Suh ref] and align these on one of the Rule of Thirds lines. A more ambitious approach would be to generate a saliency map [refs] of the image, and look not only for simple Rule of Thirds croppings, but also croppings that make use of the related principles of the Golden Diagonal, Golden Triangle, and the Golden Spiral [Elam ref] and that look to identify the category of the content of the image (such as a landscape versus an activity) to select the most appropriate composition style.

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REFERENCES


