Software Requirements Specification (SRS)

FastAid – Smart Accident Response System

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1. Introduction

1.1 Purpose

This Software Requirements Specification (SRS) document defines the functional and non-functional requirements of FastAid – Smart Accident Response System. The purpose of this system is to automatically detect road accidents using intelligent surveillance technologies and ensure rapid emergency response by notifying authorities, hospitals, and rescue teams. This document serves as a reference for stakeholders, developers, testers, and project managers throughout the system development lifecycle.

1.2 Document Conventions

- Functional Requirements are labeled as FR-#
- Non-Functional Requirements are labeled as NFR-#
- IEEE 830 standard structure is followed
- “Shall” indicates mandatory requirements

1.3 Intended Audience and Reading Suggestions

This document is intended for: - Government and traffic management authorities - Emergency response agencies (ambulance, police, hospitals) - Software developers and system architects - Test engineers - Academic evaluators and reviewers

1.4 Project Scope

FastAid aims to reduce accident response time and fatalities by: - Automatically detecting road accidents using CCTV and AI - Estimating the number of victims using thermal sensors - Instantly alerting nearby emergency services - Providing real-time accident data and location tracking - Supporting decision-making for rescue prioritization

The system is designed for deployment at accident-prone zones such as highways, junctions, and urban roads.

1.5 References

- IEEE Std 830-1998 — Software Requirements Specifications
- Intelligent Transportation Systems (ITS) Standards
- Government Road Safety Guidelines

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2. Overall Description

2.1 Product Perspective

FastAid is a **smart surveillance-based emergency response system** that integrates: - CCTV cameras - Thermal sensors - AI/ML accident detection models - Cloud-based backend services - Web and mobile dashboards

The system operates as part of a smart city or intelligent traffic management ecosystem.

2.2 Product Functions

Key functions include: - Real-time accident detection via CCTV footage - Vehicle crash analysis using computer vision - Victim count estimation using thermal sensors - Automatic alert generation - GPS-based location identification - Emergency service notification - Live monitoring dashboard - Incident data storage and reporting.

2.3 User Classes and Characteristics

User Class	Description
Traffic Control Admin	Manages cameras, sensors, and system configuration
Emergency Operators	Monitor incidents and dispatch help

2.4 Operating Environment

- CCTV cameras installed at accident-prone locations
- Thermal sensors integrated with cameras
- Cloud server for data processing and storage
- Web dashboard (desktop browsers)
- Mobile devices for emergency responders

2.5 Design and Implementation Constraints

- Must comply with privacy and surveillance laws
- Requires reliable internet connectivity
- Hardware installation cost constraints
- Real-time processing requirements

2.6 User Documentation

- System user manual
- Admin configuration guide
- Emergency operator handbook

2.7 Assumptions and Dependencies

- Cameras and sensors are functional at all times
- Emergency services are integrated with the system
- Accurate GPS and mapping services are available

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3. System Features (Functional Requirements)

FR-1 Accident Detection Using CCTV

- The system shall continuously monitor CCTV video feeds.
- The system shall detect accidents using AI-based image and motion analysis.
- The system shall differentiate between normal traffic and collision events.

FR-2 Thermal Sensor Victim Detection

- The system shall use thermal sensors to detect human body heat.
- The system shall estimate the number of victims inside vehicles.
- The system shall detect unconscious or immobile victims.

FR-3 Accident Location Identification

- The system shall determine the exact GPS location of the accident.
- The system shall map the accident location on a digital map.

FR-4 Severity Assessment

- The system shall classify accidents as minor, moderate, or severe.
- Severity shall be based on impact force, vehicle damage, and victim count.

FR-5 Emergency Alert Generation

- The system shall automatically generate alerts upon accident confirmation.
- Alerts shall include location, time, severity, and victim count.

FR-6 Emergency Service Notification

- The system shall notify nearest ambulance services.
- The system shall notify nearby hospitals.
- The system shall notify police and traffic authorities.

FR-7 Monitoring Dashboard

- The system shall provide a real-time monitoring dashboard.
- Operators shall view live footage and incident status.

FR-8 Data Storage and Reporting

- The system shall store accident records securely.
- The system shall generate daily and monthly accident reports.

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4. External Interface Requirements

4.1 User Interfaces

- Web-based dashboard for administrators and operators
- Mobile notification interface for emergency responders

4.2 Hardware Interfaces

- CCTV cameras
- Thermal sensors

4.3 Software Interfaces

- AI/ML accident detection models

4.4 Communication Interfaces

- Secure HTTPS communication
- SMS / Push notification services

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5. Non-Functional Requirements

NFR-1 Performance

- Accident detection shall occur within 5 seconds of impact.

