

## MULTILEVEL REVERSIBLE DATA HIDING USING MODIFICATION OF PREDICTION ERRORS

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**ABSTRACT.** *Histogram shifting is a popular reversible data hiding technique where image distortion is low. However, it is limited by smaller hiding capacity. In this paper, a high payload scheme is proposed for a histogram shifting reversible data hiding which is based on multilevel modification of prediction errors. For any 8-bit grayscale image, only a small amount of side information had to be recorded for each embedding level. The side information is the key for retrieving the hidden data and restoring the original image. Experimental results showed that the proposed method outperformed other reversible hiding methods in terms of embedding capacity and imperceptibility.*

**Keywords:** Reversible data hiding, Histogram-shifting, Multilevel data hiding, Error modification

1. **Introduction.** Data hiding or steganography is a technique that conceals the existence of information into digital carriers such as digital text, image and video [1]. Generally, the distortions from data hiding must not be detectable by raw eye visions; that is, the stego-image (image with hidden data) should not appear different from the original image.

Some data hiding techniques modified the pixel values of the image which resulted in permanent distortions. Data hiding of this type is referred to as lossy data hiding. However, many applications, such as law enforcement, military and medical, have strict requirements for reversible data hiding techniques. Reversible data hiding not only allows messages to be concealed in cover images, but also allows the images to be restored to their original state after extracting the embedded messages [2, 3].

Until recently, there was relatively little literature investigating reversible data hiding methods. Fridrich et al. [4] proposed a method for reversible data hiding that embedded message bits together with compressed group of pixels. The original image groups were losslessly compressed, and embedded together with the message bits into the cover images.