



( 1 )

# Image Coding Scheme Based on Object Extraction and Hybrid Transformation Technique

Usama S. Mohammed, Walaa M. Abd-elhafiez

## Abstract:

This paper describes an efficient object-based hybrid image coding (OB-HIC) scheme. The proposed scheme is based on using the discrete wavelet transform (DWT) in conjunction with the discrete cosine transform (DCT) to provide coding performance superior to the popular image coders. The proposed method uses combination of the object-based DCT coding and the high performance of the set partitioning in hierarchical tree (SPIHT) coding. The subband image data in the wavelet domain is modified based on the DCT and the object classification of the coefficient in the low-frequency image subband (LL). The modification process provides a new subband image data containing almost the same information of the original one but having smaller values of the wavelet coefficients. Simulation results of the proposed method demonstrate that, with small addition in the computational complexity of the coding process, the peak signal-to-noise ratio (PSNR) performance of the proposed algorithm is much higher than that of the SPIHT test coder and some of famous image coding techniques.

## Keywords:

Image compression; Region of interest (ROI); Image coding; Wavelet transform; Embedded coding; JPEG 2000; DCT; SPIHT; EZW.

## Published In:

International Journal of Engineering Science and Technology , Vol. 1, Issue. 5 , PP. 1375-1383



( 2 )

## Video coding approach based on arbitrary shaped-region motion estimation

Usama S. Mohammed

### Abstract:

This paper describes efficient video coding schemes based on arbitrary shaped-region motion estimation technique. The effect of the object based motion estimation on the video compression quality is introduced in this work. The approach is based on new arbitrary shaped-region motion estimation technique (ASRA). In the motion estimation process, the frames are segmented into moving regions and non-moving regions using four steps predictive procedure. To reduce the required operations for motion estimation, the searching technique will be performed for the moving regions only. Moreover, to ensure the robustness against the additive noise as well as reducing the computation time, the ASRA algorithm will be performed in the first level of the wavelet domain. It does not need to send any segmentation information to the decoder. The proposed video coding methods are applied on videos containing a variety of scenarios such as multiple objects undergoing occlusion, splitting, merging, entering and exiting, as well as a changing background. For all videos, the proposed approach displays higher Peak Signal to Noise Ratio (PSNR) compared to MPEG-4 methods, and provides comparable or better compression than most of the recent video coding techniques.

### Keywords:

Video-coding; image segmentation; object extraction

### Published In:

IEEE International symposinm on Signal Processing and Information Technology , ,



( 3 )

## Integrated Reader and Tag Anti-collision Protocol in RFID Systems based on Similar Topology Trees

Usama S. Mohammed and Mostafa Salah

### Abstract:

This paper describes a new fast anti-collision algorithm for Radio Frequency Identification (RFID) systems. An efficient protocol is introduced for anti-collision of tags and readers in multi-tag multi-reader environments. The proposed anti-collision protocol is based on constructing similar binary trees topology (STT) for all readers in the collision domain. The novelty of our protocol is the Parallel Binary Splitting (PBS) identification path that will be used in the tag identification process. All readers are synchronised to reply similar information and build similar binary trees topology. The identification time is divided among the tags and the readers. One bit reply will be sent sequentially (one-to-one bit dialog) in the identification process. The tags in the overlapped reader-region will be identified one time only. The integrated treatment of the collision problem provides minimum bit transmission with minimum overhead, higher throughput, and simple logic operation. Performed computer simulations have shown that the proposed collision recovery scheme is very fast and simple

### Keywords:

RFID, anti-collision protocol, tag collision problem, reader collision problem, binary tree protocol, parallel binary splitting, similar topology trees

### Published In:

Radio Frequency Identification Technology and Applications , ,



( 4 )

## -An SVM approach for activity recognition based on chord-length function shape features

S. Sadek, A. Al-Hamadi, B. Michaelis, and U. Sayed

### Abstract:

Despite their high stability and compactness, chord-length features have received little attention in activity recognition literature. In this paper, we present an SVM approach for activity recognition, based on chord-length shape features. The main contribution of the paper is two-fold. We first show how a compact computationally-efficient shape descriptor is constructed using 1-D chord-length functions. Secondly, we unfold how to use fuzzy membership functions to partition action snippets into a number of temporal states. When tested on KTH benchmark dataset, the approach achieves promising results that compare very favorably with those reported in the literature, while maintaining real-time performance.

