Fingerprint Identification System

6.111 Final Project
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Fingerprint Overview

What is a fingerprint?

• Ridges and furrows on finger surface
• Pattern of ridges and furrows creates print uniqueness

How does a fingerprint identification system work?

• Acquire fingerprint images and represent them in proper format
• Match acquired fingerprint to a sample in a database

Why build a fingerprint identification system?

• Identify individuals within contexts of security, forensics, and personnel management
System Overview

Goal: To produce a fingerprint identification system that can identify print samples in a pre-established database

System Components

Acquisition: Capture image of inked print sample via a camera interface
Identification: Verify print in database via ridge edge detection filters

Example Application

Quick personnel identification in a large company
System Overview

Print Acquisition

- Camera
- Video Decoder
- Static RAM
- VGA interface

Print Identification

- Control FSM
- Image Processing FSM
- Matching FSM
- Display Result Controller
Identification Filters

Original Image

Direction vectors

Edge Detection

Distance scaling
Identification Filters

Edge Detection

Vertical Edges

\[ (-1) \quad (1) \]
\[ (-2) \quad (2) \]
\[ (-1) \quad (1) \]

Binarized edge map
Identification Filters

Edge Detection

Horizontal Edges

Original

Binarized edge map
Identification Filters

Direction Vectors

Binarized edge map
Identification Filters

Distance Scaling

Original
Identification Filters

Original Image

Direction vectors

Edge Detection

Distance scaling
Project Management

Work Breakdown

Costs: All components available via 6.111 lab kit or EECS stockroom
Project Management

Timeline

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- System Construction
- System Debugging
- User Interface Extensions
Summary

**Goal:** To produce a fingerprint identification system that can identify print samples in a pre-established database

**System Components**

- **Acquisition:** Capture image of inked print sample via a camera interface
- **Identification:** Verify print in database via ridge edge detection filters