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SPECIAL ISSUE

Score level fusion of voting strategy of geometric hashing and SURF for an efficient palmprint-based identification

G. S. Badrinath · Phalguni Gupta · Hunny Mehrotra

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Abstract This paper proposes an efficient indexing scheme for palmprint-based identification system. The proposed system uses geometric hashing of SURF key-points to index the palmprint into hash table and makes score level fusion of voting strategy based on geometric hashing and SURF score to identify the live palmprint. All ordered pairs of SURF key-points of the palmprint are scaled and mapped to a predefined coordinate system and all other points are similarity transformed. The new location after transformation serves as the index of the hash table. During identification, all ordered pairs of key-points of live palmprint are scaled and mapped to the coordinate system while remaining points are similarity transformed. A vote is casted to all images in the corresponding bins. Images having votes more than certain threshold are considered as candidate images of the live palmprint. SURF features of the live palmprint and the candidate images are compared for matching. Matching scores which are based on SURF key-points and vote of the corresponding candidate image are fused using weighted sum rule. The candidate image with the highest fused score is considered as the best match. The system is tested on IITK, CASIA and PolyU datasets. It has been observed that penetration rate of the proposed system is less than 30% for 0% bin miss rate (BMR) and has the identification accuracy of more than 97% for all three datasets. Further, the system is evaluated for robustness on downscaled and rotated. It has been found that the identification accuracy of the system for top best match is more than 90% for images downscaled up to 49% and accuracy is more than 85% when images are rotated at any angle.

Keywords Indexing · Identification · Palmprint · Geometric hashing · Voting score · SURF and fusion

G. S. Badrinath (✉) · P. Gupta
Department of Computer Science and Engineering,
Indian Institute of Technology Kanpur, Kanpur 208016, India
e-mail: badri@cse.iitk.ac.in

P. Gupta
e-mail: pg@cse.iitk.ac.in

H. Mehrotra
Department of Computer Science and Engineering,
National Institute of Technology Rourkela,
Rourkela 769008, India
e-mail: hunny@nitrkl.ac.in

1 Introduction

Palmprint which is the region between wrist and fingers, has several characteristics like principle lines, wrinkles, ridges, minutia points, singular points, crease points and texture pattern. These characteristics can be considered as biometric features of the person [50]. Compared to other well-known biometrics, palmprint-based system has the following advantages. Features of a human hand are relatively stable and unique. Data acquisition is non-intrusive. Also very low co-operation needed from the user to collect data. It is reported that the systems based on palmprint are most acceptable to users [21]. There exist low-cost devices to collect the palmprint data. Low-resolution images provide high efficiency. Further, palmprint can serve as a reliable human identifier because features of the palmprint are found to be unique even in mono-zygotic twins [27].

Palmprint can be represented by structural, statistical and its combination of features. The system based on the structural features of the palmprint makes use of crease points [13], line features [20], datum points [48], isolated points [15], ridges [17] and minutia points [22]. Efforts