June 2022

# Draggable Light Ring for Enhanced Post-Capture Portraiture

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## ABSTRACT

Professional photographers create attractive portraits by using specialized equipment such as off-camera flashes, ring lights, reflectors, etc. Their photographic expertise enables them to capture their subjects with illumination at just the right angle and intensity. This disclosure describes techniques to simulate a directional light source on portraits at any time post-capture. The simulated light source can heighten the depth-of-field and enhance facial contours, resulting in a studio-quality look. The techniques enable any user of a smartphone or other camera to obtain portrait photographs that emulate high quality professional portrait photographs by automatic and dynamic adjustment of the lighting in the image.



## KEYWORDS

- Light ring
- Portrait
- Computational illumination
- Computational optics
- Reflectance field
- Machine learning


## BACKGROUND

Professional photographers create attractive portraits by using specialized equipment such as off-camera flashes, ring lights, reflectors, etc. Their photographic expertise enables them to capture their subjects with illumination at just the right angle and intensity. Although preset filters in various applications used for photo editing provide users with alternative lighting conditions, these don’t generally enable the free or dynamic control of light.

DESCRIPTION

This disclosure describes techniques to simulate, after capture, a directional light source on portraits. The simulated light source can heighten the depth-of-field and enhance facial contours, resulting in a studio-quality look.

