Single Image Motion Deblurring Using Transparency

Dependencies :-

1) Numpy
2) Scipy
3) Opencv-python
4) Skimage

Alpha Matte :-

Our work starts with estimating the foreground and background regions, as well as the foreground opacity which is called the alpha matte.
The user needs to specify the path to the image and to the trimap image in matte.ipynb file (or closed_form_matting.py, if using python interface).
The trimap image has to be created by the user. Or, the user may provide the scribble on the original image for prior.

Dataset: Many images were picked from kaggle blurred image dataset: https://www.kaggle.com/kwentar/blur-dataset. We additionally did experiments from images provided in the paper and other sources.

The output images are passed onto the optimization stage.

Optimization :-

1. Function “Filter_size” takes an alpha matte image and returns upper bounds for width and height of the filter to be used in the optimization algorithm.
2. Patches from the blurred image have to be selected and the optimization has to be applied on them separately. This offers considerable efficiency and better estimation of the filter.
3. Two inner functions loss and gradient are defined to be used in the gradient descent algorithm.
4. Estimated filter values are returned by the gradient descent and passed on to the Lucy_Richardson algorithm. Finally the unblurred output is plotted.
5. The hyperparameters for the optimizations are :-
    a. Learning rate.
    b. Number of epochs.
    c. LR iterations.

    d. Filter size.
6. Since filter size returns an upper bound, sometimes for larger images/patches it requires a lot of iterations. We can apply some heuristics to reduce the filter size by observing the filter, and removing the rows, and columns that are not changing.
7. example1.ipynb and example2.ipynb have the working model.

Lucy-Richardson

1. Lucy-Richardson is used to deconvolve the estimated filter from the blurred image to get an unblurred image.
2. Richardson lucy proposed function have some parameters :
    a. Image : Blurred image which is to be deconvolved.
    b. PSF   : Point Spread Function.
    c. Iterations
    d. Clip