

Abstract—Recently, image pairs, such as noisy and blurred images or infrared and noisy images, have been considered as a solution to provide high-quality photographs under low lighting conditions. In this paper, a new method for decomposing the image pairs into two layers, i.e., the base layer and the detail layer, is proposed for image pair fusion. In the case of infrared and noisy images, simple naive fusion leads to unsatisfactory results due to the discrepancies in brightness and image structures between the image pair. To address this problem, a local contrast-preserving conversion method is first proposed to create a new base layer of the infrared image, which can have visual appearance similar to another base layer, such as the denoised noisy image is presented. To estimate the noise-free and unknown detail layer from the three designed detail layers, the optimization framework is modeled with residual-based sparsity and patch redundancy priors. To better suppress the noise, an iterative approach that updates the detail layer of the noisy image is adopted via a feedback loop. This proposed layer-based method can also be applied to fuse another noisy and blurred image pair. The experimental results show that the proposed method is effective for solving the image pair fusion problem.



Software Training and Development PATCH-BASED VIDEO DENOISING WITH OPTICAL FLOW ESTIMATION

Abstract:

A novel image sequence denoising algorithm is presented. The proposed approach takes advantage of the self-similarity and redundancy of adjacent frames. The algorithm is inspired by fusion algorithms, and as the number of frames increases, it tends to a pure temporal average. The use of motion compensation by regularized optical flow methods permits robust patch comparison in a spatiotemporal volume. The use of principal component analysis ensures the correct preservation of fine texture and details. An extensive comparison with the state-of-the-art methods illustrates the superior performance of the proposed approach, with improved texture and detail reconstruction.



REMOVAL HIGH DENSITY SALT & PEPPER NOISE IN QUICK TRANSIENT OR FAULTY SWITCHING IMAGES

Abstract:

In the Transmission of images over channels, Images are corrupted by salt and pepper noise, due to faulty communications. Salt and Pepper noise is also referred to as Impulse noise. The objective of filtering is to remove the impulses so that the noise free image is fully recovered with minimum signal distortion. The best-known and most widely used non-linear digital filters, based on order statistics are median filters. Median filters are known for their capability to remove impulse noise without damaging the edges. Median filters are known for their capability to remove impulse noise as well as preserve the edges. The effective removal of impulse often leads to images with blurred and distorted features. Ideally, the filtering should be applied only to corrupted pixels while leaving uncorrupted pixels intact. Applying median filter unconditionally across the entire image as practiced in the conventional schemes would inevitably alter the intensities and remove the signal details of uncorrupted pixels. Therefore, a noise-detection process to discriminate between uncorrupted pixels and the corrupted pixels prior to applying nonlinear filtering is highly desirable. Adaptive Median is a "decision-based" or "switching" filter that first identifies possible noisy pixels and then replaces them using the median filter or its variants, while leaving all other pixels unchanged. This filter is good at detecting noise even at a high noise level. The adaptive structure of this filter ensures that most of the impulse noises are detected even at a high noise level provided that the Window size is large enough. The existing non-linear filter like Standard Median Filter (SMF), Adaptive Median Filter (AMF), Decision Based Algorithm (DBA) and Robust Estimation Algorithm (REA) shows better results at low and medium noise densities. At high noise densities, their performance is poor. A new algorithm to remove high-density salt and pepper noise using modified sheer sorting method and Decision Based UN Symmetric Trimmed Median Filter (DBUTM) is proposed.



Software Training and Development A NOVEL APPROACH TO DETECT BRAIN TUMOUR IN MRI IMAGES USING HYBRID TECHNIQUE WITH SVM CLASSIFIERS

Abstract:

The proposed system consists of a hybrid techniques are combining SVM algorithm along with two combined clustering techniques such as k-mean techniques, fuzzy c-mean methods, these all are used to find out the brain tumor. The hybrid techniques are involving image enhancement which is done by contrast improvement and midrange stretch, skull striping is done through double thresholding using morphological operations, segmentation of the image is done through two clustering techniques such as k-means and FCM in which separate analysis is done and also it is also enhanced by combining these k-means and FCM.FCM uses member ship functions to detect real tumor region. The feature extraction is performed by using gray level run length matrix. Finally SVM is helped to classify the image and also grade the location of the tumor is done with sensitivity, specificity, accuracy parameters. GUI program is constructed to test proposed algorithm.



