Small Hole Filling in ITK

Release 0.00

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Abstract

This code provides an implementation of a simple technique to fill small holes in an image. We use a multi-pass method that fills pixels on the border of a hole with the average of its non-hole 8-connected neighbors. This process is repeated until all holes are filled.

The code is available here: https://github.com/daviddoria/SmallHoleFiller

Latest version available at the Insight Journal [http://hdl.handle.net/10380/3257]

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1 Introduction

This code provides an implementation of a simple technique to fill small holes in an image. We use a multi-pass method that fills pixels on the border of a hole with the average of its non-hole 8-connected neighbors. This process is repeated until all holes are filled.

The code is available here: https://github.com/daviddoria/PoissonEditing

2 Algorithm

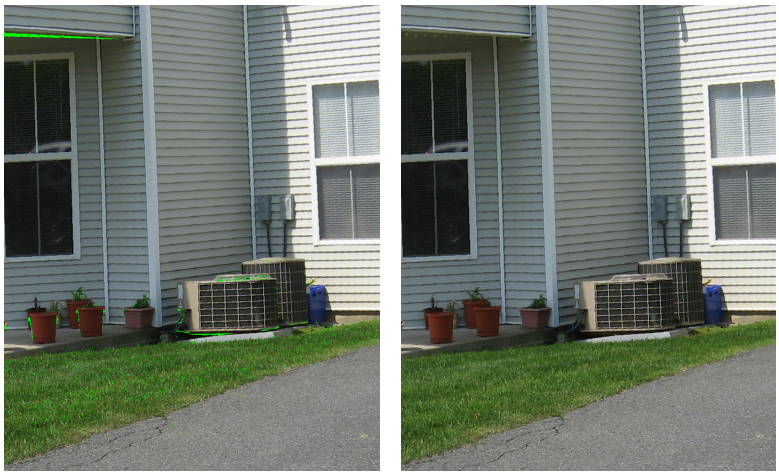
The algorithm we use is as follows:

- Perform a raster scan of the image, looking for a pixel that is a hole.
- If the pixel has at least 1 valid 8-connected neighbor, set its value to the average of its valid neighbors.
- Do NOT mark this pixel as valid - it should not be considered "known" for the remainder of this pass through the image.
- Repeat this process (re-raster scan) until no more pixels are invalid.

It is important that we do not mark pixels as known for the current iteration. This would lead to a bias towards the colors of known pixels that occur earlier in the raster scan order. Using our method, larger holes are filled from all sides simultaneously. If we had marked new pixels as known during each pass, holes would be filled in a "left to right, top to bottom" fashion.

3 Demonstration

Figure 1 shows an image with bright green pixels indicating invalid regions.



(a) Original image (b) Filled image

Figure 1: A demonstration of hole filling

4 Code Snippet

The interface to the code is very straight forward.

```
// Instantiate the hole filler class
```

```
SmallHoleFiller<ImageType> smallHoleFiller;

... read an image and pass it to the hole filler...
smallHoleFiller.SetImage(reader->GetOutput());

// Indiate which values in the image should be treated like holes
smallHoleFiller.SetHolePixel(holePixelValue);

// Perform the filling
smallHoleFiller.Fill();

// Write output
... setup a writer and pass it the output of the hole filler ...
writer->SetInput(smallHoleFiller.GetOutput());
```