Paper Reading: A Combined Corner & Edge Detector (Harris Corners)

By Thomas Dolan

1. What problems are solved in the paper?

The problem addressed in this paper is edge detection and tracking with camera motion. It is known before this paper was written how to easily compute distances with stereo images. However, problems arise in calculation complexity when the camera is in motion. A reference axis is no longer available to use.

1. What are the previous approaches to solve the problem?

Some of the previous approaches included estimation with Kalman filtering and Canny Edge Detection. Kalman filtering is done by estimating the 3 dimensional location of the object in the 2 separate images. Canny is used to compute the edge pixels via filtering. The edges then can be compared with hysteresis.

1. What are the approaches/novelties of this paper?

The paper details a couple steps to go through with an approach. First, you apply Moravec’s corner detector functions. These will help find the high intensity edges in a window. After, Moravec’s is applied and used, we are given a set of fixes in case the result is of an unusual set. After fixes are applied, then the result is classified based on alpha and beta values. If both are high, there is a corner in your window. If both are low, you have a flat surface. If one is high and the other low, then you have found an edge, which can be followed to a corner. The corners are determined via an 8-way local maximum. These corners can then be connected into a graph, following edges. These edge graphs can then be compared between the images to get a 3 dimensional model of the area.

1. How do you think about this paper? Any brilliant ideas you'd like to take home? Any drawback or improvements?

The paper is short and concise. It quickly breaks down the problem and presents a solution in a matter of pages. It builds of work already done by Moravec. It’s easy to understand how to apply their new method to any set of pictures. It helps me understand how to approach a problem like this and not be limited to only what the pictures show. Warping the images in some way can be beneficial to glean more knowledge form them. The processes detailed are fairly low calculation, meaning they are good to use in a program as they will not bog down runtime doing tedious mathematical operations.

Paper Reading: Intelligent Scissors for image Composition

By Thomas Dolan

1. What problems are solved in the paper?

The problem in this paper is the ability to accurately remove portions of one image and graph them onto another. The authors accomplish this by implementing Intelligent Scissors, a process which “cuts out” the image portion in question accurately while only given a vague shape path.

(2) What are the previous approaches to solve the problem?

The most basic solution to this is manual tracing, done with a cursor. A more popular method is the usage of active contour or “snake” algorithms. These try to find an outline trace given a couple of reference points for the user. Image segmentation techniques are somewhat tedious and processor heavy.

(3) What are the approaches/novelties of this paper?

First, a point is chosen. The point finds the nearest edge possible. This is local cost and is a simple minimization function. Then, the user traces a shape around their image. The contour finds the shortest path to the edge being surrounded. This is done using some dynamic programming techniques. Part of the technique is that the current position of the cursor always tries to return to the initial point. Up until a certain point, this always follows the path already traversed. When you reach halfway around the object, then it becomes more beneficial to continue following the object, as it is the shortest path. This allows the scissors to snap to the rest of the image after halfway has already been reached.

(4) How do you think about this paper? Any brilliant ideas you'd like to take home? Any drawback or improvements?

I think it’s an innovative paper, something that should be read. The authors have a clever vision of how to run their process, but also make it rather user friendly. The intelligent scissors are definitely something that are very useful. For those among us with unsteady hands or large images, this is a godsend. The scissors help make many things a reality, like moving one set of images to another and rearranging them.