Sparse Similarity-Based Fisherfaces

In this work, the effect of introducing Sparse Principal Component Analysis within the Similarity-based Fisherfaces algorithm is examined. The technique aims at mimicking the human ability to discriminate faces by projecting the faces in a highly discriminative and easy interpretative way. Pixel intensities are used by Sparse Principal Component Analysis and Fisher Linear Discriminant Analysis to assign a one dimensional subspace projection to each person belonging to a reference data set. Experimental results performed in the AR dataset show that Similarity-based Fisherfaces in a sparse version can obtain the same recognition results as the technique in a dense version using only a fraction of the input data. Furthermore, the presented results suggest that using SPCA in the technique offers robustness to occlusions.

Automatic change detection and quantification of dermatological diseases with an application to psoriasis images

Change monitoring in skin lesion analysis has proven to be a useful adjunct in their assessment. This article presents a comparative study of the available change detection techniques applied to change visualization and quantification in bi-temporal psoriasis images. The chosen methods are evaluated on a time series of psoriasis images and results are compared with dermatologists' scores.
Individual discriminative face recognition models based on subsets of features

The accuracy of data classification methods depends considerably on the data representation and on the selected features. In this work, the elastic net model selection is used to identify meaningful and important features in face recognition. Modelling the characteristics which distinguish one person from another using only subsets of features will both decrease the computational cost and increase the generalization capacity of the face recognition algorithm. Moreover, identifying which are the features that better discriminate between persons will also provide a deeper understanding of the face recognition problem. The elastic net model is able to select a subset of features with low computational effort compared to other state-of-the-art feature selection methods. Furthermore, the fact that the number of features usually is larger than the number of images in the data base makes feature selection techniques such as forward selection or lasso regression become inadequate. In the experimental section, the performance of the elastic net model is compared with geometrical and color based algorithms widely used in face recognition such as Procrustes nearest neighbor, Eigenfaces, or Fisher-faces. Results show that the elastic net is capable of selecting a set of discriminative features and hereby obtain higher classification rates.

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Precise acquisition and unsupervised segmentation of multi-spectral images

In this work, an integrated imaging system to obtain accurate and reproducible multi-spectral images and a novel multi-spectral image segmentation algorithm are proposed. The system collects up to 20 different spectral bands within a range that vary from 395 nm to 970 nm. The system is designed to acquire geometrically and chromatically corrected images in homogeneous and diffuse illumination, so images can be compared over time. The proposed segmentation algorithm combines the information provided by all the spectral bands to segment the different regions of interest. Three experiments are conducted to show the ability of the system to acquire highly precise, reproducible and standardized multi-spectral images and to show its applicabilities in different situations.

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Collecting highly reproducible images to support dermatological medical diagnosis

In this article, an integrated imaging system for acquisition of accurate standardized images is proposed. The system also aims at making highly reproducible images over time, so images taken at different times can be compared. The system is made up of an integrating intensity sphere illumination together with a high resolution 3CCD color camera. The well-defined and diffuse illumination of the optically closed scene enhances the true color and avoids effects from specular reflections, shading and shadows. Two experiments are conducted to show the precision of the system and the suitability of the collected images to track dermatological diseases. Results indicate that the developed equipment is an excellent tool for getting high quality digital images. Furthermore, the images collected with the equipment turn out to be a good source to characterize dermatological images.

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A face recognition algorithm based on multiple individual discriminative models

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Development of an image based system to objectively score the severity of phoriasis

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Analysis of time-varying psoriasis lesion image patterns
The multivariate alteration detection transform is applied to pairs of within and between time varying registered psoriasis image patterns. Color band contribution to the variates explaining maximal change is analyzed.

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An image based system to automatically and objectively score the degree of redness and scaling in psoriasis lesions.

In this work, a combined statistical and image analysis method to automatically evaluate the severity of scaling in psoriasis lesions is proposed. The method separates the different regions of the disease in the image and scores the degree of scaling based on the properties of these areas. The proposed method provides a solution to one of the present problems in dermatology: the lack of suitable methods to assess the lesion and to evaluate the changes during the treatment. An experiment over a collection of psoriasis images is conducted to test the performance of the method. Results show that the obtained scores are highly correlated with scores made by doctors. This and the fact that the obtained measures are continuous indicate the proposed method is a suitable tool to evaluate the lesion and to track the evolution of dermatological diseases.

Automatic scoring of the severity of psoriasis scaling

In this work, a combined statistical and image analysis method to automatically evaluate the severity of scaling in psoriasis lesions is proposed. The method separates the different regions of the disease in the image and scores the degree of scaling based on the properties of these areas. The proposed method provides a solution to the lack of suitable methods to assess the lesion and to evaluate changes during the treatment. An experiment over a collection of psoriasis images is conducted to test the performance of the method. Results show that the obtained scores are highly correlated with scores made by doctors. This and the fact that the obtained measures are continuous indicate the proposed method is a suitable tool to evaluate the lesion and to track the evolution of dermatological diseases.

Multi-set multi-temporal canonical analysis of psoriasis images

Nowadays, the medical tracking of dermatological diseases is imprecise, mainly due to the lack of suitable objective methods to evaluate the lesion. The severity of the disease is currently scored by doctors merely by means of visual examination. In this work, multi-set canonical correlation analysis over registered images is proposed to track the evolution of the disease automatically. This method transforms the original images into sets of variables that exhibit decreasing degree of similarity, based on correlation measures. Due to this property, these new variables are more suitable to detect...
where changes occur. An experiment with 5 different time series collected from psoriasis patients during 4 different sessions is conducted. The analysis of the obtained results points out some patterns that can be used both to interpret and summarize the evolution of the lesion and to achieve a better image registration.

Precise Multi-Spectral Dermatological Imaging
In this work, an integrated imaging system to obtain accurate and reproducible multi-spectral dermatological images is proposed. The system is made up of an integrating sphere, light emitting diodes and a generic monochromatic camera. The system can collect up to 10 different spectral bands. These spectral bands vary from ultraviolet to near infrared. The well-defined and diffuse illumination of the optically closed scene aims to avoid shadows and specular reflections. Furthermore, the system has been developed to guarantee the reproducibility of the collected images. This allows for comparative studies of time series of images. Two experiments are conducted to show the ability of the system to acquire highly precise and standardized multi-spectral images. The first experiment aims to show the capacity of the system to collect reproducible images. The second experiment demonstrates that the multi-spectral images provide more information than the classical tri-chromatic images and that this information is enough to segment lesions easily. These two facts together indicate the suitability of the system to collect images and to summarize and track the evolution of dermatological diseases.

S.H.A.R.P: A smart Hierarchical Algorithm to Register Psoriasis
In this work, an automatic algorithm for registering psoriasis images is proposed. The algorithm, made up of two stages, takes advantages of the behavior of the disease. In the first stage, the diseased area is segmented in the image. The
second stage uses this information to align the image based on the two first statistical moments of the area. The algorithm is compared with other existing methods. One of these methods was developed specifically to register psoriasis images. Results show the suitability of the proposed algorithm from the point of view of accuracy, parameter dependency and speed.

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