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# Image Contrast Enhancement Based on Intensity Expansion-Compression

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## Abstract

In most image based applications, input images of high information content are required to ensure that satisfactory performances can be obtained from subsequent processes. Manipulating the intensity distribution is one of the popular methods that have been widely employed. However, this conventional procedure often generates undesirable artifacts and causes reductions in the information content. An approach based on expanding and compressing the intensity dynamic range is here proposed. By expanding the intensity according to the polarity of local edges, an intermediate image of continuous intensity spectrum is obtained. Then, by compressing this image to the allowed intensity dynamic range, an increase in information content is ensured. The combination of edge guided expansion with compression also enables the preservation of fine details contained in the input image. Experimental results show that the proposed method outperforms other approaches, which are based on histogram divisions and clippings, in terms of image contrast enhancement.

*Keywords:* Contrast enhancement, Information content, Expansion-compression

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## 1. Introduction

Features perceived from a scene are valuable sources of information for many human activities. This is also true when an increasing number of autonomous machines are being deployed for industrial applications. The use of images in computerized intelligent systems can be found in robotic welding [1], object detection [2], aerial surveillance [3], remote sensing of the environment [4], data security [5], and others.

Many approaches make use of image local characteristics to carry out the contrast enhancement process. An example is the un-sharp masking filter that enhances the sharpness of captured objects by extracting edges and then superimposing them on the original image [6]. Another recent approach does not use local features but rather employs a global manipulation strategy. It treats contrast enhancement as an optimization problem such that the image intensities are iteratively adjusted according to a power law for

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