Software Training and Development BRAIN TUMOR SEGMENTATION BASED ON A HYBRID CLUSTERING TECHNIQUE

Abstract

Image segmentation refers to the process of partitioning an image into mutually exclusive regions. It can be considered as the most essential and crucial process for facilitating the delineation, characterization, and visualization of regions of interest in any medical image. Despite intensive research, segmentation remains a challenging problem due to the diverse image content, cluttered objects, occlusion, image noise, non-uniform object texture, and other factors. There are many algorithms and techniques available for image segmentation but still there needs to develop an efficient, fast technique of medical image segmentation.

This paper presents an efficient image segmentation approach using K-means clustering technique integrated with Fuzzy C-means algorithm. It is followed by thresholding and level set segmentation stages to provide an accurate brain tumor detection. The proposed technique can get benefits of the K-means clustering for image segmentation in the aspects of minimal computation time. In addition, it can get advantages of the Fuzzy C-means in the aspects of accuracy. The performance of the proposed image segmentation approach was evaluated by comparing it with some state of the art segmentation algorithms in case of accuracy, processing time, and performance. The accuracy was evaluated by comparing the results with the ground truth of each processed image. The experimental results clarify the effectiveness of our proposed approach to deal with a higher number of segmentation problems via improving the segmentation quality and accuracy in minimal execution time.



Software Training and Development LOCAL DIAGONAL EXTREMA PATTERN: A NEW AND EFFICIENT FEATURE DESCRIPTOR FOR CT IMAGE RETRIEVAL

Abstract:

The medical image retrieval plays an important role in medical diagnosis where a physician can retrieve most similar images from template images against a query image of a particular patient. In this letter, a new and efficient image features descriptor based on the local diagonal extrema pattern (LDEP) is proposed for CT image retrieval. The proposed approach finds the values and indexes of the local diagonal extremas to exploit the relationship among the diagonal neighbors of any center pixel of the image using first-order local diagonal derivatives. The intensity values of the local diagonal extremas are compared with the intensity value of the center pixel to utilize the relationship of central pixel with its neighbors. Finally, the descriptor is formed on the basis of the indexes and comparison of center pixel and local diagonal extremas. The consideration of only diagonal neighbors greatly reduces the dimension of the feature vector which speeds up the image retrieval task and solves the "Curse of dimensionality" problem also. The LDEP is tested for CT image retrieval over Emphysema-CT and NEMA-CT databases and compared with the existing approaches. The superiority in terms of performance and efficiency in terms of speedup of the proposed method are confirmed by the experiments.



Software Training and Development AN INNOVATIVE LOSSLESS COMPRESSION METHOD FOR DISCRETE-COLOR

IMAGES

Abstract

In this paper, we present an innovative method for lossless compression of discrete-color images such as map images, graphics, GIS as well as binary images. This method comprises two main components. The first is a fixed-size codebook encompassing 8×8 bit blocks of two-tone data along with their corresponding Huffman codes and their relative probabilities of occurrence. The probabilities were obtained from a very large data set of two color images (binary) and are used for arithmetic coding. The second component is the row-column reduction coding, which will encode those blocks that are not in the codebook. The proposed method has been successfully applied on two major image categories: (i) images with a predetermined number of discrete colors such as digital maps, graphs, and GIS images; and (ii) binary images. The results show that our method compresses images from both categories (discrete color and binary images) with 90% in most case and higher than the JBIG-2 by 5% to 20% for binary images, and by 2% to 6.3% for discrete color images on average.



