

EE 113D Project Proposal: Fingerprint Recognition Program

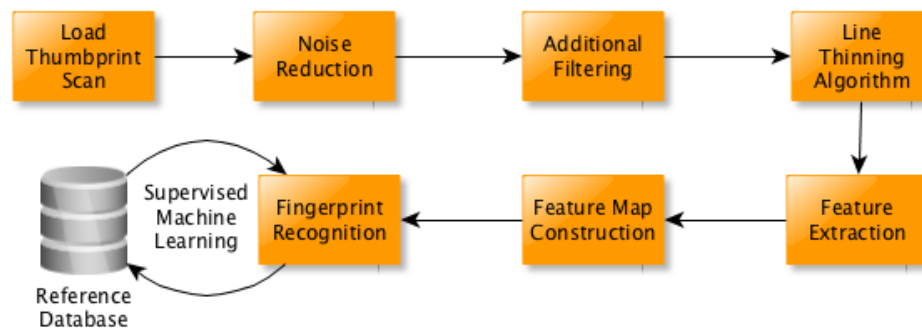
Ryan Baker and Russell De Guzman

Motivation:

Biometrics are becoming more and more ubiquitous as a method to identify users, and fingerprints are the most-used form of biometric identification. The applications are no longer limited to high-security uses; for example, consumer smartphones are increasingly being sold with built-in fingerprint scanners to serve as an alternative to passcode locks. The problem of identifying a user based on a fingerprint is inherently a digital signal processing problem.

Possible Implementation:

Fingerprint recognition synthesizes several core concepts explored in EE 113D. It is primarily image processing, and the techniques used include noise reduction, line detection, and line thinning. It can also be coupled with machine learning, as an ideal algorithm performs feature extraction to highlight key features in a thumbprint. The supervised learning technique can be used to build up a database of known fingerprint scans. The project would require researching the key features of a thumbprint and testing different methods of identifying these features.



Success Criteria and Benchmark Goals:

The Week 3 goal is to produce an algorithm which successfully performs noise reduction, any other necessary filtering, and line thinning on the thumbprint. The Week 7 goal is to determine the unique, identifying features of a thumbprint, and to add feature extraction to the algorithm so that a feature map can be constructed from the thumbprint.

The final goal is to implement a machine learning algorithm which, using supervised learning, can compare a thumbprint feature map to a pre-initialized database of known thumbprints in order to identify which user the thumbprint belongs to. The stretch goal is to, instead of using pre-loaded thumbprint image files, connect a thumbprint scanner to the LCDK (for example, via USB) and extract thumbprints from the scanner before running the recognition algorithm. An additional stretch goal is to run the algorithm while scanning, perhaps introducing other optimizations as well for a faster real-time thumbprint identification.

Proposed Division of Work:

Ryan Baker: MATLAB testing/implementation of thinning and feature extraction, C implementation of thinning and feature extraction, feature map construction algorithm, scanning algorithm (stretch goal)

Russell De Guzman: MATLAB testing/implementation of noise reduction and filtering, C implementation of noise reduction and filtering, feature map construction algorithm, supervised machine learning