A Local Descriptor with Physiological Characteristic for Finger Vein Recognition

Liping Zhang[1, 2], Weijun Li[1], Xin Ning[1, 2], Linjun Sun[1, 2], Xiaoli Dong[1, 2]

[1]Institute of Semiconductors, Chinese Academy of Sciences, Beijing, China

[2]Cognitive Computing Technology Joint Laboratory, Wave Group, Beijing, China

zliping@semi.ac.cn

Abstract   Local feature descriptors exhibit great superiority in finger vein recognition due to their stability and robustness against local changes in images. However, most of these are methods use general-purpose descriptors that do not consider finger veinspecific features. In this work, we propose a finger vein-specific local feature descriptors based physiological characteristic of finger vein patterns, i.e., histogram of oriented physiological Gabor responses (HOPGR), for finger vein recognition. First, a prior of directional characteristic of finger vein patterns is obtained in an unsupervised manner. Then the physiological Gabor filter banks are set up based on the prior information to extract the physiological responses and orientation. Finally, to make the feature robust against local changes in images, a histogram is generated as output by dividing the image into non-overlapping cells and overlapping blocks. Extensive experimental results on several databases clearly demonstrate that the proposed method outperforms most current state-of-the-art finger vein recognition methods.

Framework
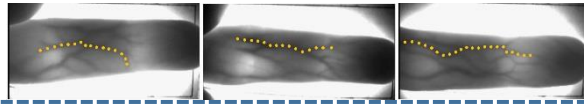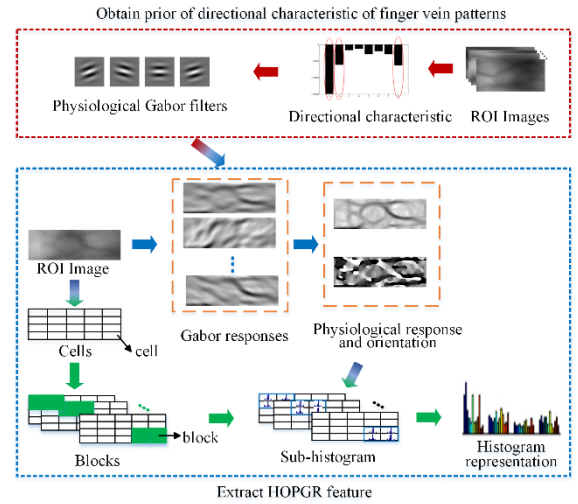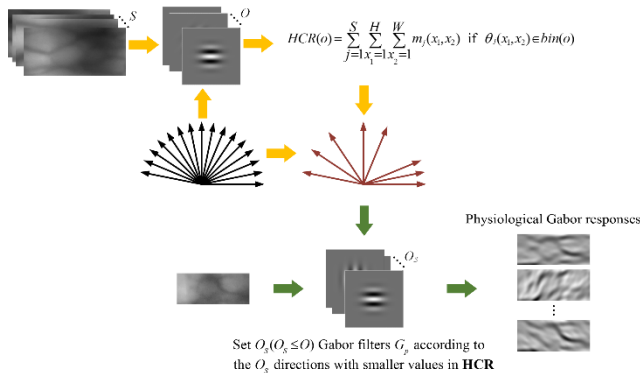
Results

Method	SEMI-FV	MMCBNU 6000	
	EER/%	EER/%	Time/ms
Gabor filter	1.67	2.42	*
HOG	0.86	1.54	*
HCGRwith 8 directions	0.80	1.39	85
HCGRwith 16 directions	0.71	1.07	114
HOLwith 8 directions	0.74	1.47	90
HOLwith 16 directions	0.69	1.00	120
Ours with 8 directions	0.678	0.70	90

Method	EER/%
GFSSR	1.50
KMHM	2.08
DBC	2.48
ITQM	1.33
EMC+HOG	1.79
Gabor+Tri-branch structure	1.14
Combining primary and soft biometric traits	0.82
PG-Gabor	0.71
Ours with 8 directions	0.70

Conclusion

- The directional characteristic of finger vein patterns is analysed, and the common rule from a training dataset is obtained as prior information in an unsupervised manner.
- A novel local feature descriptor named HOPGR that uses physiological characteristic of finger vein is proposed.
- Extensive experimental results on the MMCBNU 6000 and SEMI-FV databases clearly demonstrate the feasibility and effectiveness of the proposed method.