NFR-2 Reliability

- System shall operate 24/7 with 99.5% uptime.

NFR-3 Security

- All data shall be encrypted in transit and at rest.
- Access shall be role-based.

NFR-4 Privacy

- Video data shall comply with surveillance and privacy regulations.

NFR-5 Scalability

- The system shall support multiple locations and cameras.

NFR-6 Maintainability

- The system shall support remote updates and diagnostics.

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6. System Architecture Overview

The system follows a layered architecture: - **Sensing Layer**: CCTV and thermal sensors - **Processing Layer**: AI-based accident detection - **Application Layer**: Alert generation and dashboards - **Integration Layer**: Emergency services communication - **Data Layer**: Cloud database and logs

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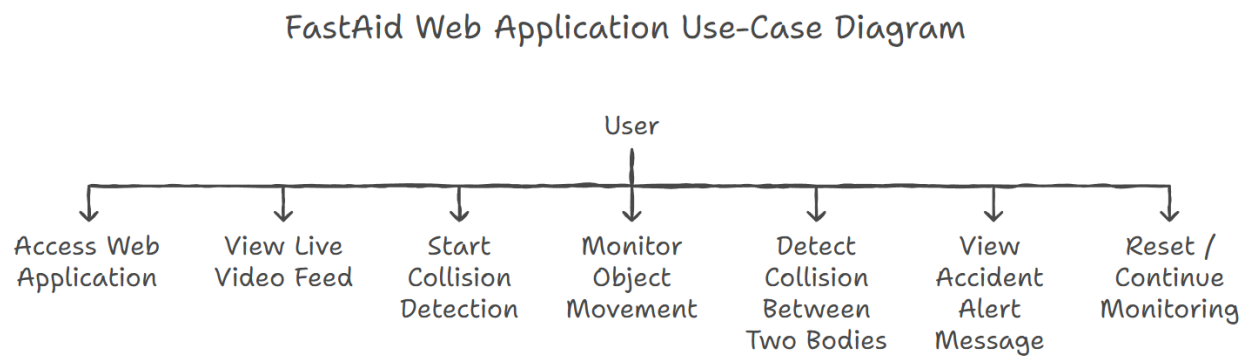
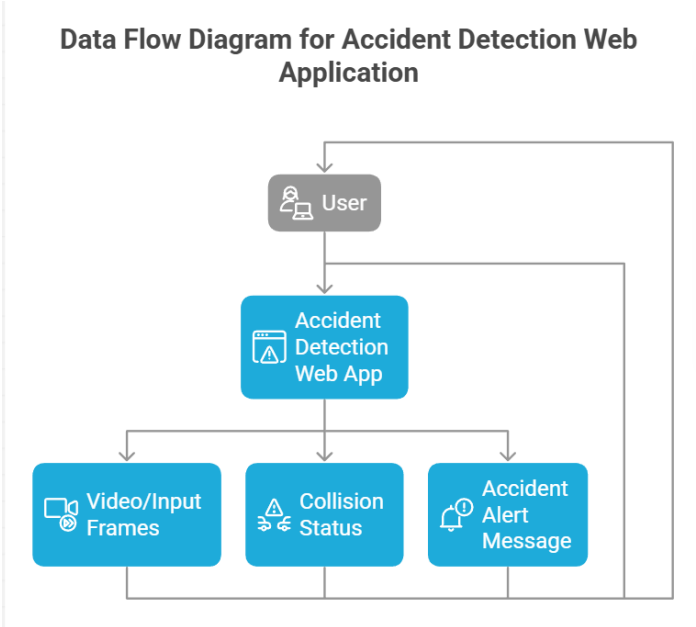
7. System Models (Overview)

