

Smart AI Powered Surveillance System

Software Requirements Specification SRS

Version 1.3

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Date 2025-11-23

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1 Introduction

1 1 Purpose

This Software Requirements Specification describes the Smart AI Powered Surveillance System which performs real time face detection recognition unknown person registration profile retrieval and activity logging using a webcam python based face analysis and a MySQL database. All biometric data remains local.

1 2 Scope

The system detects faces recognizes known individuals and registers unknown persons by prompting the operator for details. It stores all profiles encodings and logs in a MySQL database. Version 1 focuses on real time recognition and basic logging.

1 3 Definitions

OpenCV computer vision library.

Face Encoding numerical vector representing a face.

Known Face person previously registered.

Unknown Face person not found in database.

MySQL local relational database used for profiles and logs.

2 Overall Description

2 1 Product Perspective

The system is a standalone python application with modules for webcam capture face detection encoding recognition database access and display overlay.

2 2 Product Functions

Real time webcam streaming.

Face detection and encoding.

Known face recognition.

Unknown face registration workflow.

Profile retrieval and on screen display.

Event logging into MySQL.

2 3 User Classes

Primary user homeowner or operator responsible for monitoring and registering new persons.

2 4 Constraints

Single webcam input only. Lighting affects detection accuracy. Must run on local machine with MySQL.

2 5 Assumptions

User enters correct profile details. Webcam is available. Required libraries are installed.

3 Interface Requirements

3 1 User Interface

A live video window displays detection rectangles and profile text. Unknown persons are labeled and trigger a registration prompt.

3 2 Hardware Interface

Laptop webcam accessed using python OpenCV.

3 3 Software Interface

MySQL server stores profiles and logs. OpenCV provides video access and face recognition library provides encodings and comparisons.

4 System Features

4 1 Face Detection

The system shall detect faces in real time and draw green rectangles around each face.

4 2 Face Encoding

The system shall convert each detected face into a numerical encoding for comparison and matching.

4 3 Recognition

The system shall compare encodings with stored encodings and identify known persons. Recognized profiles shall be displayed.

4 4 Unknown Registration

If the system cannot match an encoding it shall prompt the operator to register the person by entering name age favorite color and favorite food. The new encoding shall be stored immediately.

4 5 Profile Display

For recognized faces the system shall display the profile text next to the face in the video feed.

4 6 Logging

The system shall record each face detection event with timestamp label and confidence into the MySQL database.

5 Non Functional Requirements

5 1 Performance

System shall maintain at least ten frames per second under normal conditions.

Recognition shall require one second or less per face.

5 2 Security

Database credentials shall be stored securely and not hard coded.

All biometric data encodings and profiles remain local and are not uploaded anywhere.

5 3 Usability

System must operate with simple commands and clear prompts for new user registration.

5 4 Reliability

System must tolerate temporary webcam failures or MySQL disconnections without crashing.

6 Data Requirements

6.1 Database Tables

Table family_members fields id name age favorite_color favorite_food face_encoding created_at.

Table activity_logs fields log_id member_id label confidence event_time.

7 Diagrams

7 1 Use Case Diagram Description

Actor User interacts with the system to start camera detect faces recognize persons register unknown persons and review logs.

7 2 Architecture Diagram Description

Data flows from Webcam to OpenCV to Recognition Module to MySQL and then back to Display Overlay.

7 3 Entity Relationship Diagram Description

family members table stores profiles. activity logs references family members through member id for known persons.

7 4 Activity Flow for Registration

Frame capture then face detection then encoding then comparison then match decision then registration if needed then display and logging.

8 Product Backlog

US1 User wants face detection for awareness.

US2 User wants recognition of known persons.

US3 User wants unknown face registration prompt.

US4 User wants reliable profile storage.

US5 User wants activity logging for review.

US6 User wants readable on screen overlays.

US7 User wants error handling for camera or database issues.

9 Appendices

Future enhancements may include alerts multiple camera feeds mobile companion app and integration with IoT security devices.