UI/UX AUTOMATION USING LLM

Project Code:

To be assigned

Project Advisor:

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1. Abstract

The demand for efficient and intelligent UI/UX design processes has grown significantly. This project seeks to address this need by automating UI/UX workflows using Large Language Models (LLMs) [1] in combination with a Neo4j-based knowledge graph and OWL (Web Ontology Language) for semantic enrichment.

The project uses GraphRAG (Graph-based Retrieval-Augmented Generation) to enable context-aware querying and response generation[2]. Ontologies developed using Protégé, a popular ontology development tool [3], will serve as the backbone for the knowledge graph, ensuring semantic accuracy and scalability [2].

By integrating GraphRAG with an OWL-based knowledge graph, the framework will automate tasks like wireframe generation, design validation, and UI/UX adherence checks, ultimately delivering **Figma designs** as high-fidelity outputs for developers and designers.

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2. Background and Justification

Traditional UI/UX design relies heavily on manual efforts and expertise, leading to inconsistencies and inefficiencies. The introduction of knowledge graphs and ontologies has transformed data organization and decision-making. This project introduces:

- **OWL Ontologies** created in Protégé to define UI/UX principles, components, and relationships.
- **Neo4j Knowledge Graphs** to represent these ontologies and their data.
- **GraphRAG** to enable contextual retrieval and informed LLM responses.

This novel approach combines state-of-the-art tools and techniques to enhance productivity, consistency, and innovation in UI/UX design workflows while producing professional-quality outputs directly usable in **Figma** [3].

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3. Research Methodology

3.1. Ontology Design and Knowledge Graph Construction:

- Use Protégé to create OWL-based ontologies [4] for UI/UX components, design principles, and relationships.

- Build a Neo4j-based knowledge graph to represent the ontology and store relevant data [4].
- Incorporate semantic reasoning to infer new relationships and validate data consistency [5].

3.2. Integration with GraphRAG:

- Implement GraphRAG for context-aware retrieval of design principles and components from the knowledge graph.
- Use Cypher queries to retrieve graph data and provide it as input to the LLM.

3.3. Framework Development:

- Develop features like:
    - Wireframe generation using GraphRAG and ontology-based prompts.
    - Consistency checks based on OWL-defined constraints.
    - Interactive suggestions leveraging graph queries and LLM responses.
    - Exporting generated wireframes into **high-fidelity Figma designs**.

3.4. Evaluation and Refinement:

- Validate the system with real-world UI/UX scenarios, focusing on usability and efficiency.
- Refine the ontology and knowledge graph based on evaluation feedback.

3.5. Deployment and Documentation:

- Document the framework architecture and methodologies.
- Deploy a prototype for academic and industrial testing.

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4. Project Scope

1. Development of OWL-based ontologies using Protégé [6].
2. Construction of a Neo4j knowledge graph integrated with GraphRAG.
3. Automation of wireframe generation and design validation.
4. Export of generated wireframes into **high-fidelity Figma designs** for developers and designers.

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5. High-Level Project Plan

Phase	Duration	Deliverables
Requirement Analysis	2 weeks	OWL ontology schema, initial knowledge graph structure.
Ontology Development	3 weeks	UI/UX ontology in Protégé.
Knowledge Graph Design	2 weeks	Fully integrated Neo4j graph with OWL ontologies.
GraphRAG Integration	3 weeks	Context-aware query and response system.
Framework Development	2 weeks	Prototype with key automation features, including Figma design export.
Evaluation & Testing	2 weeks	Test cases, performance reports, user feedback.
Documentation	1 week	Project report, user guide, ontology schema.

References

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