Software Design Specification

UI/UX Automation Using LLM

Project Code:

Internal Advisor:

Dr. Fahad Maqbool

External Advisor:

Project Manager:

Dr. Muhammad Ilyas

Project Team:

Muhammad Dawood (BSCS51F21S089)
Muhammad Rashid (BSCS51F21S084)
Ghulam Rasool (BSCS51F21S080)

Submission Date:

01/02/2025

Project Manager's Signature

Document Information

Category	Information
Customer	UI/UX Designers, Design Teams, and Developers.
Project	UI/UX Automation Using LLM
Document	Software Design Specification
Document Version	1.0
Identifier	PGBH01-2003-DS
Status	Draft
Author(s)	Muhammad Dawood, Muhammad Rashid, Ghulam Rasool
Approver(s)	Dr. Muhammad Ilyas
Issue Date	November 26, 2024
Document Location	
Distribution	1. Dr. Fahad Maqbool 2. Dr. Muhammad Ilyas 3. University of Sargodha

Definition of Terms, Acronyms and Abbreviations

Term	Description
LLM	Large Language Model, used for generating designs and contextual suggestions.
GraphRAG	Graph-based Retrieval-Augmented Generation for contextual responses.
OWL	Web Ontology Language for semantic consistency.
Neo4j	Graph database used for storing and querying UI/UX design knowledge.
UI	User Interface.
UX	User Experience.
Figma	Collaborative design tool for exporting high-fidelity designs.

Table of Contents

1. Introduction

1.1 Purpose of Document

This document specifies the software design for the **UI/UX Automation Using LLM** project. It establishes a blueprint for the system's development, ensuring adherence to the defined requirements and delivering a scalable and efficient product. The audience includes stakeholders, system architects, developers, and QA teams.

1.2 Project Overview

The project leverages **Large Language Models (LLMs)** to automate UI/UX workflows, enabling seamless wireframe generation, validation, and export. Integration with Neo4j for knowledge graphs and OWL for ontologies ensures adherence to UI/UX standards.

Key Features:

- Automated wireframe generation from natural language descriptions.
- Context-aware design validation using OWL-defined principles.
- Export functionality to Figma for high-fidelity design outputs.
- AI-driven design suggestions based on industry trends.

1.3 Scope

In-Scope:

- Automating design workflows for UI/UX designers.
- Providing intuitive feedback for improvement.
- Knowledge graph management and updates for scalable usage.

Out-of-Scope:

- Prototypes with interactive elements.
- Domain-specific UI/UX needs outside the ontology's scope.

2. Design Considerations

2.1 Assumptions and Dependencies

Assumptions:

- Users are proficient in basic UI/UX principles and tools like Figma.
- Internet connectivity will be reliable for LLM and knowledge graph queries.
- APIs (OpenAI, Figma) remain stable and accessible throughout development.

Dependencies:

- **LLM APIs:** Dependence on services like OpenAI for processing natural language.
- **Neo4j Database:** Ensures efficient knowledge storage and querying.
- **Cloud Infrastructure:** Hosting for scalability and consistent performance.
- **Ontology Updates:** Regular maintenance required for industry-relevant suggestions.

2.2 Risks and Volatile Areas

- **Evolving Standards:** Changing UI/UX trends may necessitate updates to ontologies and suggestions.
- **API Downtime:** Dependence on third-party APIs may lead to disruptions.
- **Scalability Concerns:** High user demand could affect system performance if not optimized.
- **Data Security:** Protecting sensitive design data and adhering to regulations like GDPR is critical.

3. System Architecture

3.1 System Level Architecture

The system is organized into three primary layers:

1. **Presentation Layer:**
    - User-facing interface for accessing features.
    - Includes functionalities like design input, wireframe generation, and validation feedback.
2. **Business Logic Layer:**
    - Handles core workflows including GraphRAG-based design generation.
    - Interacts with the ontology for design validation.
3. **Data Layer:**

- Manages Neo4j-based knowledge graphs and data persistence.

3.2 Sub-System / Component / Module Level Architecture

Wireframe Generation Subsystem:

- Converts textual design requirements into structured wireframes using LLM and GraphRAG.

Design Validation Subsystem:

- Validates wireframes against UI/UX principles.
- Suggests improvements for usability and alignment.

Feedback Subsystem:

- Provides actionable design insights based on contextual queries.

Export Subsystem:

- Enables seamless export of designs to Figma.

3.3 Sub-Component / Sub-Module Level Architecture (1…n)

- **Wireframe Generator:** Handles LLM queries and graph-based suggestions.
- **Validator:** Ensures compliance with UI/UX principles.
- **Knowledge Graph Manager:** Updates and retrieves data from Neo4j.
- ***Exporter:*** *Converts wireframes into Figma-compatible formats.*

4. Design Strategies

4.1 Strategy 1…n

- **Scalability:** Modular components for future enhancements.
- **Data Reuse:** Centralized knowledge base with reusable components.
- **Cross-Platform Accessibility:** Responsive design for web and mobile interfaces.
- **Performance Optimization:** Asynchronous processing for efficient LLM queries.
- ***Security Measures:*** *End-to-end encryption and role-based access.*

5. Detailed System Design

5.1 Class Diagram:

- **Classes:** User, Wireframe, Validator, KnowledgeGraph, Exporter.
- **Interactions:** User generates wireframe → Validator ensures compliance → Exporter formats output.

5.2 Sequence Diagram:

- Wireframe Creation Workflow.
- Export to Figma.

5.3 State Transition Diagram:

- Wireframe States: Input → Generated → Validated → Exported.

5.4 Logical Data Model (E/R Diagram):

- Entities: User, Wireframe, Ontology.
- Relationships: User generates wireframes; wireframes validated by ontology rules.

5.5 Physical Data Model:

- Tables for Users, Wireframes, Ontology Rules.

5.6 GUI Designs:

- Mockups for main screens including input forms, validation results, and export options.

6. References

Ref. No.	Document Title	Date of Release/ Publication	Document Source
RAG2023	GraphRAG Explained: Enhancing RAG with Knowledge Graphs	2023	Medium (https://medium.com
OWL2004	OWL Reference	Feb 10, 2004	W3C (https://www.w3.org/TR/ owl-ref/)
AIUX2023	Artificial Intelligence (AI) for User Experience (UX) Design	Aug 2023	Information Technology and People Journal

7. Appendices

Appendix
A:Glossary
Appendix B: Workflow Diagrams