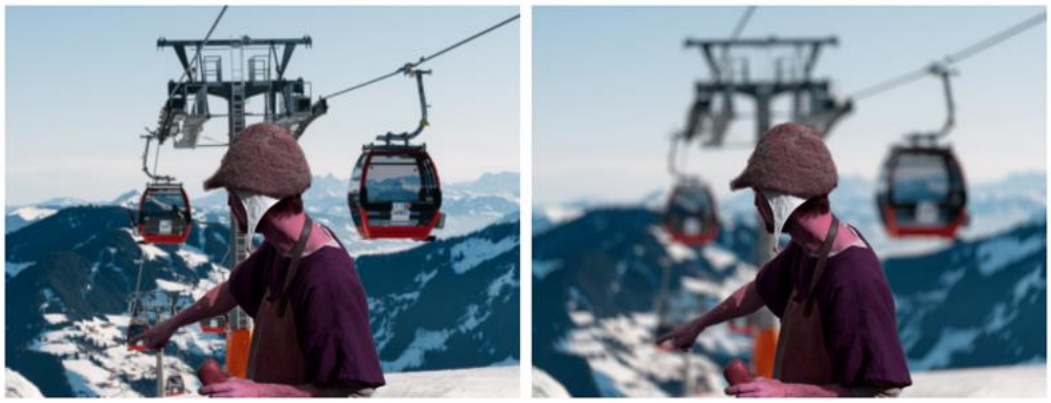
Simulate Aperture Control on All-in-Focus Image



Background

Photography captures light through a lens to create images, with elements like aperture, shutter speed, and ISO affecting exposure, depth of field, and clarity. Depth of field (DOF) defines how much of the image appears in focus, and a shallow DOF creates a popular "bokeh" effect, where the subject stands out against a softly blurred background. Achieving such effects typically requires a DSLR camera, as it provides flexible control over settings and has larger sensors and interchangeable lenses, allowing for more dramatic depth control. However, mobile cameras, limited by smaller sensors and fixed lenses, often produce a deeper DOF, keeping most of the image in focus. Regardless of the initial capture method, users might wish to apply the “bokeh” effect on their photos after capturing them. By providing adjustable aperture and lens settings, this project aims to enable users to create DSLR-like aesthetics, such as smooth background blur, making high-quality visual effects accessible to a broader audience.

Problem Specification

This project addresses the challenge of recreating realistic bokeh effects in post-processing. Using a single all-in-focus image, it aims to simulate various aperture settings and lens types to generate a natural background blur effect. The project will implement a GUI app where users can upload an image, adjust aperture settings, and select lens options to produce the desired depth of field. By leveraging models like EBokehNet or other models identified in a literature review, the app will apply the chosen effect, rendering a image with DSLR-quality bokeh.

Suggested Method

The project will involve developing a user-friendly GUI application where users can upload an image and select desired aperture and lens settings. The selected model, such as EBokehNet or other suitable options from the literature, will process the image to add bokeh effects according to the specified parameters. The application will support multiple lens and aperture configurations, enabling users to experiment with varying depths of field and simulate the look of different lenses. Evaluation criteria will include realism of the generated bokeh effect and processing speed. The generated results will be compared against the ground truth images taken from the identified dataset.

Relevant Articles

[1] Seizinger, T., Conde, M.V., Kolmet, M., Bishop, T.E. and Timofte, R., 2023. Efficient multi-lens bokeh effect rendering and transformation. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. (GitHub)

[2] Conde, M.V., Kolmet, M., Seizinger, T., Bishop, T.E., Timofte, R., Kong, X., Zhang, D., Wu, J., Wang, F., Peng, J. and Pan, Z., 2023. Lens-to-lens bokeh effect transformation. NTIRE 2023 challenge report. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. (GitHub)

[3] Ignatov, A., Patel, J. and Timofte, R., 2020. Rendering natural camera bokeh effect with deep learning. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops. (GitHub)

[4] Purohit, K., Suin, M., Kandula, P. and Ambasamudram, R., 2019, October. Depth-guided dense dynamic filtering network for bokeh effect rendering. In 2019 IEEE/CVF International Conference on Computer Vision Workshop (ICCVW) IEEE. (GitHub)

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