### Keywords:

Human action recognition , chord-length function , shape features , video interpretation

### Published In:

IEEE International Conference on Image Processing , ,



( 5 )

## Image Object Extraction Based on Curvelet Transform

Usama Sayed, Mahmoud A. Mofaddel, Walaa M.Abd-Elhafiez and M. M. Abdel-gawad

### Abstract:

Image-object extraction is one of the most important parts in the image processing. Object extraction is the technique of extracting objects from the pre-processed image in such a way that within  $\square$  class similarity is maximized and between  $\square$  class similarity is minimized. In this paper, a new method of extracting objects from grey scale static images using Fast Discrete Curvelet Transform (FDCT) via wrapping function is proposed. The motivation of using the curvelet transform in the proposed method is due to the approximate properties and the high directional sensitivity of this transform. An imaginary component of the curvelet coefficients to extract the object in the image is used. Firstly, the Curvelet transform is applied on the input image. Secondly, the Canny edge detector is applied on the edge image in all sub bands in the curvelet domain. Thirdly, the inverse of Curvelet transform is applied and finally; morphological filters are used to extract objects from the obtained binary image. Experimental results of the proposed method are compared with the results of extracting objects in the wavelet domain and the pixel domain. Indeed, the curvelet have useful geometric features that set them apart from the wavelet and the pixel domain.

### Published In:

Applied Mathematics , vol.7, no. 1 , pp 1-6



( 6 )

## -A Novel Robustness Watermarking Scheme for Copyright Proving

Mohamed A. Abdel-Wahab, Hany Selim, and Usama Sayed

### Abstract:

In this paper, a new wavelet-based copyright proving scheme is proposed. The original image is not required for watermark verification. Moreover, the proposed scheme does not introduce any visual quality degradation into the original image; however, a feature is extracted from the original image and mixed with the watermark to generate a secret key. This secret key is registered for verification. The feature of the image is extracted from the approximation subband in the  $t$ -level of the wavelet decomposition. A series of experiments are conducted to prove the robustness property. The results show that this proposed scheme has high robustness under heavy image signal processing attacks and geometric transformation attacks. Moreover, the experimental results show that our scheme outperforms recent works in most cases.

### Keywords:

Copyright protection , discrete wavelet transform , image watermarking

### Published In:

International Conference on Computer Engineering & Systems (ICCES09), Ain Shams University, Cairo, Egypt , ,



( 7 )

# Novel Teeter-Totter 2-Axes MEMS Magnetometer with Equal Sensitivities

M. A. Farghaly, V. Rochus, X. Rottenberg, U. S. Mohammed and H. A. C. Tilmans

## Abstract:

In this paper, we demonstrate a novel 2-axes MEMS-based resonant magnetic field sensor. It is a compact magnetometer, build in a single MEMS layer, which measures the two in-plane components of magnetic field and this with equal relative sensitivity. Its principle of operation is based on Lorentz force acting on a current carrying conductor placed in a magnetic field  $B$ . The force is proportional to the magnetic field  $B$  and for this particular design it results in a torque exerted on the microstructure, resulting a rotation (teeter-totter) motion of the structure, which on its turns is translated into a differential capacitance. The proposed magnetometer design fits a chip area less than  $250[\mu\text{m}] \times 300[\mu\text{m}]$ . An analytical design approach is described to reach to the equal and maximal relative sensitivity. Using FEM simulations, A relative sensitivity  $3547[\text{T}^{-1}]$  was reached. The design makes that cross sensitivities between the 2-axes is as small as possible. Also, for the first time, we introduce an equivalent circuit of a torsional MEMS magnetometer. It was developed starting from the known transducers like electrodynamic and electrostatic transducers.