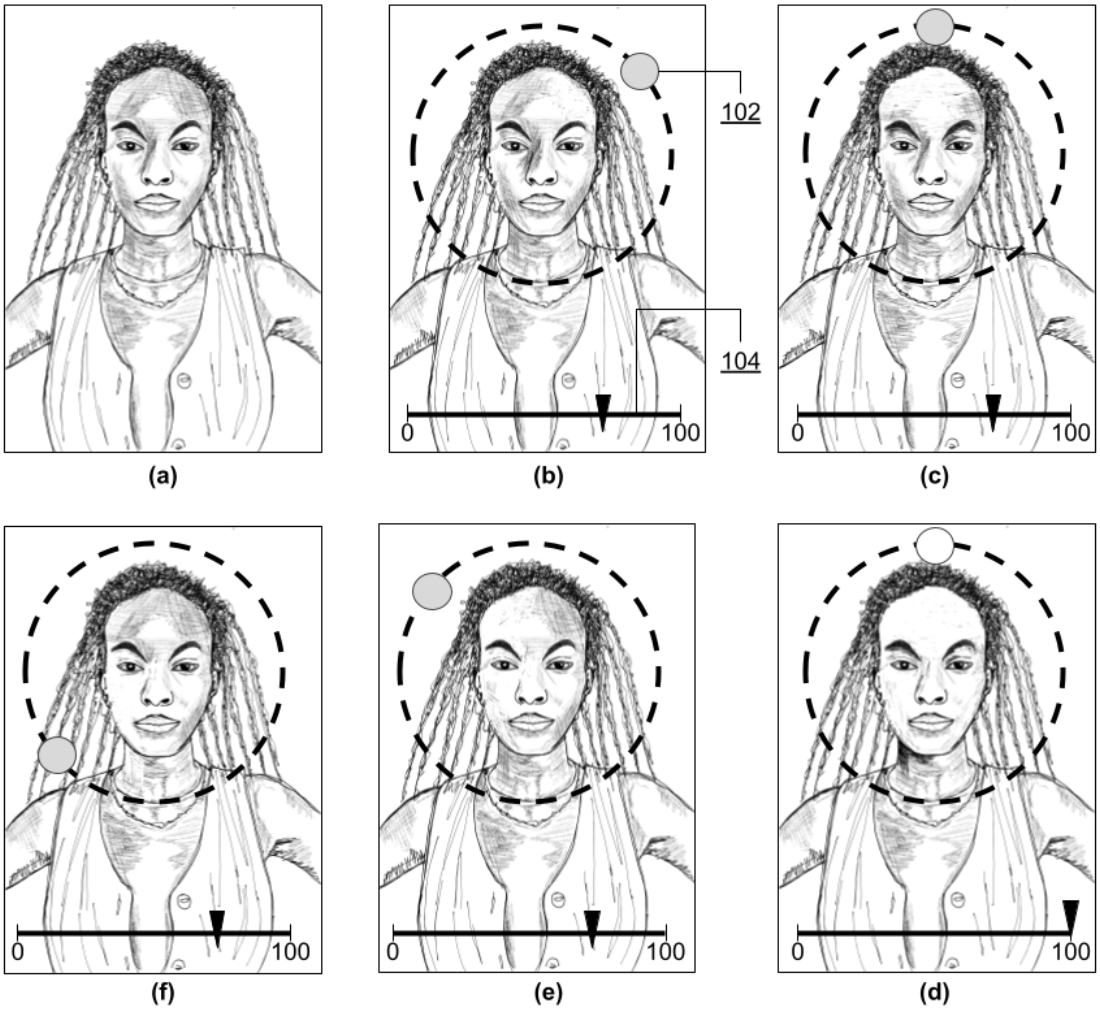


**Fig. 1: Draggable light ring for enhanced post-capture portraiture**

Fig. 1 illustrates a draggable light ring for enhanced post-capture portraiture. Fig. 1(a) illustrates an original captured portrait. Per the techniques, a simulated light source (102, Fig. 1b) can be placed at a certain depth within the image. The light source can be moved by the user, e.g., by dragging or via tapping-to-place.

An intensity adjuster, e.g., in the form of a slider, (104) can be provided to enable the user to adjust the intensity of the light source. The depth of placement of the light source, its intensity, and the range of its intensity can be determined automatically using techniques of machine learning or computational illumination. Having set the depth and intensity to initial, automatically determined values, the user can manually reposition the light source and adjust its intensity to suit their preference. The image is automatically adjusted based on the user selection to provide the corresponding lighting effect on the subject. The automatic calculation of the depth and intensity ranges ensures the user's manual adjustments result in an image that is neither too dark nor too bright.

By moving the light source and by changing its intensity, a variety of artistic or aesthetically pleasing effects can be achieved. For example, when the light source is placed on the right of the subject (Fig. 1b), the right half of the subject's face becomes relatively well-lit, and the subject's nose casts a longer, deeper shadow, thus gaining visual depth. When the light source is moved to the top (Fig. 1c), the forehead increases in brightness.

In Fig. 1(d), the slider is used to increase the intensity of the simulated light, causing a general brightening of the face, in particular of the forehead (due to the top-of-face placement of the light source). The shadow of the head on the neck darkens. In Fig. 1(e), the intensity of the simulated light is reduced, and its position moved to the left of the subject. The left half of the face appears brighter; in particular, the nasal shadow is partially canceled. In Fig. 1(f), the light source is moved to the bottom left of the subject, causing the brightening of the lower left of the face and the neck.


**Fig. 2: Surfacing the light ring feature**

Fig. 2 illustrates an example technique for surfacing the light ring feature in the user interface of a smartphone photo editing application. The feature can be surfaced (202), e.g., as one of the image-processing filters provided to the user to adjust an image. A button (204) can be added such that, when activated, the light source is automatically placed at a position and intensity that optimizes the aesthetic appeal of the portrait. The optimal position and intensity of the light source can be based on the content of the image and can be determined by machine learning techniques. Upon activating the light ring feature, the user interface displays a modified

image based on a light at the position and intensity that optimizes aesthetic appeal. The user can choose to accept the modified image or make further adjustments.

In this manner, the described techniques enable any user of a smartphone or other camera to obtain portrait photographs that emulate high quality professional portrait photographs by automatic and dynamic adjustment of the lighting in the image.

## CONCLUSION

Professional photographers create attractive portraits by using specialized equipment such as off-camera flashes, ring lights, reflectors, etc. Their photographic expertise enables them to capture their subjects with illumination at just the right angle and intensity. This disclosure describes techniques to simulate a directional light source on portraits at any time post-capture. The simulated light source can heighten the depth-of-field and enhance facial contours, resulting in a studio-quality look. The techniques enable any user of a smartphone or other camera to obtain portrait photographs that emulate high quality professional portrait photographs by automatic and dynamic adjustment of the lighting in the image.