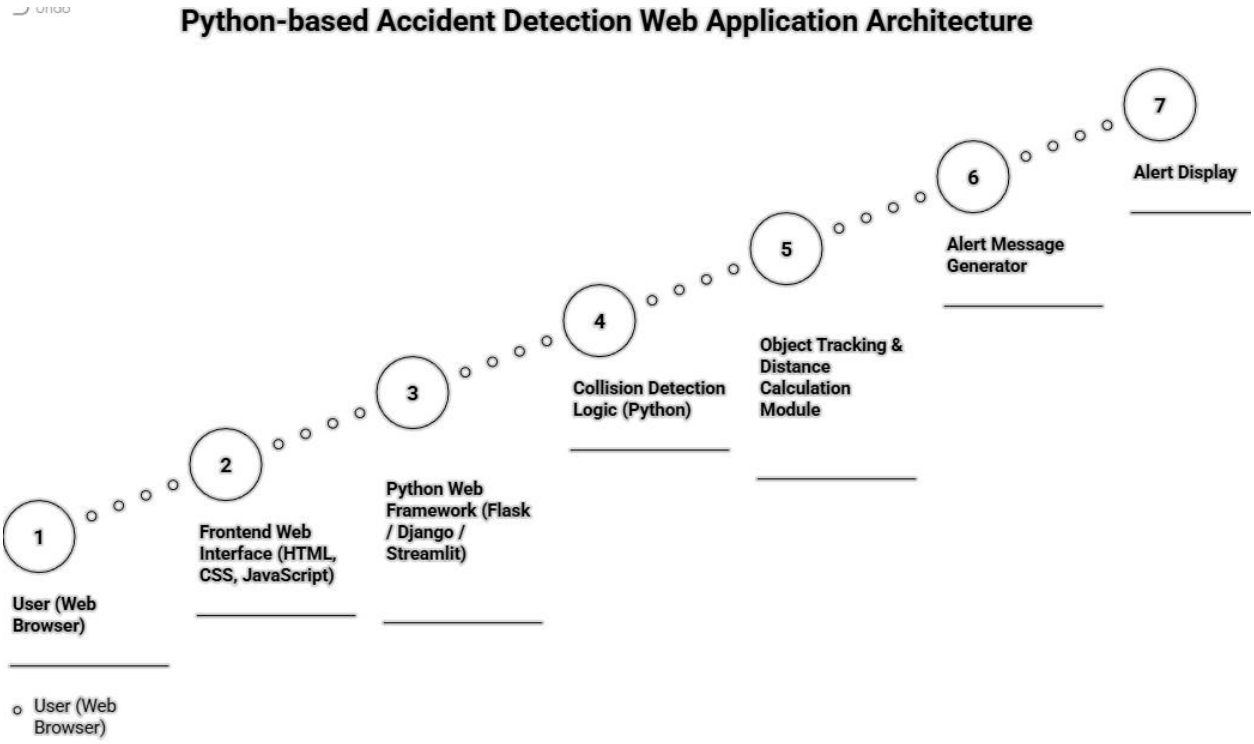
- Use-Case Diagrams



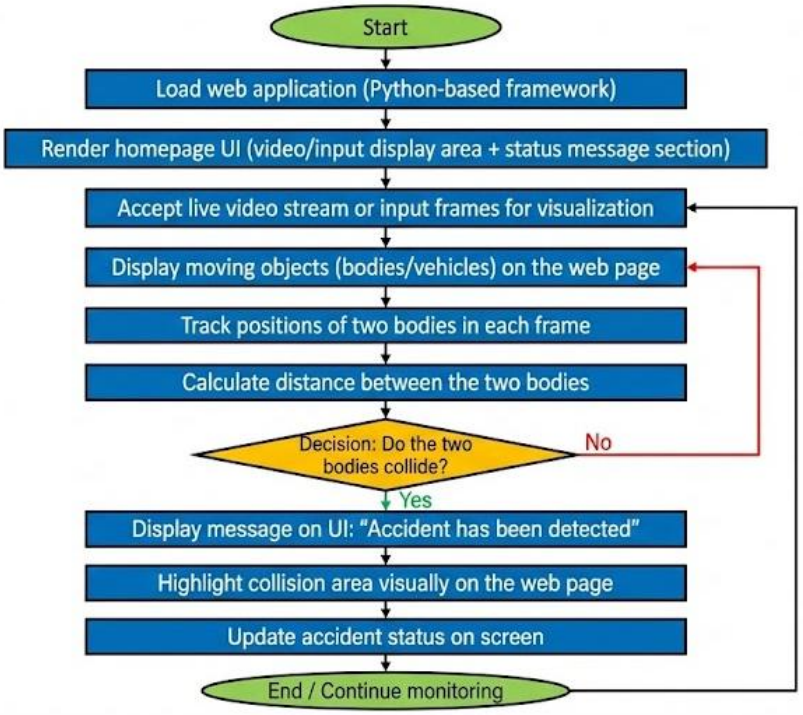
- Data Flow Diagrams (DFD)



- Architecture Diagrams



- Flow Chart



8. Validation and Acceptance Criteria

- Successful detection of simulated accidents
- Accurate victim count detection
- Alerts delivered within defined time limits
- User acceptance testing approval

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9. Appendices

Appendix A – Glossary

- **CCTV**: Closed-Circuit Television
- **AI**: Artificial Intelligence
- **ITS**: Intelligent Transportation System

Appendix B – Future Enhancements

- Integration with vehicle airbag sensors
- AI-based traffic rerouting
- Drone-based visual assistance