## Published In:

Eurosime 2013 conference Proc. , , 6



( 8 )

# Nonblind and Quasiblind Natural Preserve Transform Watermarking

G. Fahmy, M. F. Fahmy and U. S. Mohamed

## Abstract:

This paper describes a new image watermarking technique based on the Natural Preserving Transform (NPT). The proposed watermarking scheme uses NPT to encode a gray scale watermarking logo image or text, into a host image at any location. NPT brings a unique feature which is uniformly distributing the logo across the host image in an imperceptible manner. The contribution of this paper lies in presenting two efficient non-blind and quasi-blind watermark extraction techniques. In the quasi blind case, the extraction algorithm requires little information about the original image that is already conveyed by the watermarked image. Moreover, the proposed scheme does not introduce visual quality degradation into the host image while still being able to extract a logo with a relatively large amount of data. The performance and robustness of the proposed technique are tested by applying common image-processing operations such as cropping, noise degradation, and compression. A quantitative measure is proposed to objectify performance; under this measure, the proposed technique outperforms most of the recent techniques in most cases. We also implemented the proposed technique on a hardware platform, digital signal processor (DSK 6713). Results are illustrated to show the effectiveness of the proposed technique, in different noisy environments.

## Keywords:

NULL

## Published In:

EURASIP Journal of advances on Signal Processing, volume 2010, ID. 452548 , NULL , NULL



---

( 9 )

# Signal Denoising and Image Compression Using Bspline Wavelets

Mamdouh F. Fahmy, Gamal F. Abdel Raheem, Osama S Mohammed, Omar F. Fahmy, G. Fahmy

## Abstract:

NULL

## Keywords:

NULL

## Published In:

IEEE International Symposium for Signal Processing and Information Technology, ISSPIT, Sarajevo, Dec. 2008 , NULL , NULL



---

( 10 )

# Watermarking via Bspline Expansion and Natural Preserving Transforms

M. Fahmy, G. Raheem, O. Mohammed, O. Fahmy and G. Fahmy

## Abstract:

NULL

## Keywords:

NULL

## Published In:

IEEE International Symposium for Signal Processing and Information Technology, ISSPIT, Sarajevo, Dec. 2008. , NULL ,  
NULL



---

( 11 )

## Natural preserving transform watermarking technique

M.F. Fahmy, G. Abdel Raheem, U. S. Mohamed+ , Omar F. Fahmy and G. F. Fahmy

### Abstract:

NULL

### Keywords:

NULL

### Published In:

26th National Radio Science Conference, C32, Future University, Egypt, March 2009 , NULL , NULL



( 12 )

# Compressive Sensing Approach in Multicarrier Sparsely Indexing Modulation Systems

Mostafa Salah1 , Osama A. Omer2,4, Usama S. Mohamed3

## Abstract:

recently the indexed modulation (IM) technique in conjunction with the multi-carrier modulation gains an increasing attention. It conveys additional information on the subcarrier indices by activating specific subcarriers in the frequency domain besides the conventional amplitude-phase modulation of the activated subcarriers. Orthogonal frequency division multiplexing (OFDM) with IM (OFDM-IM) is deeply compared with the classical OFDM. It leads to an attractive trade-off between the spectral efficiency (SE) and the energy efficiency (EE). In this paper, the concept of the combinatorial modulation is introduced from a new point of view. The sparsity mapping is suggested intentionally to enable the compressive sensing (CS) concept in the data recovery process to provide further performance and EE enhancement without SE loss. Generating artificial data sparsity in the frequency domain along with naturally embedded channel sparsity in the time domain allows joint data recovery and channel estimation in a double sparsity framework. Based on simulation results, the performance of the proposed approach agrees with the predicted CS superiority even under low signal-to-noise ratio without channel coding. Moreover, the proposed sparsely indexed modulation system outperforms the conventional OFDM system and the OFDM-IM system in terms of error performance, peak-to-average power ratio (PAPR) and energy efficiency under the same spectral efficiency.

## Keywords:

indexed modulation; combinatorial modulation; double sparsity; critical sparsity; sparsely indexed modulation; OFDM-IM.