Software Training and Development AUTOMATION SEGMENTATION OF PET IMAGE FOR BRAIN TUMORS

Abstract

The paper presents an improved Fuzzy C-Means (FCM) Algorithm for obtaining segmentation results of PET image. The segmentation of images with low resolution is usually more difficult than images with high resolution on account of boundary definition difficulties. In order to extract tumor from a PET image, we have to specify the numbers of clusters and which may vary from one image to another when we apply FCM algorithm. However we can divide all contents of image into two parts: background and foreground. Then iterative fuzzy clustering was used and we can get desired results via parameters assessment. The advantage of the algorithm is completely automatic and simply. It is shown that the algorithm is robust for a lot of different datum by experiment.



Software Training and Development AUTOMATIC DETECTION OF BREAST LESION CONTOUR AND ANALYSIS USING FRACTALS THROUGH SPECTRAL METHODS

Abstract

Breast cancer is the utmost usual cancer among the women world population. However, when premature detected, the treatment can be performed earlier and therefore be more efficient. Mammography is the most common exam to early detect this disease. There are different lesions that are breast cancer characteristic such as micro calcifications which can be detected trough this technique. Computed aided detection (CAD) intends to provide assistance to the mammography detection, reducing breast cancer misdiagnosis, thus allowing better diagnosis and more efficient treatments. CAD systems result of a collection of computed algorithms which characterize lesions through automatic image analysis. The main aim of this work corresponds to the automatic enhancement and segmentation of micro calcifications in mammographic images. This include simplementation and application of image enhancement technique homomorphic filter. Image segmentation technique K-means clustering was also implemented and applied. Extraction of contour and features carried out using Fractals spectral method.



Software Training and Development

Classification on the Monogenic Scale Space: Application to Target Recognition in SAR

Image

ABSTRACTS

This system introduces a novel classification strategy based on the monogenic scale space for target recognition in Synthetic Aperture Radar (SAR) image. The proposed method exploits monogenic signal theory, a multidimensional generalization of the analytic signal, to capture the characteristics of SAR image, e.g., broad spectral information and simultaneous spatial localization. The components derived from the monogenic signal at different scales are then applied into a recently developed framework, sparse representation-based classification (SRC). Moreover, to deal with the data set, whose target classes are not linearly separable, the classification via kernel combination is proposed, where the multiple components of the monogenic signal are jointly considered into a unifying framework for target recognition. The novelty of this paper comes from: 1) the development of monogenic feature via uniformly down sampling, normalization, and concatenation of the components at various scales; 2) the development of score-level fusion for SRCs; and 3) the development of composite kernel learning for classification. In particular, the comparative experimental studies under nonliteral operating conditions, e.g., structural modifications, random noise corruption, and variations in depression angle, are performed. The comparative experimental studies of various algorithms, including the linear support vector machine and the kernel version, the SRC and the variants, kernel SRC, kernel linear representation, and sparse representation of monogenic signal, are performed too. The feasibility of the proposed method has been successfully verified using Moving and Stationary Target Acquiration and Recognition database.



Software Training and Development DES Algorithm Security Fortification Using Elliptic Curve Cryptography

ABSTRACT:

The Data Encryption Standard (DES) was a boundless symmetric key piece figure calculation. It was the most well known utilized cryptographic plan. DES's security was a very petulant and questionable viewpoint until it turned into a frail calculation in 1999. In this approach, an alteration that conquers the security issue of the DES calculation is presented. The improvement is relying upon the craft of the Elliptic Curve Cryptography (ECC). The ECC methodology is additionally used to accomplish the required key era and conveyance to build up a correspondence session. Our new ECC-based DES calculation can be connected to any record position, in this system it is utilized to encode and decode a picture document. Test results are completed with nitty gritty investigations, the outcomes exhibit that the proposed plan has a vast key space to oppose the savage power assault and it is extremely resistant to measurable assaults. The acquired results demonstrate that the ECC-based DES calculation could be utilized as a profoundly secure calculation.



