# 論文の内容の要旨

論文題目　Multiplexed Photographic Exposures By Coded Aperture For High Dynamic Range Imaging（高ダイナミックレンジ撮像のための符号化開口を用いた多重露光法の研究）

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This dissertation proposes a new technique for the acquisition of high dynamic range images. The most common way of capturing a scene that has a dynamic range larger than the sensor of the camera is capable of capturing is called bracketing. Bracketing has the advantage of simplicity but it is time demanding. Often three or more exposures are necessary to cover the full dynamic range of the scene. Depending on the light conditions of the target, the bracketing exposures may take an impractical long time.

By using the proposed method, the number of shots required to capture the dynamic range of the scene can be reduced to only one. This is possible by multiplexing many exposures into one shot only. In order to achieve this objective, coded apertures are used.

Coded apertures consist of masks that are placed in the path of light. These special apertures have transparent, opaque and semi-transparent elements. Depending on the organization of these elements, different effects can be obtained.

The current method uses the coded apertures to split the scene into different exposures, each with a different exposure value associated to it. The exposures are multiplex on the sensor of the camera. The sensor is an unmodified sensor and it captures the coded image with full resolution.

It is up to post-processing software to decode the exposures from the single image that was captured. This process is largely dependent upon the deconvolution technique that is used. The captured image is actually a superposition of the many exposures, following the spatial code determined by the coded aperture. By using the inverse code correspondent to each of the channels, it is possible to recover each exposed photo individually.

There are many advantages to this method, including: higher dynamic range, customizable width of the dynamic range, faster shooting time, the use of the full resolution of the sensor, relatively inexpensive, simple hardware, and the increased signal-to-noise ratio naturally created by the use of the coded apertures.

Disadvantages are also present, including: the necessity of added hardware, coding-decoding errors, difficulty of decoding, and the impossibility of obtaining one clear shot without decoding.