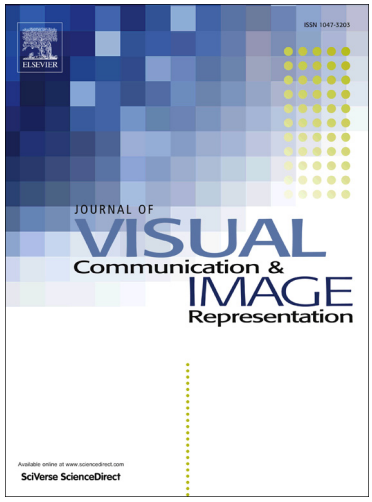


# Contrast Enhancement of Noisy Low-Light Images Based on Structure-Texture-Noise Decomposition

Jaemoon Lim, Minhyeok Heo, Chul Lee, Chang-Su Kim

PII: S1047-3203(17)30060-3
DOI: http://dx.doi.org/10.1016/j.jvcir.2017.02.016
Reference: YJVCI 1967

To appear in: *J. Vis. Commun. Image R.*

Received Date: 7 July 2016
Revised Date: 13 January 2017
Accepted Date: 21 February 2017

Please cite this article as: J. Lim, M. Heo, C. Lee, C-S. Kim, Contrast Enhancement of Noisy Low-Light Images Based on Structure-Texture-Noise Decomposition, *J. Vis. Commun. Image R.* (2017), doi: http://dx.doi.org/10.1016/j.jvcir.2017.02.016

# Contrast Enhancement of Noisy Low-Light Images Based on Structure-Texture-Noise Decomposition

Jaemoon Lim[a], Minhyeok Heo[b], Chul Lee[c], Chang-Su Kim[b,*]

[a] *Samsung Electronics Co., Ltd., Korea*
[b] *School of Electrical Engineering, Korea University, Seoul, Korea*
[c] *Department of Computer Engineering, Pukyong National University, Busan, Korea*

**Abstract**

A noisy low-light image enhancement algorithm based on structure-texture-noise (STN) decomposition is proposed in this work. We split an input image into structure, texture, and noise components, and enhance the structure and texture components separately. More specifically, we first enhance the contrast of the structure image, by extending a 2D-histogram-based image enhancement scheme based on the characteristics of low-light images. Then, we reconstruct the texture image by retrieving residual texture components from the noise image and enhance it by exploiting the perceptual response of the human visual system (HVS). Experimental results on both synthetic and real-world images demonstrate that the proposed STN algorithm sharpens the texture and enhances the contrast more effectively than conventional algorithms, while providing robust performance under various noise and illumination conditions.

*Keywords:* Image enhancement, contrast enhancement, structure-texture-noise decomposition, noise removal, denoising, texture retrieval, texture enhancement.

*Corresponding author
*Email addresses:* jaemoon.lim@samsung.com (Jaemoon Lim), mhheo@mcl.korea.ac.kr (Minhyeok Heo), chullee@pknu.ac.kr (Chul Lee), changsukim@korea.ac.kr (Chang-Su Kim )