A Novel Approach to Optimize Crime Investigation Process Using Palmprint Recognition

Janitha R. Karunawallabha[1], Thilini I. Wijesiriwardene[2], Vajishc U. Wanniarachchi[3], Anuja T. Dharmaratne[4], Damitha Sandaruwan[5]
University of Colombo School of Computing, 35, Reid Avenue, Colombo 07, Sri Lanka

[1]janitharasanga@gmail.com, [2]amthiliniiw@gmail.com, [3]vajeecool88@gmail.com, [4]atd@ucsc.cmb.ac.lk
[5]dsr@ucsc.cmb.ac.lk

***Keywords*— Minutiae matching, Partial palmprint recognition, Palmprint segmentation, Palmprint classification**

INTRODUCTION

A crime investigation is generally carried out to aid the crime solving process by identifying criminals and in some cases victims. Print evidence plays a crucial part in identifying criminals or suspects. According to Sri Lankan Criminal Records, 30% - 35% of the print evidences are in the form of partial palmprints. Partial-to-full palmprint matching has attracted the experts in print identification area and researchers in palmprint matching. An efficient partial palmprint identification approach can increase the efficiency of the criminal investigation process in Sri Lanka as well as in other countries.

KEY PROBLEMS

Full-to-full palmprint matching for person authentication is a well attempted and established area of research for several years. Partial-to-full palmprint matching has become popular recently as most of the evidences found in crime scenes are of partial palmprints and manual matching process of these prints is a very difficult as well as an error-prone task. Therefore accurate and efficient partial palmprint matching methodologies are a very urgent requirement of the forensic institutions.

PROPOSED DESIGN AND EXPERIMENTS

The proposed design of the partial palmprint recognition system consists of two main sections namely, database design and system design.

A. Database design

When implementing the system, a palmprint segmentation method will be proposed based on an analysis of latent partial palmprint records in CRD. All the full palmprints will be segmented accordingly and minutia information files of those segments will be generated and stored in a database. Accordingly the gallery database will consist of segmented palmprints stored according to their hand type (right/left) and segment type.

B. System Design

The system will consist of 3 main modules. They are (1) Segment identification module (2) Hand type identification module and (3) minutiae matching module. The segment identification and hand type identification can be done simultaneously or one after the other. However, out of these two initial processes, Segment identification is compulsory to carry out the main process.

1) *Segment identification:* In this step, the partial palmprint is classified into a pre-specified segment of the palm.

2) *Hand type identification:* Identification of the hand type is important to increase the partial palmprint matching speed. Difficulty of identifying the hand which the partial print is from increases when the size of the partial print decreases.

3) *Minutiae matching:* Several software are available for minutiae matching and NIST Biometric Image Software (NBIS) is one such free and open source software used to present for our experiments.

One of our experiments indicated that matching a partial palmprint with a full palmprint repository does not provide a considerably high matching score for the correct match and it sometimes gives similar scores for several full palmprints in the repository.

In our next experiment, full palmprints will be segmented into 4 arbitrary segments and stored in a separate partition of the database. When matching a partial palmprint, the corresponding quarter is identified prior to minutiae matching and the final matching is performed (only) with the partition which contains similar quarters.

These experiments imply that a higher matching score can be obtained by matching the query palmprint with the correctly segmented palmprint database. Thus segment identification plays one of the major roles in this system.

CONCLUSIONS & FUTURE WORK

Data from the CRD of Sri Lanka would be collected and analysed to identify an appropriate palmprint segmentation methodology. The gallery prints would be stored in the database according to the pre-specified segments and hand type. Then the available palmprint minutiae extraction and matching techniques will be compared to identify the most appropriate minutiae matching technique. Finally all of these modules would be combined and the resulting system would be evaluated and tested.