

# **IMPROVED IMPLEMENTATION OF DIGITAL WATERMARKING TECHNIQUES**

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WATERMARKING TECHNIQUES

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*Dedicated to my family.*  
*Thank you for your perseverance*

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Praise be to God, who sent his messenger with guidance and the religion of truth to proclaim it over all religions, and make it a good example for those who had hope for Allah, then praise be to God Almighty whom through his will and his grace that supported the completion of this work.

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Ahmed

## ABSTRACT

With the advancement of high speed computer networks, multimedia storage and transmission technology, an enormous amount of information is being communicated in digital form. There is a constant threat to copyright, ownership and integrity of digital data. Therefore information security has become an emerging area of research. Security of images is an area of major concern as digital images are available all over World Wide Web. Numerous watermarking techniques have been developed to protect images from illegal manipulations. In this project, spatial domain and transform domain have been proposed. Histogram shifting falls under the spatial domain method and spread spectrum falls under transform domain method. For the proposed Histogram Shifting, modification of the histogram and shifting is applied for embedding the stage, add to that our contribution in this method incorporated the threshold concept to improve the visual quality of the host image. In the proposed Spread Spectrum, a chaos-based spread spectrum watermarking algorithm is developed in the DCT domain for still image. The most significant feature of chaos is its sensitivity to initial conditions. This characteristic of chaos has been used successfully for secure watermarking applications. Local properties of the image and the features of the human visual system are considered in order to optimize the watermark strength in addition to the incorporated luminance masking effect of the HVS in the masking image, since the human eye is less sensitive to change in regions with high brightness as well as in very dark regions in comparison to mid-grey regions, where the distortion is most noticeable. The contribution only uses luminance masking for enhancing the visual quality of images in the embedding stage instead of using a combination of different masks and that leads to less complexity. The performance of the proposed watermarking schemes have been evaluated by using the watermarked images of size  $512 \times 512$ , and the watermark (payload) is of the same size as the host image in the spread spectrum with a different amount of variables "random bit streams" used in the histogram sniffing. The simulations are performed in MATLAB 7 software environment. The PSNR metric and SSIM with GMSD are applied to measure the degradation of the images. A comparison is made between the results of the proposed algorithms with each other and also compared with the best method namely Bit Plane Mapping and demonstrates that the proposed methods are superior in performance and especially the proposed Spread Spectrum.

## ABSTRAK

Dengan kemajuan rangkaian komputer berkelajuan tinggi, storan multimedia dan teknologi transmisi, sangat banyak maklumat dikomunikasikan dalam bentuk digital. Terdapat satu ancaman berterusan kepada hak cipta, hak milik dan integriti data digital. Oleh itu keselamatan maklumat telah menjadi sesuatu penyelidikan yang baru muncul. Keselamatan imej adalah sesuatu bidang yang menjadi kebimbangan utama kerana imej digital boleh didapati di seluruh Jaringan Sejagat (World Wide Web). Banyak teknik tera air telah dibangunkan untuk melindungi imej dari manipulasi haram. Dalam projek ini, domain spatial dan perubahan domain telah dicadangkan. Peralihan Histogram berada di bawah kaedah domain ruang dan spektrum penyebaran berada di bawah kaedah perubahan domain. Untuk Peralihan Histogram yang dicadangkan itu, pengubahsuaian histogram dan peralihan digunakan untuk membenamkan pentas, disamping sokongan tambahan dengan sumbangan kami dalam kaedah ini digabungkan dengan konsep ambang untuk meningkatkan kualiti visual imej perumah. Dalam Serakan Spektrum yang dicadangkan itu, spektrum penyebaran algoritma berasaskan huru-hara – tera air dibangunkan dalam domain DCT untuk imej pegun. Ciri yang paling ketara daripada algoritma huru-hara adalah kepekaannya terhadap keadaan awal. Ciri huru-hara ini telah digunakan dengan jayanya untuk aplikasi tera air yang selamat. Ciri-ciri imej tempatan dan ciri-ciri sistem visual manusia dipertimbangkan untuk mengoptimumkan kekuatan tera air sebagai tambahan kepada kesan pelitupan luminans HVS yang diperbadankan dalam pelitupan imej, kerana mata manusia adalah kurang sensitif terhadap perubahan di kawasan-kawasan dengan kecerahan tinggi dan juga di kawasan-kawasan yang sangat gelap berbanding dengan kawasan-kawasan separa kelabu, yang mana kesan herotan adalah yang paling ketara. Sumbangan ini hanya menggunakan pelitupan luminans untuk meningkatkan kualiti visual imej dalam peringkat pembenaman dan bukan menggunakan gabungan litupan-litupan yang berbeza dan yang membawa kepada kurang kerumitan. Prestasi skema tera air yang dicadangkan telah dinilai dengan menggunakan imej tera air bersaiz  $512 \times 512$ , dan tera air ( muatan ) adalah saiz yang sama dengan imej perumah dalam spektrum penyebaran dengan jumlah yang berbeza pembolehkan "sedikit rawak aliran" yang digunakan dalam penghiduan histogram. Simulasi dilakukan dalam persekitaran perisian MATLAB 7. Metrik PSNR dan SSIM dengan GMSD digunakan untuk mengukur penguraian imej. Perbandingan dibuat antara keputusan algoritma yang dicadangkan antara satu sama lain dan juga berbanding dengan kaedah terbaik iaitu Pemetaan Satah Bit dan menunjukkan bahawa kaedah yang dicadangkan adalah berprestasi unggul terutama Serakan Spektrum yang dicadangkan.