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AN SVD ORIENTED WATERMARK EMBEDDING SCHEME WITH HIGH QUALITIES FOR THE RESTORED IMAGES

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Abstract. *Considering Chang et al.'s SVD-based watermarking scheme, which successfully embeds watermarks into images, and its hidden watermarks can resist various attacks. In this paper, we further extend their idea so that the hidden watermarks can be removed to provide authorized users better image quality for later usage after the ownership of purchased images has been verified. To achieve our objective, we modify their embedding strategy, and the extra information required for later restoration is embedded into the least important non-zero coefficients of the S matrices in the image. Experimental results confirm that our scheme not only provides good image quality of watermarked images but also successfully restores images with high restoration quality.*
Keywords: Watermark, Singular value decomposition, Intellectual property rights, Removable watermarking, Restored images

1. **Introduction.** Owing to the progress in information technologies and the growth of the Internet, vast amounts of data such as text and images have been digitized for easy storage, processing and transmission over the Internet. To prevent the transmitted data from being tampered with or grabbed from the Internet, two approaches have been proposed over the past decade. One is legislation that forces violators to pay stiffer penalties for illegal cribs and manipulations. The other one is based on information technologies such as watermarking, copy detection or digital signatures. By using watermarking, the original owners of digital media can embed their own logos such as portraits or trademarks or even secret information into their works. Later, the embedded logos or secret information can be easily extracted by the real owners or authorized users who have the necessary confidential data, also called keys, to prove ownership.