Software Training and Development Enhancement of Textural Differences Based on Morphological Component Analysis

Abstract

This system proposes a new texture enhancement method which uses an image decomposition that allows different visual characteristics of textures to be represented by separate components in contrast with previous methods which either enhance texture indirectly or represent all texture information using a single image component. Our method is intended to be used as a preprocessing step prior to the use of texture-based image segmentation algorithms. Our method uses a modification of morphological component analysis (MCA) which allows texture to be separated into multiple morphological components each representing a different visual characteristic of texture. We select four such texture characteristics and propose new dictionaries to extract these components using MCA. We then propose procedures for modifying each texture component and recombining them to produce a texture-enhanced image. We applied our method as a preprocessing step prior to a number of texture-based segmentation methods and compared the accuracy of the results, finding that our method produced results superior to comparator methods for all segmentation algorithms tested. We also demonstrate by example the main mechanism by which our method produces superior results, namely that it causes the clusters of local texture features of each distinct image texture to mutually diverge within the multidimensional feature space to a vastly superior degree versus the comparator enhancement methods.



Software Training and Development MULTI VIDEO OBJECT COSEGMENTATION FOR IRRELEVANT FRAMES

INVOLVED VIDEOS

Abstract

Even though there have been a large amount of previous work on video segmentation techniques, it is still a challenging task to extract the video objects accurately without interactions, especially for those videos which contain irrelevant frames (frames containing no common targets). In this essay, a novel multivideo object cosegmentation method is raised to cosegment common or similar objects of relevant frames in different videos, which includes three steps: 1) object proposal generation and clustering within each video; 2) weighted graph construction and common objects selection; and 3) irrelevant frames detection and pixel-level segmentation refinement. We apply our method on challenging datasets and exhaustive comparison experiments demonstrate the effectiveness of the proposed method.



Software Training and Development PIXEL MODELING USING HISTOGRAMS BASED ON FUZZY PARTITIONS FOR DYNAMIC BACKGROUND SUBTRACTION

ABSTRACT

We propose a novel pixel-modeling approach for background subtraction using histograms based on strong uniform fuzzy partitions. In the proposed method, the temporal distribution of pixel values is represented by a histogram based on a triangular partition. The threshold for background segmentation is set adaptively according to the shape of the histogram. Histogram accumulation is controlled adaptively by a fuzzy controller under a supervised learning framework. Benefiting from the adaptive scheme, with no parameter tuning, the proposed algorithm functions well across a wide spectrum of challenging environments. The performance of the proposed method is evaluated against more than 20 state-of-the-art methods in complex outdoor environments, particularly in those consisting of highly dynamic backgrounds and camouflaged foregrounds. Experimental results confirm that the proposed method performs effectively in terms of both the true positive rate and the noise suppression ability. Further, it outperforms other state-of-the-art methods by a significant margin.



Software Training and Development High Resolution Image Profile Management Scheme Using Gradient Profile Sharpness

ABSTRACT

Single image superresolution is a work of art and dynamic picture preparing issue, which plans to produce a high-determination (HR) picture from a low-determination information picture. Because of the seriously under-decided nature of this issue, an viable picture earlier is important to make the issue resolvable, also, to enhance the nature of produced pictures. In this system, a novel picture superresolution calculation is proposed in light of Gradient Profile Sharpness (GPS). GPS is an edge sharpness metric, which is extricated from two gradient description models, i.e., a triangle model and a Gaussian mixture model for the depiction of various types of gradient profiles. At that point, the change relationship of GPSs in diverse picture resolutions is concentrated factually, and the parameter of the relationship is assessed naturally. In light of the evaluated GPS change relationship, two inclination profile change models are proposed for two profile depiction models, which can keep profile shape and profile inclination extent whole steady amid profile change. At long last, the objective slope field of HR picture is produced from the changed slope profiles, which is included as the picture earlier in HR picture remaking model. Broad tests are led to assess the proposed calculation in subjective visual impact, target quality, also, calculation time. The exploratory results show that the proposed methodology can create predominant HR pictures with better visual quality, lower reconstruction error, and adequate calculation effectiveness as contrasted and best in class works.



