Software Requirement Specification

Version 1.0

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01. Introduction

1.1 Purpose

This document describes the functional, non-functional and hardware requirements and the importance of a Fingerprints and Face recognition system with briefly presenting its input and output functionalities. And also this would give an overview to the client and would give detail specification for the developer.

1.2 Problem Description

Fingerprint verification is one of the most reliable personal identification methods, which is widely used today. Fingerprints are popular for personal identification due to the facts that they are easy to obtain, reliable, extremely unique and amenability to automation. Although those automated systems are much easier, they can be prone to noise. So Fingerprint readers today are not ideally suited to handle the large variation of populations that need to be enrolled.

Although extremely reliable methods of biometrics personal identification exist, personal identification system based on the images of the face is often effective due to its user friendly nature. But there are many more facts like race, age, gender, facial expression, diseases and facial coverings that affects when identifying and verifying persons using the existing face recognition systems. And the output may also change due to the differences of the image quality and the amount of back ground clutter. During the past few years face recognition received increased attention and has advanced technically. But significant research efforts still have been focused on this area. Though many facial recognitions systems have been proposed and have demonstrated significant promises, robust face recognition is still under research.

In a high volume, high speed environments, fingerprints and face recognition systems do not have the accuracy, reliability or ability to handle large, diverse population as needed for critical applications and up to now it is challengeable.

1.3 Objectives

This project is aimed at,

➢ Identify the faults of currently using algorithms for fingerprint recognition and face recognition and make suggestions to improve those.

➢ Develop a new algorithm for matching the person's fingerprint against a large database containing over several millions of data at a high speed.

➢ Develop a specialized algorithm for face matching on large databases with references taken on different time scale and conditions at very low error rates

1.3 Definitions, Acronyms and Abbreviations

Acronyms	Description
API	Application Programming Interface
GUI	Graphical User Interface

1.4 Overview

Section 2 here deals with the overall description about the product while describing the product perspective, functional and data requirements, input and output data, general constraints and assumptions of the application briefly. Section 3 gives the detailed description about the functional and non functional requirements of the application.

02. Overall Description

2.1 Product Perspective

This product is aimed to provide a best fitted engine to enroll, verify and identify face and fingerprint data at a high speed and very low error rate. As the input devices, web cam, scanner or any other image acquisition device can be used where user feeds input through this image acquisition device while processed biometric information is stored in an internal database. Product will do the comparison between internal database and given inputs by the user at identification.
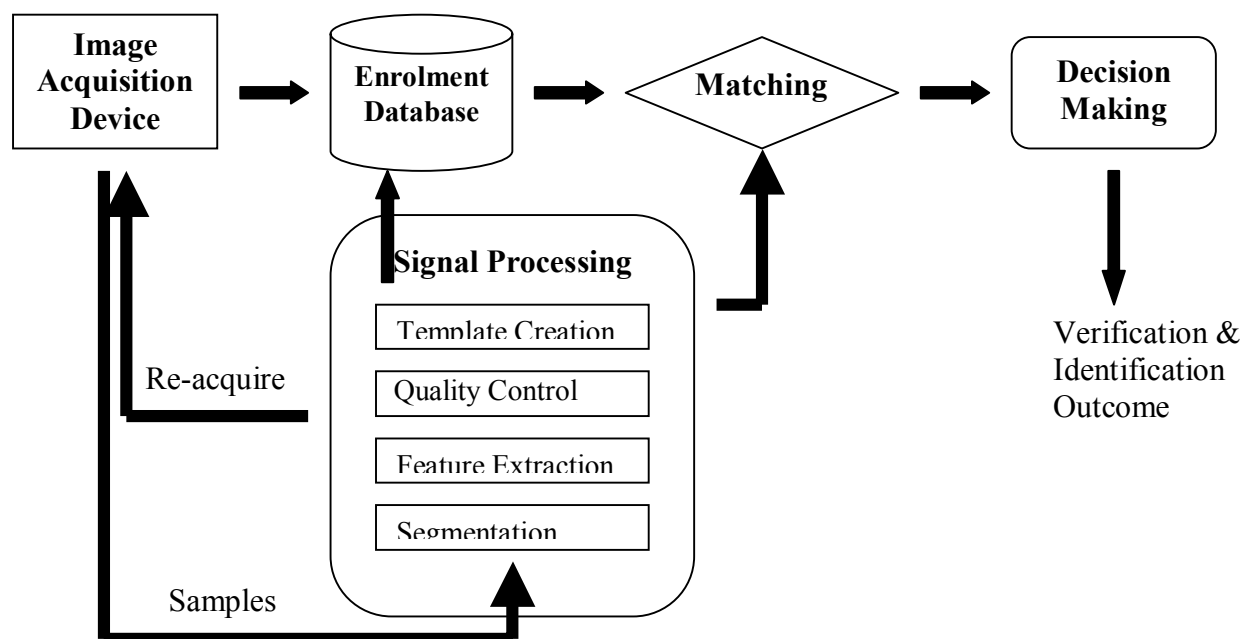

Figure 1- High level system description diagram

2.2 Overview of Functional Requirements

This is a research project on fingerprint recognition and structural face matching algorithms on large Databases.

Our application is capable of enrolling fingerprint and facial images, verifying and identifying those images. System should be provided with the face and fingerprint images captured through an image acquisition device. The distinctive measures of the enrolling images are extracted and stored in the database as a "template". When it is used to match information, the specific template will be compared to many templates or all templates already in the database and determine if there is a match.

