
Artificial Bokeh Blur for Portrait Imaging using Depth Estimation

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1 Objective

The project aims at simulating an Artificial Bokeh blur with the help of Depth estimation.

2 Motivation

High-quality portrait photography often features a special kind of background blur, called Bokeh. Its nature originates from the shape of camera lenses, aperture, distance to background objects, and their distinctive light and shadow patterns. Many of today's amateur photographers need to create artistic photos on a budget. One of the convenient ways this can be achieved is through the use of post processing toolkits. These toolkits provide a variety of features such as blurring, bokeh, patching, and many more. The creation of these toolkits fall under computational photography, and are an ever-growing research field. As well as generating new toolkits, there are also active efforts to improve existing ones and to use new approaches in order to get better results or make the tools easier/simpler to use. This lowers the barrier for entry and allows more people to get involved in the field of photography.

3 Related work

Current research in this field basically discuss bokeh effect as a post-processing technique in rendering like Wu et al. [Wu+12]; Moersch and Hamilton [MH14]. Yu [Yu04]; Liu and Rokne [LR12]; McIntosh, Riecke, and DiPaola [MRD12]. This is different from our approach. Yan, Tien, and Wu [YTW09] are most similar to our approach, as they are concerned not only with bokeh computation, but also with foreground-background segmentation. They use a technique called "lazy snapping". Other methods have explored various kinds of Gaussian blurring. It is in fact wrong to use a Gaussian blur (like [GK07] do) as the resulting image is too soft. We shall perform a more detailed literature survey over the existing methods of Bokeh creation and shall look forward to also make a comparative study over the different methods vs ours.

4 Project Overview

Currently, there are many different approaches to apply artificial Bokeh in post processing. Two of the most popular methods utilize either a measured depth ground truth map, or stereo pairs to infer a depth ground truth map. The second method has gained wide spread adoption recently due to Google's deployment in its new camera technology. [1] We haven't yet decided on the exact algorithms to come up with the depth maps. Luckily, computational photography problems often have a wealth of information to mine for patterns. As such, Saxena et al. have developed a depth estimator for monocular images. Their work was crucial to our work as it provided a solid foundation for generating approximate depth maps. After these depth maps are estimated the we would like to defocus the images based on the depth map in order to create a Bokeh that is not as sharp as that of the Gaussian blurring.

5 Timeline and Milestones

1. Literature survey existing implementation: 18th Feb 2020
2. Familiarize with Depth estimation techniques: 25th Feb 2020
3. Creating the Artificial Bokeh Blur using the Depth map: 9th Mar 2020
4. Poster and Report work: 11th Mar 2020

6 References

- [1] <https://jonbarron.info/BarronCVPR2015.pdf>
- [2] <http://www.cs.cornell.edu/asax-ena/learningdepth/NIPSLearningDepth.pdf>
- [3] Friedrich, Nadine et al. "Faking It : Simulating Background Blur in Portrait Photography using a Coarse Depth Map Estimation from a Single Image." (2018).
- [4] https://web.stanford.edu/class/ee368/Project_Autumn_1617/Reports/report_gong_liu_vukkadala.pdf