Version 1.0

Software Requirements Specification (SRS)

Project Title: Android Application for Image Capture and Offline Measurement using USB UVC Camera and OpenCV

Software Requirements Specification (SRS)

1. Introduction

1.1 Purpose

This document defines the **Software Requirements Specification (SRS)** for of the Android application. It focuses on establishing a functional foundation for image capture using **USB UVC webcams** and performing **offline image-based measurements using OpenCV**.

1.2 Scope

The application will:

- Run on an **Android 12 tablet**
- Capture still images from **USB UVC webcams** (primary camera source)
- Integrate **OpenCV** for image processing
- Perform **offline measurements** on captured images
- Support **camera calibration** using OpenCV
- Detect basic geometric shapes and compute distances

1.3 Target Users

- Internal development team
- Engineering and measurement-focused users

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2. System Overview

2.1 Platform

- Android OS: **Android 12**
- Device Type: **Tablet**

- Development Environment: **Android Studio**
- Programming Language: **Java**

2.2 External Dependencies

- USB UVC camera hardware
- OpenCV Android SDK

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3. Functional Requirements

3.1 USB UVC Camera Integration (Primary Requirement)

FR-1

The application **shall detect and connect** to USB UVC webcams attached to the Android tablet.

FR-2

The application **shall request and manage USB permissions** required to access the UVC camera.

FR-3

The application **shall display a live preview** from the connected UVC camera.

FR-4

The application **shall capture still images** from the UVC camera upon user action.

3.2 Image Storage

FR-5

The application **shall save captured images locally** on the device storage.

FR-6

Saved images **shall be accessible** for further processing and measurement.

3.3 OpenCV Integration

FR-7

The application **shall integrate the OpenCV Android SDK** successfully within the project.

FR-8

Captured images **shall be convertible** into OpenCV-compatible formats (e.g., Mat).

3.4 Camera Calibration

FR-9

The application **shall support camera calibration** using OpenCV calibration functions.

FR-10

Calibration parameters **shall be stored locally** and reused for measurement calculations.

3.5 Shape Detection

FR-11

The application **shall detect basic geometric shapes** in captured images, including:

- Circles
- Rectangles

FR-12

Detected shapes **shall be visually highlighted** on the image.

3.6 Measurement and Distance Calculation

FR-13

The application **shall calculate distances** between detected shapes using calibrated camera data.

FR-14

Measurements **shall be performed offline** on captured images only.

3.7 Counter Detection (Basic)

FR-15

The application **shall count detected shapes** (e.g., number of circles or rectangles) in an image.

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4. Non-Functional Requirements

4.1 Performance

- Image capture and processing shall complete within a reasonable time for offline use.

4.2 Usability

- The UI shall provide clear controls for:
    - Capturing images
    - Running calibration
    - Performing measurements

4.3 Maintainability

- The project **shall be well-structured and documented** to allow collaborators to extend functionality in later phases.

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5. Deliverables

- Android Studio project compatible with Android 12
- USB UVC camera image capture implementation
- OpenCV integrated and functional
- Offline shape detection and distance measurement
- Camera calibration functionality
- Clean, extendable codebase for future phases

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6. Approval

This document represents the **complete and final scope**. Any additional features or enhancements will be addressed in subsequent phases and documented separately.

Basic Proposal

DESCRIPTION	DEADLINE
Task 1:	
USB UVC Camera Setup & Image Capture **Objective:** Create a working Android 12 project that captures photos from a USB UVC webcam. **Scope:** ● Android Studio project setup (Java, Android 12 – Tablet) ● USB permission handling ● Detection and connection of USB UVC webcams ● Live preview from UVC camera ● Capture still images from UVC camera ● Save captured images locally on the device **Deliverable:** ● Android app capable of capturing and storing photos from a USB UVC webcam	6 Days

Task 2:

7 Days

OpenCV Integration & Camera Calibration

Objective:
Integrate OpenCV and enable camera calibration for accurate measurements.

Scope:

- OpenCV Android SDK integration
- Conversion of captured images to OpenCV-compatible formats (Mat)
- Implementation of OpenCV camera calibration
- Local storage of calibration parameters
- Reuse of calibration data for measurements

Deliverable:

- Working OpenCV pipeline with calibrated camera support

Task 3:

7 Days

Shape Detection & Offline Measurement

Objective:
Perform offline measurements on captured images using OpenCV.

Scope:

- Detection of basic geometric shapes:
    - Circles
    - Rectangles
- Visual overlay of detected shapes on images
- Distance calculation between detected shapes using calibration data
- Basic counter detection (counting detected shapes)

Deliverable:

- app with offline shape detection, counting, and distance measurement