Authentication Scheme Based on Principal Component Analysis for Satellite Images

Ashraf k.helmy¹, Ghada El-Tawel²

¹ National Authority of Remote Sensing and Space Sciences, El Nozha El-Gidida, Cairo, Egypt
akahelmy@narss.sci.eg

² Computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
ghada_eltawel@ci.suez.edu.eg

Abstract: This paper presents a multi-band wavelet image content authentication scheme for satellite images by incorporating the principal component analysis (PCA). The proposed scheme achieves higher perceptual transparency and stronger robustness. Specifically, the developed watermarking scheme can successfully resist common signal processing such as JPEG compression and geometric distortions such as cropping. In addition, the proposed scheme can be parameterized, thus resulting in more security. That is, an attacker may not be able to extract the embedded watermark if the attacker does not know the parameter. In order to meet these requirements, the host image is transformed to YIQ to decrease the correlation between different bands, then Multi-band Wavelet transform (M-WT) is applied to each channel separately obtaining one approximate sub band and fifteen detail sub bands. PCA is then applied to the coefficients corresponding to the same spatial location in all detail sub bands. The last principle component band represents an excellent domain for inserting the watermark since it represents lowest correlated features in high frequency area of host image. One of the most important aspects of satellite images is spectral signature, the behavior of different features in different spectral bands, the results of proposed algorithm shows that the spectral stamp for different features doesn't tainted after inserting the watermark.

Keywords: Multi-band wavelet, principal component analysis

Published In:
International Journal of Signal Processing, Image Processing and Pattern Recognition
Vol. 2, No.3, September 2009

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A NOVEL FEATURE EXTRACTION SCHEME FOR HUMAN
GAIT RECOGNITION

Hamed NASSR¹, Ghada El-Tawel² and Eman Mahmoud³

¹ computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
nassar@ci.suez.edu.eg

² Computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
Ghada_eltawel@ci.suez.edu.eg

³ Computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
eman_attia@ci.suez.edu.eg

Abstract

With the increasing demand of visual surveillance systems, human recognition at a distance has gained extensive research interest. Gait is a potential behavioral feature to identify humans based on their motion. This paper describes a new scheme for extracting and selecting features from the gait of a human for recognition. This scheme that combines both Key Fourier Descriptors (KFDs) and principal component analysis (PCA) techniques. This leads to strength in reducing feature space by KFD, and increasing accuracy by PCA. Also, it is shown that the proposed scheme leads to a higher correct classification rate than schemes that depend on KFD alone or PCA alone.

Keywords: Human recognition; gait motion; principal component analysis; key Fourier descriptors; feature extraction.


References

Neural Network Change Detection Model for Satellite Images Using Textural and Spectral Characteristics

Ashraf k.helmy¹, Ghada El-Tawel²

¹ National Authority of Remote Sensing and Space Sciences, El Nozha El-Gidida, Cairo, Egypt
akhelmy@narss.sci.eg

² Computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
ghada_eltawel@ci.suez.edu.eg

Abstract

Change detection is the process of identifying difference of the state of an object or phenomena by observing it at different time. Essentially, it involves the ability to quantify temporal effects using multi-temporal data sets. Information about change is necessary for evaluating land cover and the management of natural resources. Approach: A neural network model based on both spectral and textural analysis is developed. Change detection system in this study is presented using modified version of back-propagation-training algorithm with dynamic learning rate and momentum. Through proposed model, the two images at different dates are fed into the input layer of neural network, in addition with Variance, Skewness and Eucledian for each image that represent different texture measure. This leads to better discrimination process. Results: The results showed that the trained network with texture measures achieve 23% higher accuracy than that without textural parameters. Conclusion: Adding textural parameters of satellite images through training phase increases the efficiently of change detection process also, it provides adequate information about the type of changes. It also found, when using dynamic momentum and learning rate, time and effort needed to select their appropriate value is reduced.

Keywords: Change detection, neural network, image texture

Published In: American J. of Engineering and Applied Sciences 3 (4): 604-610, 2010 ISSN 1941-7020

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Automatic Image Registration Technique of Remote Sensing Images

Mohamed Wahed, Ghada El-Tawel and Asmaa Gad

Computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
mewahed@yahoo.com

Computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
ghada_eltawel@ci.suez.edu.eg

Math Dept, Suez Canal University, Elarish, 41522, Egypt
eng_asmaa_gad@hotmail.com

Abstract

Image registration is a crucial step in most image processing tasks for which the final result is achieved from a combination of various resources. Automatic registration of remote-sensing images is a difficult task as it must deal with the intensity changes and variation of scale, rotation and illumination of the images. This paper proposes image registration technique of multi-view, multi-temporal and multi-spectral remote sensing images. Firstly, a preprocessing step is performed by applying median filtering to enhance the images. Secondly, the Steerable Pyramid Transform is adopted to produce multi-resolution levels of reference and sensed images; then, the Scale Invariant Feature Transform (SIFT) is utilized for extracting feature points that can deal with the large variations of scale, rotation and illumination between images. Thirdly, matching the features points by using the Euclidian distance ratio; then removing the false matching pairs using the RANdom SAmple Consensus (RANSAC) algorithm. Finally, the mapping function is obtained by the affine transformation. Quantitative comparisons of our technique with the related techniques show a significant improvement in the presence of large scale, rotation changes, and the intensity changes. The effectiveness of the proposed technique is demonstrated by the experimental results.

Keywords: Image registration, Steerable Pyramid Transform, SIFT, RANSAC.


References

Semiautomatic Detection of Lanes and Bands in DNA Gel electrophoresis images

Ashraf k.helmy¹, Ghada El-Tawel²

¹ National Authority of Remote Sensing and Space Sciences, El Nozha El-Gidida, Cairo, Egypt
akahelmy@narss.sci.eg

² Computer Science Dept, Suez Canal University, Ismailia, State 41522, Egypt
ghada_eltawel@ci.suez.edu.eg

Abstract

Image registration is a crucial step in most image processing tasks for which the final result is achieved from a combination of various resources. Automatic registration of remote-sensing images is a difficult task as it must deal with the intensity changes and variation of scale, rotation and illumination of the images. This paper proposes image registration technique of multi-view, multi-temporal and multi-spectral remote sensing images. Firstly, a preprocessing step is performed by applying median filtering to enhance the images. Secondly, the Steerable Pyramid Transform is adopted to produce multi-resolution levels of reference and sensed images; then, the Scale Invariant Feature Transform (SIFT) is utilized for extracting feature points that can deal with the large variations of scale, rotation and illumination between images. Thirdly, matching the features points by using the Euclidian distance ratio; then removing the false matching pairs using the RANdom SAmple Consensus (RANSAC) algorithm. Finally, the mapping function is obtained by the affine transformation. Quantitative comparisons of our technique with the related techniques show a significant improvement in the presence of large scale, rotation changes, and the intensity changes. The effectiveness of the proposed technique is demonstrated by the experimental results.

Keywords: Gel Electrophoresis (GE); Lane Comparison; Matched Filter; Lane Segmentation; Lane Detection

Published In: J. Biomedical Science and Engineering, 2013, 6, 76-84 JBiSE doi:10.4236/jbise.2013.61010
published Online January 2013 (http://www.scirp.org/journal/jbise/)

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