REPRESENTATION AND MATCHING

ABSTRACT

Incorporation of global features in minutia-based fingerprint recognition schemes enhances their recognition capability but at the expense of a substantially increased complexity. In this paper, we introduce a novel low-complexity multilevel structural technique for fingerprint recognition by first decomposing a fingerprint image into regions based on only some of the global features and then formulating multilevel feature vectors to represent the fingerprint by employing both the global and local features. A fast multilevel matching algorithm based on the new fingerprint represen- tation is proposed. In order to show the effectiveness of the proposed scheme, extensive experiments are conducted using challenging benchmark databases from the 2002, 2004 and 2006 Fingerprint Verification Competitions (FVC2002, FVC2004 and FVC2006), and the results compared with those of some state-of-the-art schemes. The experimental results show that the average template size of the fingerprint representa- tion is only 253 bytes, whereas the average enrollment and matching time is about 0.23 s. The proposed scheme is shown to yield recognition accuracy higher than that provided by the existing schemes at a lower cost.



Software Training and Development CLASSIFICATION ON THE MONOGENIC SCALE SPACE: APPLICATION TO TARGET RECOGNITION IN SAR IMAGE

ABSTRACT

This paper introduces a novel classification strategy based on the monogenic scale space for target recognition in Synthetic Aperture Radar (SAR) image. The proposed method exploits monogenic signal theory, a multidimensional generalization of the analytic signal, to capture the characteristics of SAR image, e.g., broad spectral information and simultaneous spatial localization. The components derived from the monogenic signal at different scales are then applied into a recently developed framework, sparse representation-based classification (SRC). Moreover, to deal with the data set, whose target classes are not linearly separable, the classification via kernel combination is proposed, where the multiple components of the monogenic signal are jointly considered into a unifying framework for target recognition. The novelty of this paper comes from: 1) the development of monogenic feature via uniformly downsampling, normalization, and concatenation of the components at various scales; 2) the development of score-level fusion for SRCs; and 3) the development of composite kernel learning for classification. In particular, the comparative experimental studies under nonliteral operating conditions, e.g., structural modifications, random noise corruption, and variations in depression angle, are performed. The comparative experimental studies of various algorithms, including the linear support vector machine and the kernel version, the SRC and the variants, kernel SRC, kernel linear representation, and sparse representation of monogenic signal, are performed too. The feasibility of the proposed method has been successfully verified using Moving and Stationary Target Acquiration and Recognition database. The experimental results demonstrate that significant improvement for recognition accuracy can be achieved by the proposed method in comparison with the baseline algorithms.



ABSTRACT

Elastic distortion of fingerprints is one of the major causes for false non-match. While this problem affects all fingerprint recognition applications, it is especially dangerous in negative recognition applications, such as watchlist and deduplication applications. In such applications, malicious users may purposely distort their fingerprints to evade identification. In this paper, we proposed novel algorithms to detect and rectify skin distortion based on a single fingerprint image. Distortion detection is viewed as a two-class classification problem, for which the registered ridge orientation map and period map of a fingerprint are used as the feature vector and a SVM classifier is trained to perform the classification task. Distortion rectification (or equivalently distortion field estimation) is viewed as a regression problem, where the input is a distorted fingerprint and the output is the distortion field. To solve this problem, a database (called reference database) of various distorted reference fingerprints and corresponding distortion fields is built in the offline stage, and then in the online stage, the nearest neighbor of the input fingerprint is found in the reference database and the corresponding distortion field is used to transform the input fingerprint into a normal one. Promising results have been obtained on three databases containing many distorted fingerprints, namely FVC2004 DB1, Tsinghua Distorted Fingerprint database, and the NIST SD27 latent fingerprint database.



