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A DATA HIDING SCHEME FOR HIGH DYNAMIC RANGE IMAGES

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Abstract. *This paper proposes a data hiding method for high dynamic range images with the LogLuv encoding format. To the best of our knowledge, this is the first data hiding algorithm developed in the literature for such an HDR format. Our scheme considers both the luminance channel and two chromatic channels when we embed a secret message. This allows us to conceal up to 6 bits of secret messages in the luminance channel with floating point representation and 10 bits of secret messages in each chromatic channel with integer representation. Consideration of the luminance and chromatic channels allows our scheme to be able to provide the embedding capacity of 26 bits per pixel, which is the magnitude of* $3.42 \sim 3.46$ *times over the current state-of-the-art HDR data hiding algorithm. Still, our method can produce a low distortion HDR image and a visually pleasing tone-mapped low dynamic range image. Experimental results confirmed that our algorithm can embed and extract secret messages correctly without referring to the original cover HDR image. The proposed algorithm is simple, efficient and feasible for hiding secret messages in an HDR image.*

Keywords: Data hiding, High dynamic range images, LogLuv encoding, RGBE encoding

1. **Introduction.** Transmission of private information in a secret manner through the Internet has become more frequent due to the prevalence of Internet and computer science. This trend encourages researchers to investigate techniques for covert communication such as the system of cryptography. Data hiding, also known as steganography, provides an alternative solution to achieving the goal of covert communication [1]. A data hiding algorithm conceals secret messages within a carrier object, also known as a "cover medium", which may be in the form of emails, audio files, video files, images or even 3D models [2]. The sender first embeds the secret message into the cover medium which produces the stego medium. Then, the stego medium is delivered to an intended receiver through a public channel. This allows the receiver to extract the secret message from the cover medium. Consequently, other than the sender and the receiver, no one is able to determine that a secret message has been hidden in the stego medium.

Digital images are the most widely used media on the Internet with an application such as image enhancement [3]. A number of data hiding algorithms have been developed which use digital images as the cover media for message embedding [4-8]. In recent years, there has been an explosion of interest in high dynamic range (HDR) images [9]. The "dynamic range" of a scene is the contrast ratio between its brightest and darkest parts. High dynamic range images represent luminance values using floating-point numbers for a scene. A set of advanced imaging techniques have been investigated that allow a far greater dynamic range of exposures than the normal digital imaging techniques. The scenario