شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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Developing a Smart Multimodal Biometric Authentication System based on Hand Vein

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Mona Abdel-Aziz

Abstract

Because of the uniqueness and complication of hand vein patterns the hand vein authentication gives a great level of recognition accuracy. The hand vein patterns are inside the body so that it can be a challenging technique to forge. Moreover, the system is contactless and hygienic for operate in society regions. The contactless hand vein recognition technology comprises of image sensor and software technology. The user's hand is hold under an infrared ray scanner to capture an image of hand. The illumination of the infrared beam is limited relying on the light round the sensor, and the sensor is capable of take the hand image in spite of the location and movement of the hand. Afterward, the software compares the decoded vein image with the enrolled images, though determining the location and alignment of the hand by a pattern matching technique.

This research reports a novel multimodal biometric system employing intelligent technique to authenticate human by fusion of dorsal hand, palm and finger veins pattern alternately. By explains an image analysis technique to detect the region of interest (ROI) from hand vein image. Once detecting ROI, construct a series of preprocessing steps for eliminate the transformation and rotation of hand vein images presented in the data gathering procedure and decrease several data quantity devoid of missing any effective information this stage done by used canny edge detector, dilation filter and erosion filter. Next construct a series of preprocessing steps to improve the contrast among hand vein patterns and background using median filter, 2D Wiener filter, Applied Contrast Limited Adaptive Histogram Equalization (CLAHE) filter and Homomorphic filter. Once hand vein pattern extracted it managed to obtain the features to use them in matching stage. This study use

Principal Component analysis (PCA) algorithm to extract features. In matching step K-nearest neighbor (KNN) classifier with the Euclidian distance used as a similarity measure by one-to-one match method. Bosphorus Hand Vein Database, CASIA Multi-Spectral Palmprint Image Database V1.0 (CASIA database) and the Shandong University Machine Learning and Applications - Homologous Multi-modal Traits (SDUMLA-HMT) databases used in experiments in this study. Finally, fusion methodology adopted at the decision level which is a post-classification method, and it follows the AND rule. It compared the accuracy of the three unimodal (dorsal hand, palm and finger veins) and the four multimodal (fusion of finger and dorsal hand, fusion of palm and dorsal hand, fusion of palm and finger and fusion of dorsal hand, palm and finger veins) and the results showed that the fusion of dorsal hand, palm and finger veins has the best accuracy with correct recognition rate (CRR) 99.21%.

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List of Abbreviations

Acronyms	Terms
2D	Two Dimensional
ACO	Ant Colony Optimization
ATM	Automatic Teller Machine
AUC	Area Under Curve
CASIA	Central Asia Student International Academic
CCD	Charge Coupled Device
CCL	Connected Component Labeling
CDF	Cumulative Distribution Function
CED	Canny Edge Detector
CFS	Correlation based Feature Selection
CLAHE	Contrast Limited Adaptive Histogram Equalization
CN	Crossing Number
CRR	Correct Recognition Rate
DNA	Deoxyribonucleic Acid
DoG	Difference of Gaussian
DWT	Discrete Wavelet Transform
EER	Equal Error Rate
FAR	False Accept Rate
FMR	False Matching Rate
FNMR	False Non-Matching Rate
FRR	False Rejection Rate
GAR	Genuine Acceptance Rate
HD	Hamming Distance
HoG	Histogram of Gradients
HTML	Hyper Text Markup Language
ID	Identification
IGMF	Improved Gaussian Matched Filter
IoT	Internet of things
IS	Information System
KNN	K-nearest neighbor
LBPH	Local Binary Patterns Histograms
LBPV	Local Binary Patterns Variance
LDPC	Low Density Parity Check
LEDs	Light-Emitting Diodes

LLBP	Local Line Binary Pattern
LPQ	Local Phase Quantization
LRE	Local Ridge Enhancement
LRT	Localized Radon Transforms
MAD	Mean Absolute Deviation
MCP	Maximum Curvature Points
MLBP	Monogenic Local Binary Pattern
MMSE	Minimum Mean-Square Error
NIR	Near-infrared
OS	Operating system
PC	Personal Computer
PCA	Principal Component Analysis
PIN	Personal Identification Number
ROI	Region of Interest
SDUMLA-HMT	Shandong University Machine Learning and Applications - Homologous Multimodal Traits
SE	Structuring Element
SIFT	Scale Invariant Feature Transform
SMR	Spectral Minutiae Representation
SRC	Sparse Representation Classifier
SVM	Support Vector Machine
VP	Vein Pattern
VW	Visible Wavelength
WEF	Wavelet Energy Calculation