## Published In:

COMMUNICATIONS THEORIES & SYSTEMS , Vol. 14 - No. 11 , pp. 151 - 166



( 13 )

## Spectral Efficient Spatial Modulation Techniques

Hany S. Hussein<sup>1,2</sup>, Member, IEEE, Mohamed Elsayed<sup>3</sup>, Student Member, IEEE, Usama Sayed Mohamed<sup>4</sup>, Member, IEEE, Hamada Esmail<sup>2</sup>, Member, IEEE, and Ehab Mahmoud Mohamed<sup>5,2</sup>, Member, IEEE

### Abstract:

Space modulation techniques (SMTs) have emerged as promising candidates for spectral- and energy-efficient wireless communication systems since they strike a good balance among error performance, power efficiency, spectrum efficiency, and receiver complexity. In SMTs, the information is not only conveyed by the habitual M-ary signal constellations; rather, it is also conveyed by the indices of the transmit antennas. As such, the indices of the transmit antennas are harnessed in such a manner that enhances the transmission efficiency compared to the other multiple-input multiple-output (MIMO) opponents. Despite their exceptional advantages, SMTs suffer from a major drawback, which lies in the logarithmic proportion between their achievable data rates and the number of transmit antennas. In this regard, the fully-generalised spatial modulation (F-GSM) and the fully-quadrature spatial modulation (F-QSM) are proposed in this paper in order to vanquish this controversial drawback. In F-GSM and F-QSM, the transmit antennas used for data transmission are varied from the state in which only one transmit antenna is activated to the state in which multiple/all transmit antennas are activated. Therefore, a linear relationship between the achievable data rates and the number of transmit antennas is acquired. Moreover, a novel mathematical framework for assessing the average bit error rate (ABER) performance of the different SMTs is delineated. The driven mathematical framework is considered as the first major attempt to generalize the analytical analysis of different SMTs. In addition, the receiver's computational complexity of the proposed schemes is obtained and analysed in terms of the computational complexity of different SMTs. The simulation results substantiate the validity of the analytical analysis conducted throughout the paper, as they are very akin to the obtained analytical formulas.

### Keywords:

NULL

### Published In:

journal Of IEEE Access , NULL , NULL



---

( 14 )

# Energy and Spectrally Efficient Modulation Scheme for IoT Applications

Hany S. Hussein 1,2,\* , Mohamed Elsayed 3 , Mahmoud Fakhry 2 and Usama Sayed Mohamed 4

## Abstract:

Due to the Internet of Things (IoT) requirements for a high-density network with low-cost and low-power physical (PHY) layer design, the low-power budget transceiver systems have drawn momentous attention lately owing to their superior performance enhancement in both energy efficiency and hardware complexity reduction. As the power budget of the classical transceivers is envisioned by using inefficient linear power amplifiers (PAs) at the transmitter (TX) side and by applying high-resolution analog to digital converters (ADCs) at the receiver (RX) side, the transceiver architectures with low-cost PHY layer design (i.e., nonlinear PA at the TX and one-bit ADC at the RX) are mandated to cope with the vast IoT applications. Therefore, in this paper, we propose the orthogonal shaping pulses minimum shift keying (OSP-MSK) as a multiple-input multiple-output (MIMO) modulation/demodulation scheme in order to design the low-cost transceiver architectures associated with the IoT devices. The OSP-MSK fulfills a low-power budget by using constant envelope modulation (CEM) techniques at the TX side, and by applying a low-resolution one-bit ADC at the RX side. Furthermore, the OSP-MSK provides a higher spectral efficiency compared to the recently introduced MIMO-CEM with the one-bit ADC. In this context, the orthogonality between the in-phase and quadrature-phase components of the OSP are exploited to increase the number of transmitted bits per symbol (bps) without the need for extra bandwidth. The performance of the proposed scheme is investigated analytically and via Monte Carlo simulations. For the mathematical analysis, we derive closed-form expressions for assessing the average bit error rate (ABER) performance of the OSP-MSK modulation in conjunction with Rayleigh and Nakagami-m fading channels. Moreover, a closed-form expression for evaluating the power spectral density (PSD) of the proposed scheme is obtained as well. The simulation results corroborate the potency of the conducted analysis by revealing a high consistency with the obtained analytical formulas.

## Keywords:

IoT; one-bit ADC; MIMO-CEM; OSP-MSK; energy efficiency; spectral efficiency

## Published In:

Hany S. Hussein 1,2,\* , Mohamed Elsayed 3 , Mahmoud Fakhry 2 and Usama Sayed Mohamed 4 , Vol. 18 - No. 4382 , pp. 1-20