Software Training and Development ENHANCEMENT OF TEXTURAL DIFFERENCES BASED ON MORPHOLOGICAL

COMPONENT ANALYSIS

ABSTRACT

This paper proposes a new texture enhancement method which uses an image decomposition that allows different visual characteristics of textures to be represented by separate components in contrast with previous methods which either enhance texture indirectly or represent all texture information using a single image component. Our method is intended to be used as a preprocessing step prior to the use of texture-based image segmentation algorithms. Our method uses a modification of morphological component analysis (MCA) which allows texture to be separated into multiple morphological components each representing a different visual characteristic of texture. We select four such texture characteristics and propose new dictionaries to extract these components using MCA. We then propose procedures for modifying each texture component and recombining them to produce a texture-enhanced image. We applied our method as a preprocessing step prior to a number of texture-based segmentation methods and compared the accuracy of the results, finding that our method produced results superior to comparator methods for all segmentation algorithms tested. We also demonstrate by example the main mechanism by which our method produces superior results, namely that it causes the clusters of local texture features of each distinct image texture to mutually diverge within the multidimensional feature space to a vastly superior degree versus the comparator enhancement methods.



Software Training and Development FIXED-ORDER CONTROLLER FOR REDUCED-ORDER MODEL FOR DAMPING OF POWER OSCILLATION IN WIDE AREA NETWORK

ABSTRACT

The interconnected power systems are complex and stabilizing control design still remains challenging task. The use of wide area monitoring system (WAMS) offers an integrated measurement-based and model-based control, which suits to the operation of large electric power system (EPS), along with online analysis. This paper presents a study on fixed-order controller design for equivalent network of coherent generator in order to stabilize inter-area electromechanical oscillations in the system. Firstly, the coherent generators in each area of large EPS are determined by mutual information theory, which represents the dynamic equivalence. Then network of each area with input–output variables of the selected generator that participates dominantly is reduced to lower size by square-root variant of balanced truncation algorithm. The dynamics and important oscillation modes are verified in equivalent representation of each area. Finally a local controller (decentralized) in each coherent area and a centralized controller between two coherent areas for selected generator are designed by reducing the H1 norm of its closed loop transfer function as much as possible. These controllers feed supplementary control signal in addition to one fed by local conventionally tuned PSS. The decentralized controller for selected generator is fed by local bus power or generator's speed signal. On other hand, the centralized controller uses difference of power flow/speed of generators as input signal to dampen the oscillations between equivalent networks of two areas. The simulation results reveal effective damping of power/speed oscillations achieved by designed controller with respect to

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conventional PSS implemented. The robustness of controller is verified for heavy and light load operating conditions.

HUFFMAN IMAGE COMPRESSION INCORPORATING DPCM AND DWT

ABSTRACT

This paper presents a medical image compression approach. In this approach, first the image is pre-processed by Differential Pulse Code Modulator (DPCM), second, the output of the DPCM is wavelet transformed, and finally the Huffman encoding is applied to the resulting coefficients. Therefore, this approach provides theoretically threefold compression. Simulation results are presented to compare the performance of the proposed (DPCM-DWT-Huffman) approach with the performances of the Huffman incorporating DPCM (DPCM-Huffman), the DWT-Huffman and the Huffman encoding alone. Several quantitative indexes are computed to measure the performance of the four algorisms. The results show that the DPCM-DWT-Huffman, the DPCMHuffman, the DPCMHuffman and the Huffman encoding alone and the Huffman algorisms provide compression ratio (CR) of 6.4837, 4.32, 2.2751 and 1.235, respectively. The results also confirm that while the proposed DPCM-DWT-Huffman approach enhances the CR, it does not deteriorate other performance quantitative measures in comparison with the DWT-Huffman, the DPCM-Huffman and the Huffman algorisms.



