

Reversible watermarking for digital images

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Every picture tells a story, but how do you know that a digital photo has not been manipulated to change the tale being told? A new approach to adding an encrypted watermark to digital images allows the an image to be validated against a pass key, according to research published in the *International Journal of Signal and Imaging Systems Engineering*.

Visible watermarks are routinely added to <u>digital images</u> as a form of copy protection, but their presence essentially destroys the picture, obliterating information within altered pixels in a way that cannot be reversed. Now, Dakshinamurthi Sivakumar and Govindarajan Yamuna of Annamalai University, in Tamil Nadu, India, have developed a new, reversible watermarking scheme. The system could be used initially for the authentication of military images.

Inexpensive image editing software is now available that can be used to make essentially undetectable "photo realistic" changes to almost any photograph, the team explains. In a military setting it is important to prevent unauthorized manipulation of digital images and to be able to demonstrate credibility and provenance.

"Traditionally, source authentication and integrity verification of digital data have been carried out with <u>digital signatures</u> and encrypted watermarks," the team says, "Unfortunately, watermarking techniques modify original data as a modulation of the watermark information and unavoidably cause permanent distortion to the original data." Reversible, or lossless, watermarking is therefore required for many highly sensitive applications.



The team has now developed a reversible watermarking system based on calculating the parameters of every pixel in the image but nevertheless at low computer power. This information is converted into a code, a Hash Message Authentication Code (HMAC), of the image where distinct pixel values are selected for embedding watermark bits and the preferred pixel values are stored as a key. The key thus generated is used for both the watermark extraction and restoration of the original image. The extracted HMAC and the HMAC of the restored image can be compared to verify that the received image is authentic and has not been altered.

More information: "Novel reversible watermarking scheme for authentication of military images," Int. J. Signal and Imaging Systems Eng, Vol. 2, 134-140

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