The research is done for more accurate high speed algorithms for image matching on large database.
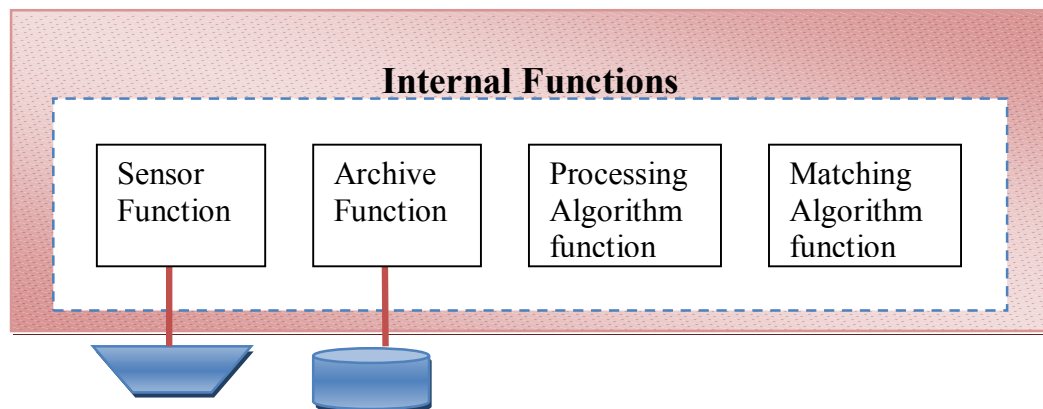

Figure 2- Internal functions of the product

2.3 Overview of Data Requirements

2.3.1 Input

Inputs are the fingerprint and facial images and personal details of the particular person, in the purpose of identification.

2.3.2 Output

Database records with the personal details of the matched image against the given image, or system generated alerts on strange data patterns.

2.3.3 Internal Data

The program maintain following internal data

- Biometric Template (the distinguish measures) that consists with the measured features of the images.

2.4 General Constraints, Assumptions, Dependencies, Guidelines

2.4.1 Software Constraints

- Windows 2000, Windows XP or Linux as the operating system.

- MySQL as Database

2.4.2 Hardware Constraints

- Fingerprint scanning device, camera or any other image acquisition device.

- Minimum of 256MB RAM

2.4.3 Guidelines

- Code is kept clean and simple for future upgrades and maintenance

2.4.4 Assumptions

- User will provide front view of the face image with a preferable quality.

03. Specific Requirements

3.1 Functional Requirements

The main purpose of this project is to provide a best fitted engine for fingerprint and face recognition. The following functions are provided through an API.

3.1.1 Enrollment

In enrolment, samples of fingerprints and facial images are captured from the sensor unit and processed them in to a usable form and stored in the database for that individual. And it involves

- Sample acquisition
- Segmentation and feature extraction
- Quality checks
- Template creation (converts the captured images in to usable format and stored in the database)

3.1.2 Verification

In verification, one or more samples of fingerprints and facial images are captured, processed into a usable form, and then matched against a reference template to check whether essential features are there. The image will either accept with the reference template or not. Fingerprint system may have two or more fingerprint images as backup for a particular person in the case enrolled finger gets damaged.

It involves

- Comparison of the sample features against the reference template
- A verification decision based on the match result with the reference template

3.1.3 Identification

In identification, fingerprint or facial image of the identifiable person are captured, processed into a usable form (template), and matched against a set of templates stored in the database. The final result may be empty or contain only one identifier that is best fitted to the captured image. System should be capable of identifying persons among a large database with a reasonable speed. That would be the final goal of the research.

Identification involves

> ➢ Sample acquisition;
> ➢ Segmentation and feature extraction;
> ➢ Quality checks
> ➢ Comparison against templates stored in the database
> ➢ An identification decision based matching result in one or more attempts
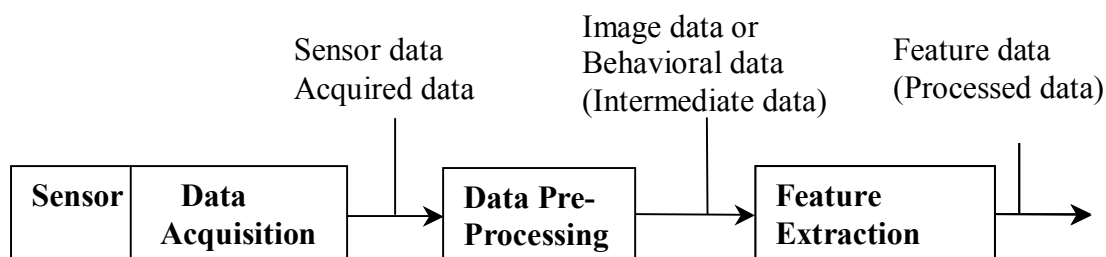

Figure 3- Functions of the biometric system

3.3 Reliability

The system should perform reliable identification with large databases, as biometrical identification systems tend to accumulate False Acceptance Rate with database size increase.

3.4 Performance

The system should response user within few seconds since the fingerprint and face recognition systems are real time. Therefore the engine we implement here should have law response time. So the fingerprint and face verification time should be low and it requires high computational power. On the other hand this system will maintain a large database which consists of millions of data. So the data processing time while identifying a particular image on the database should also be very low.

3.5 Application

A simple GUI application will be implemented for the demonstration purpose of the verification engine.

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