Software Requirements Specifications

Smart Mirror

Project Code: AUZ-272032

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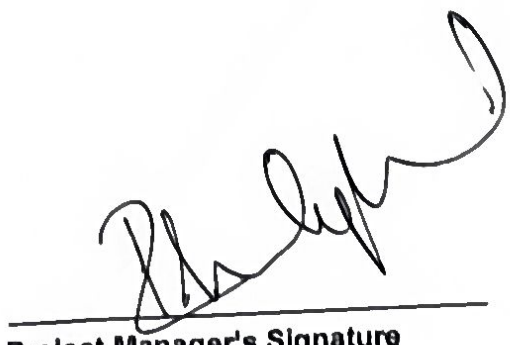

Project Manager's Signature

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Definition of Terms, Acronyms and Abbreviations

Term	Description
AI	Artificial Intelligence
CNN	Convolutional Neural Network
UI	User Interface
Raspberry Pi	Single-board computer used as processing unit
VTO	Virtual Try-on
Suitability Score	Percentage value showing how well a frame fits the user's face

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1. Introduction

1.1 Purpose of Document

This document defines the software requirements for the Smart Mirror -AI-Based Eyewear Suitability System. It describes the system's features, interfaces, functional and non-functional requirements, and operational environment. The intended audience includes the project team, advisors, evaluators, and developers who will design, implement, and maintain the system.

1.2 Project Overview

The Smart Mirror is designed for optical shops to assist customers in selecting eyeglass frames that best match their facial features. When a person stands before the mirror wearing physical glasses, the built-in camera captures the image and the AI module analyzes the face shape and expressions to compute a suitability percentage. If another frame in the database is predicted to suit the customer better, the system recommends it. This solution minimizes human bias, enhances user confidence, and improves the shopping experience through data-driven recommendations.

1.3 Scope

The project focuses on building a prototype smart mirror capable of capturing real-time facial images, performing AI-based face analysis, displaying a suitability score, and suggesting better frame options. The system will not provide online purchasing, augmented-reality try-on. It is intended for in-store use only with local data processing.

2. Overall System Description

The Smart Mirror integrates both hardware and software components to perform real-time image capture and AI-driven evaluation.

2.1 User characteristics

Primary Users: Optical shop customers seeking frame recommendations.
Secondary Users: Shop staff who manage and maintain the system. Users require no technical background.

2.2 Operating environment

Hardware: Two-way mirror, camera module, Raspberry Pi (or PC), LED display.
Software: Python 3.x, OpenCV, TensorFlow (or other AI framework), local database.
OS: Raspberry Pi OS / Linux-based environment.
Environment: Indoor optical store lighting.

2.3 System constraints

- **Hardware limits:** Raspberry Pi processing speed may restrict model complexity.
- **Lighting conditions:** Low light can affect accuracy.
- **Data storage:** Limited to local database capacity.
- **Privacy:** No permanent image storage allowed.
- **Legal:** Must comply with data protection guidelines.

3. External Interface Requirements

3.1 Hardware Interfaces

Camera Module: Captures user image and feeds it to processing unit.
Display Screen: Shows live feed and suitability percentage.
Raspberry Pi: Coordinates data processing and display output.
Power Supply: Ensures continuous operation.

3.2 Software Interfaces

Python & OpenCV: Image capture and face detection.
TensorFlow: AI model for face analysis and suitability scoring.
Local Database: Stores frame data and recommendation history.

3.3 Communications Interfaces

Local network or Wi-Fi (optional) for software updates.
USB interface for data backup or frame database transfer.
No continuous internet dependency.

4. Functional Requirements

- System shall capture real-time facial images through camera.
- System shall detect face area and landmarks.
- System shall extract geometric and expression-based features.
- System shall compute a numerical suitability score (0–100%).
- System shall suggest better frames from the local database (if present).
- System shall display the live image, score, score, and recommendation on the mirror screen.
- Hardware and software modules shall work in real time with minimal delay.

5. Non-functional Requirements

5.1 Performance Requirements

Real-time processing with response time under 8 seconds.

5.2 Safety Requirements

Electrical components must be securely enclosed. Device should comply with basic electronic safety standards. No user data will be stored beyond session duration.

5.3 Security Requirements

Images processed locally only; no external upload. Password-protected database access for administrators.

5.4 User Documentation

User Manual for shop staff. Quick Setup Guide for installation. On-screen usage instructions for customers.

6. Assumptions and Dependencies

Consistent lighting and clear camera view are available.

Trained AI model and datasets exist for face shape classification.

Reliable power supply is present.

Hardware components function within normal temperature and voltage range.

Future software updates depend on Python and library compatibility.

6. Assumptions and Dependencies

It may depend on availability of a sufficiently large and accurately labeled datasets of (Face Image, Worn Frame, Ground Truth Suitability Score) pairs for model training.
External lighting and mirror cleanliness can affect image accuracy.
Only one person will stand in front of the mirror at a time during processing.

The recommendation results depend on the accuracy of the face shape detection model and frame-style matching data.

7. References

Ref. No.	Document Title	Date of Release/ Publication	Document Source
ISSN : 2347-7180	MAGIC MIRROR USING RASPBERRY PI	05 No. 01 May 2022	https://www.journal-dogorangsang.in/no_1_Online_22/89.pdf
	MagicMirror Docs	17 Jan 2019	https://docs.magicmirror.builders/getting-started/installation.html
	Determining Face Shape with Python and Recommending Glasses Frames Accordingly	16 May 2025	https://www.researchgate.net/publication/392090412_Determining_Face_Shape_with_Python_and_Recommending_Glasses_Frames_Accordingly

8. Appendices

Appendix A – Future Enhancements

Expand database for new frame brands and styles.

Integrate a VTO feature using Augmented Reality to allow customers to see how frames look without physically wearing them.

Develop a mobile or web application that connects to the Smart Mirror's database for remote virtual testing.

Appendix B – Tools and Technologies

Language: Python. Libraries: OpenCV, TensorFlow.

Hardware: Raspberry Pi, Camera Module, LED Display, Two-Way Mirror.

Operating System: Raspberry Pi OS. Version Control: GitHub Repository.