



Poisson Matting

DIP PROJECT 2019

PROJECT ID: 45

<https://github.com/anushkawakankar/Poisson-Matting.git>

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Goal

Using Poisson matting to reconstruct a faithful matte from its approximated gradient field estimated from an input image semi-automatically.

Problem Definition

Matting refers to the process of extracting foreground object from an image. Matting is an important task in image and video editing. Matting tasks usually produces a "matte" that can be used to separate foreground from the background in a given image. Matte can also be used to combine a given foreground on a different background to produce a new plausible image.

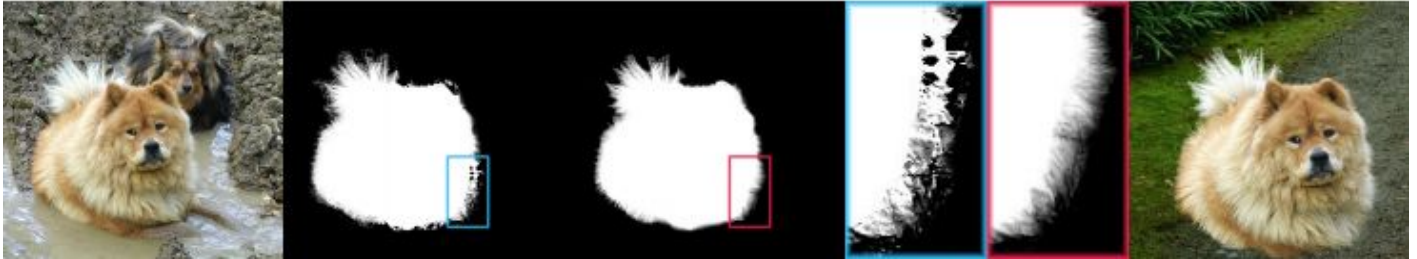
We formulate the problem of natural image matting as one of solving Poisson equations with the matte gradient field.

Experiments on many complex natural images demonstrate that Poisson matting can generate good matting results that are not possible using existing matting techniques.

The approach we follow to implement Poisson matting:-

1. A continuous gradient field is computed from the composite input image.
2. The matte is directly reconstructed from the matte gradient field by solving Poisson equations using boundary information from a user-supplied trimap.

3. By interactively manipulating the matte gradient field using a number of filtering tools, the user can further improve Poisson matting results locally until he or she is satisfied.
4. The modified local result is seamlessly integrated into the final result.



Results of Bayesian Matting vs Poisson Matting on the image.

Results of the Project

1. A high-quality matte generated from a complex image using Poisson matting
2. A composite image with the extracted foreground of the original image
3. A composite image with the foreground placed on a different background



In clockwise order, starting from the top left :

1. Original composite image
2. High-quality matte generated by Poisson matting
3. A composite image with the extracted koala and a constant-colour background
4. Composite image with the extracted koala and a different background. (our final result)

Milestones of the Project and Expected Timeline

In image composition, a new image $I(x, y)$ can be blended from a background image $B(x, y)$ and a foreground image $F(x, y)$ with its alpha matte $\alpha(x, y)$ by the matting equation ((x,y) arguments deleted for clarity):

$$I = \alpha F + (1 - \alpha)B$$

We plan on implementing Global Poisson matting, a semi-automatic approach to approximate matte from an image gradient given a user-supplied trimap.

Dates	Plan of action
20th October	<p>Compute approximate gradient field of matte from the input image.</p> <ul style="list-style-type: none"> In order to get an approximate gradient field of matte, we take the partial derivatives on both sides of the matting equation: $\nabla I = (F - B)\nabla\alpha + \alpha\nabla F + (1 - \alpha)\nabla B$ This is the differential form of the matting equation, for R, G and B channels individually.
30th October	<p>Obtain the matte from the gradient field by solving Poisson equations</p> <ul style="list-style-type: none"> We can get an approximate matte gradient field as follows: $\nabla\alpha \approx \frac{1}{F - B}\nabla I$ Hence, the matte gradient is proportional to the image gradient.
5th November	Integration and Testing