SIFT-based finger vein verification using multiple video frames

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1. Introduction

Recently, a walkthrough type vein authentication system has been attracting extensive attention, which is effective for wide-scale events such as big event venue, theme park, and so on. In our previous study, a hand waving finger vein authentication system was proposed, in which a similarity between enroll and verification finger vein patterns is calculated based on Normalized Cross Correlation (NCC) [1] and Scale-Invariant Feature Transform (SIFT) [2]. It is well known that SIFT is robust to rotation, shift and scale variation and the SIFT-based method is easy to use multiple fingers for verification. In [2], we used one video frame image for the SIFT-based method as a fundamental study. In this presentation, we improve the SIFT-based verification method so as to apply it to multiple video frames.

2. Verification method

In a SIFT-based method, we obtain some SIFT keypoints and corresponding feature vectors from a captured image and individually compare each feature vectors between the enrollment and verification finger vein image. If the number of matched feature vectors is more than a certain threshold level, that person is identified as a genuine. In order to apply it to multiple video frames, we extracted commonly matched feature vectors among genuine finger vein frames and conversely eliminate commonly matched feature vectors among imposter ones, as shown in Fig.1. Employing this method, more accurate verification can be expected than using one frame image.
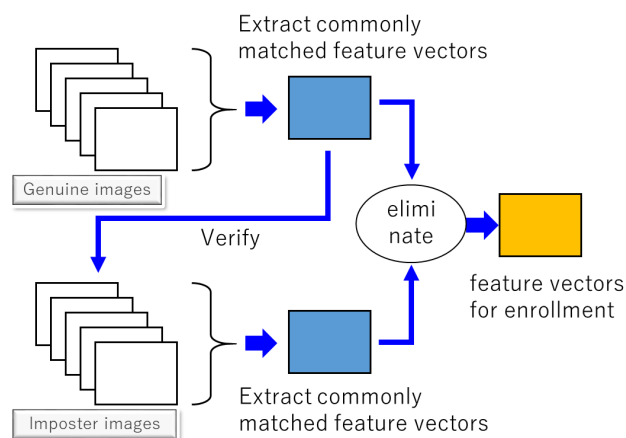

Fig.1 SIFT feature vector generation from multiple video frames.

3. Experiments

First, we generated a feature vectors for enrollment by employing the proposed method. Fig.2 shows result images of matched feature vectors with/without selection based on the proposed method. In case with selection, we can eliminate unnecessary feature vectors such as contour of finger and not vein pattern. We also conducted finger vein verification experiments and confirmed that the SIFT-based method with selection could improve the verification accuracy. In addition, the proposed method could accelerate the calculation of finger vein verification compared with the SIFT-based method using one video frame image, because the proposed method could reduce the number of the feature vectors for verification.
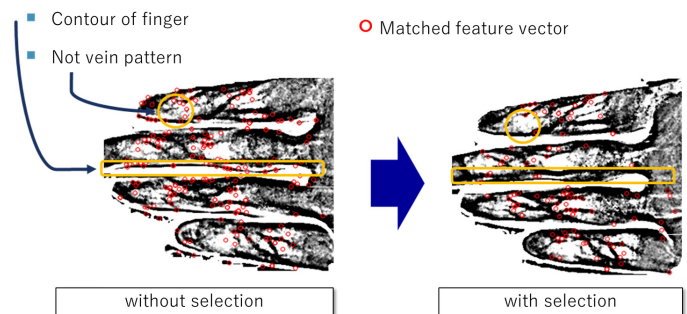

Fig.1 Matched feature vectors with/without selection.

4. Conclusions

We proposed a SIFT-based finger vein verification method using multiple video frames. With experiments, we showed that the proposed method could improve both of the verification accuracy and the processing time.

References

[1] H. Suzuki, et al., JSAP-OSA Joint Symposia 2016, 13a-C301-6 (2016).
[2] H. Suzuki, et al., JSAP-OSA Joint Symposia 2017, 6p-A409-4 (2017).

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