**SIT 725**

**Applied Software Engineering**

**Task 7.3P**

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Introduction

Document Purpose

This Software Requirements Specification (SRS) document establishes the functional and non-functional requirements of the unmanned aerial vehicle (UAV) performance analysis platform. This system is designed to visualize the flight trajectories of unmanned aerial vehicles (UAVs) and evaluate and analyse their performance indicators based on background algorithms. This document provides a blueprint for the development team, testers, project managers, and stakeholders, throughout the entire software development lifecycle.

Product Scope

The UAV Performance Analysis Platform will provide UAV flight trajectory data ingestion and processing capabilities, advanced analytics for flight pattern evaluation and flight performance analysis, and real-time 3D flight trajectory visualization. The system provides a customizable reporting dashboard for performance insights, secure multi-user access with role-based permissions, and supports JSON datasets. The platform targets aerospace researchers, drone operators, and academic institutions conducting UAV performance studies.

Definitions, Acronyms, and Abbreviations

**UAV:** Unmanned Aerial Vehicle

**API:** Application Programming Interface

**GPS:** Global Positioning System

**JSON:** JavaScript Object Notation

**SRS:** Software Requirements Specification

**UI/UX:** User Interface/User Experience

**CRUD:** Create, Read, Update, Delete operations

**REST:** Representational State Transfer

**TLS:** Transport Layer Security

Document Overview

This SRS document contains four primary sections: Introduction, Overall Description, System Features, and Non-functional Requirements. Each section delivers comprehensive requirements specifications that will direct the development process.

Overall Description

Product Perspective

The platform delivers core functionalities to UAV data management and trajectory analysis. Data ingestion capabilities provide import and validation of UAV flight data from various sources and formats. The performance analytics module offers statistical analysis of flight efficiency, trajectory accuracy, and operational metrics through advanced computational algorithms. The visualization engine creates interactive 3D trajectory mapping with environmental data overlays for comprehensive flight path analysis. Report generation functionality enables automated creation of analytical reports with customizable templates tailored to different research requirements. User administration ensures secure authentication system with access controls for different user roles and permissions. Data export capabilities support multiple format options for further research analysis and integration with external analytical tools.

Product Functions

The core functions provided by this platform include data ingestion for manually importing and verifying drone flight data, performance analysis for providing statistical analysis of flight efficiency and trajectory accuracy, visualization for creating interactive 3D trajectory mappings, report generation for supporting automatic analysis reports, and user management for ensuring security authentication through access control. It also features a data export function that supports multiple format options for research and analysis.

**Primary Users:**

UAV Researchers: Technical professionals requiring detailed analytical capabilities for UAV flight studies, with advanced knowledge of flight dynamics and data analysis methodologies.

UAV Operators: Personnel responsible for drone deployment and flight monitoring activities, possessing practical UAV operation experience but requiring intuitive performance analysis interfaces.

Academic Researchers: Scientists conducting studies on UAV flight patterns and operational efficiency, bringing specialized research methodology expertise.

**Secondary Users:**

System Administrators: Personnel managing user accounts and system configuration, requiring administrative privileges and web application management expertise.

Data Analysts: Researchers utilizing processed flight datasets for broader analytical studies, focusing on statistical analysis and performance optimization research.

Project Supervisors: Stakeholders requiring high-level performance summaries and progress reports, needing accessible reporting interfaces without deep UAV technical knowledge.

Constraints

The client environment supports modern web browsers across desktop and mobile platforms, ensuring cross-platform compatibility for user access. The system operates effectively on Windows, macOS, and Linux operating systems, with mobile support for iOS and Android devices.

The server environment utilizes Node.js runtime with MongoDB database for data management capabilities. The system supports cloud deployment platforms for scalability and reliability, with secure communication protocols ensuring data protection throughout the system architecture.

Assumptions and Dependencies

System assumptions include that users possess fundamental knowledge of UAV operations and basic data analysis principles, enabling effective platform utilization. Reliable internet connectivity is assumed for web application access and real-time processing features. Flight data is expected to follow standard GPS coordinate formats and timestamp conventions for consistent processing across different UAV systems.

Key dependencies encompass continuous availability of mapping service APIs for geographical visualization, database service reliability for system responsiveness, and cloud hosting platform compliance for system availability. The system relies on standard web browser capabilities for 3D visualization rendering and requires consistent data formatting from UAV telemetry systems for accurate analysis calculations.

Specific Requirements

External Interfaces

**User Authentication and Authorization**

The system provides secure user authentication for account creation, login, and profile management. Users can register new accounts, log in with credentials, reset passwords, and manage their profile settings.

**Flight Data Import and Processing**

The platform allows users to upload UAV flight data files in JSON format containing GPS coordinates and timestamps. The system validates the data format, processes trajectory information, and stores the flight data for analysis.

**Performance Analysis Module**

The analysis engine calculates flight performance metrics including trajectory accuracy, flight duration, distance travelled, and average speed. Users can compare multiple flights and view statistical analysis of flight patterns and efficiency.

**3D Trajectory Visualization**

The visualization system displays flight paths in an interactive 3D environment. Users can view trajectories from different angles, zoom in/out, and see altitude variations through color-coded displays. Flight paths are rendered with accurate geographical positioning.

**Administrative Management Interface**

Project managers can access an administrative dashboard to view system usage statistics, user activity data, and database performance metrics. This interface enables user account management and provides backend system monitoring capabilities.

**Report Generation System**

The system automatically generates PDF reports containing trajectory charts, performance graphs, and statistical summaries. Users can customize report templates and generate reports for multiple flight datasets with downloadable documentation.

Non-Functional Requirements

**Performance Requirements**

The system shall load pages within 3 seconds and support processing of multiple file uploads simultaneously. The platform must handle up to 100 concurrent users and process flight datasets up to 1GB within 5 minutes. System availability should maintain 99% uptime during operational hours.

**Safety Requirements**

All user input must be validated to prevent security issues. The system shall implement automated data backups every 24 hours and provide error recovery within 15 minutes of system failures. All errors shall be logged and users notified with clear guidance.

**Security Requirements**

User authentication shall include secure password policies with minimum 8 characters. The system must implement role-based access control for different user types. All data transmission shall use HTTPS encryption and user sessions shall automatically expire after 30 minutes of inactivity.

**Software Quality Attributes**

New users should complete basic tasks within 10 minutes of training. The system must maintain data integrity across all operations and function correctly on all supported browsers and operating systems. All features shall include appropriate testing to ensure reliability.

Member Contributions to the SRS

**Disen Jia s223314816 - Project Lead,** **Quality Assurance, UI/UX designer** Contributions:

Write and review SRS documents to ensure clear project goals.

Create the first website prototype (basic UI interface).

Be responsible for the visualization of unmanned aerial vehicle trajectories and the implementation of the analysis module.

Create and maintain GitHub repositories.

Final software testing and deployment.

Performance Analysis Module algorithm development.

**- Name student number - your** Contributions:

… your contribution

**Name student number - your** Contributions:

… your contribution

UI beautification

The data import function has been realized

Integration of various web apis

The implementation of user authentication function

Software testing

Implementation of PDF report generation System