

# LICENSING OPPORTUNITY

ETH transfer – Linking Science and Business

## Improved Photography by the Spatially Adaptive Flash

### Keywords

Photographic flash, Lighting, Spatial, color, Illumination, Photography, High-dynamic range

### Summary

The spatially adaptive flash unit consists of an illumination source, which can be varied in intensity and color. A beam-shaping layer (e.g. lens, or diffraction grating) is focusing the illumination in order to allow for a spatial illumination variation using only one flash unit.

### Background

Using a photographic flash for candid shots often results in an unevenly lit scene, in which objects in the back appear dark. The new spatially adaptive flash unit alleviates problems of reduced illumination of distant scene parts, avoids overexposure due to spatially dependent light attenuation, and projects spatially dependent colored light for mood lighting or textured projection.

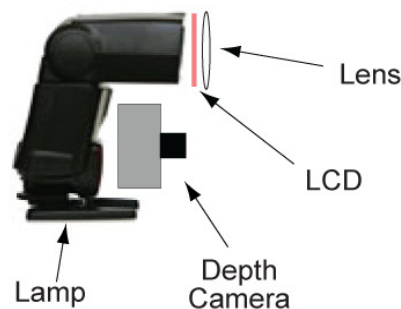


### Invention

To accommodate dark scenes, most digital cameras include electronic flash - either integrated with the camera or in a detachable unit. More expensive units offer control over brightness, duration, and angular spread. Regardless of how these parameters are chosen, flash illumination always falls off sharply with distance from the camera, making most flash pictures look unnatural.

We solve this problem by changing the physical illumination of the scene on a pixel-by-pixel basis. Our system employs an infrared time-of-flight rangefinder to determine the distance to each object, and a LCD and a lens to modulate the illumination. The light can thus be adjusted for every point of the scene allowing to take a snapshot in a single click.

A simpler setup not including the rangefinder can be achieved by using inputs from various sensors and processing stages of the camera, such as face recognition or color adjustment information. Regions of interest can be lit in a custom way, i.e. specific faces can be highlighted, or scenes with candles can be lit with a warm mood light.



Conceptual Prototype

### Patent Status

- Patent pending PCT

### Features & Benefits

- Even lighting of a scene
- Multiple intensity flash
- Compact technology as add-on to SLR cameras
- Artistic/theme lighting
- Noise reduction
- Improvement in flash photography

Almost all innovations in the camera industry are focused on the way to capture and process light. However, current flash lighting is still limited to the control over brightness, duration, and angular spread. This simple and compact extension to a spatially adaptive flash unit has opportunities in a wide range of applications.

### Field of Application

- Camera industry for single lens reflex (SLR) cameras and digital SLR cameras
- The technology can be further developed as an integrated version into compact cameras
- Potential for video applications

### References

- Spatially Adaptive Photographic Flash, R. Adelsberger, R. Ziegler, M. Levoy, M. Gross - Technical Report Nr.612, ETH Zurich, Switzerland. <ftp://ftp.inf.ethz.ch/pub/publications/tech-reports/6xx/612.pdf>

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