**INTRODUCTION**

This fingerprint recognition system integrated previous papers’ work, combined these algorithms’ steps, and explored on similarity scores estimation between two comparison fingerprint images. Give a systematic technology to deal with the low-quality fingerprint image for extracting the minutiae features.

1. Process fingerprint images
2. Verify and abstract features
3. Matched with another fingerprint image
4. Compute the similarity score

**BACKGROUND**

**Fingerprint:** narrow sense is an impression left by the friction ridges of a human finger[1]. Human fingerprints are detailed, unique, difficult to alter, and durable over the life of an individual, making them suitable as long-term markers of human identity[1]. There have been many approaches for fingerprint recognition[2].

**Application:**
- Forensic science
- Log-in authentication and other locks
- Electronic registration and library access

**DATABASE**

Source: FVC2002

Includes 80 images, 10 different fingerprints. Each fingerprint set contains 8 partition images.

Figure 1: Fingerprint Images

Four image types at the same fingerprint set:
- High resolution, complete
- High resolution, partition
- Low resolution, complete
- Low resolution, partition

**IMPLEMENT**

- Input: Images
  - Processing and normalization
  - Estimate fingerprint orientation
  - Estimate fingerprint frequency
  - Segment and enhancement

- Output: Score

Figure 2: Implement Flow

**RESULTS**

![Minutiae Detection](image)

- Compare the first fingerprint image to other images, we find the lowest similarity image is 7.
- Since image 1 is high solution and complete fingerprint image, set the value of 0.58 as bar value.
- Lowest similarity value: image 5 and image 6, former one is low solution with the bottom part of fingerprint while later one displays most top part of fingerprint.

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Table 1: Similarity for fingerprint set 1

**Future Research**

- Explore more at how to improve the details of low resolution image, and integrate those methods.
- Develop the identify part for special singular points which may improve the accurate of minutiae features abstraction.
- Additional function to the application, such as store the fingerprint images as database, user interface.
- Applied this fingerprint recognition system into practical apps.

**REFERENCES**


**CONCLUSION**

- This system can recognize and identify two fingerprint images are the same or not, it integrate previous’ paper work, and similarity score could explain the similarity between two images.
- If two images are different partition parts of fingerprint, for example one is top and another is bottom, it difficult to identify and compare. If they are different resolution, it will also make identify more challenge.
- Using the systematic algorithms which includes normalization, estimate fingerprint orientation and frequency, segment and enhancement to deal with the low resolution image is reliable, but low resolution images may make more error.
- Heavy fingerprint image also may make the trouble of identify, since it can provide spurious details, it could be researched as future work.

**CONTACT INFORMATION**

Advisor: Prof. Joe Geigel
Linkedin: www.linkedin.com/in/katrina-cui
Github: www.github.com/nc3816
Email: nc3816@rit.edu
Phone: +1 (585) 978 2860