Software Training and Development OPTIMIZED LTE CELL PLANNING WITH VARYING SPATIAL AND TEMPORAL

USER DENSITIES

ABSTRACT

Base station deployment in cellular networks is one of the fundamental problems in network design. This paper proposes a novel method for the cell planning problem for the fourth generation (4G) cellular networks using meta-heuristic algorithms. In this approach, we aim to satisfy both cell coverage and capacity constraints simultaneously by formulating an optimization problem that captures practical planning aspects. The starting point of the planning process is defined through a dimensioning exercise that captures both coverage and capacity constraints. Afterwards, we implement a meta-heuristic algorithm based on swarm intelligence (e.g., particle swarm optimization or the recently-proposed grey wolf optimizer) to find suboptimal base station locations that satisfy both problem constraints in the area of interest which can be divided into several subareas with different spatial user densities. Subsequently, an iterative approach is executed to eliminate eventual redundant base stations. We also perform Monte Carlo simulations to study the performance of the proposed scheme and compute the average number of users in outage. Next, the problems of green planning with regards to temporal traffic variation and planning with location constraints due to tight limits on electromagnetic radiations are addressed, using the proposed method. Finally, in our simulation results, we apply our proposed approach for different scenarios with different subareas and user distributions and show that the desired network quality of service targets are always reached even for large-scale problems.

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Software Training and Development SWINGING BUS OPERATION OF INVERTERS FOR FUEL CELL APPLICATIONS

WITH SMALL DC-LINK CAPACITANCE

ABSTRACT

For reliability reasons, the employment of small film capacitors instead of electrolytic ones is an interesting alternative for the dc-link in single-phase inverters for fuel cell applications. Due to the low capacitance that can be accomplished at an acceptable cost using this technology, there are large low-frequency voltage fluctuations (100/120 Hz and harmonics) in the dc-link caused by the double-frequency power transfer. By allowing these variations in the bus, the capacitor bank absorbs the current ripple from the inverter to avoid detrimental oscillations in the fuel cell.Traditional control strategies for inverters are usually designed to operate with nearly constant input voltage and are not able to effectively handle large (e.g., >10%) low-frequency input voltage fluctuations. This paper introduces the analysis of a swinging bus in the context of fuel cell standalone applications (i.e., voltage- source inverters) and proposes a nonlinear control approach to operate inverters with very large input voltage swing: the natural switching surface (NSS). Under the proposed scheme, the inverter presents excellent dynamic and steady-state characteristics, even at moderate switching frequency (e.g., 3.6 kHz). In order to illustrate the superior performance of the NSS, a comparison to a proportionalresonant (PR) controller is performed. Unlike the linear compensator, the NSS is able to reject the large bus voltage oscillations and achieve high-quality output voltage with low total harmonic distortion (THD). Simulation and experimental results are provided to illustrate the behavior of the swinging bus and to validate the NSS control scheme under the proposed demanding operating conditions.

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Software Training and Development THERMAL IMAGING AS A BIOMETRICS APPROACH TO FACIAL SIGNATURE

AUTHENTICATION

ABSTRACT

A new thermal imaging framework with unique feature extraction and similarity measurements for face recognition is presented. The research premise is to design specialized algorithms that would extract vasculature information, create a thermal facial signature, and identify the individual. The proposed algorithm is fully integrated and consolidates the critical steps of feature extraction through the use of morphological operators, registration using the Linear Image Registration Tool, and matching through unique similarity measures designed for this task. The novel approach at developing a thermal signature template using four images taken at various instants of time ensured that unforeseen changes in the vasculature over time did not affect the biometric matching process as the authentication process relied only on consistent thermal features. Thirteen subjects were used for testing the developed technique on an in-house thermal imaging system. The matching using the similarity measures showed an average accuracy of 88.46% for skeletonized signatures and 90.39% for anisotropically diffused signatures. The highly accurate results obtained in the matching process clearly demonstrate the ability of the thermal infrared system to extend in application to other thermal-imaging-based systems. Empirical results applying this approach to an existing database of thermal images prove this assertion.

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