Swinburne University of Technology

COS20007 Object Oriented Programming

Research Project Initial Plan

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HD Research Project Initial Plan

Topic: The use of OOP principles Game Development using one of the most popular and powerful Game Engines in the world, which is Unity.

Potential Research Question(s):

- How does the use of classes and objects in Unity promote code readability, reusability, extendability, and maintainability?
- How does the application of OOP principles in Unity impact game performance and optimization?
- How does encapsulation and data hiding improve the maintainability and scalability of Unity projects?
- What are the benefits/challenges of applying inheritance and polymorphism in Unity game development?
- How do OOP principles in Unity facilitate collaboration among team members and improve project organization?
- What are some specific OOP design patterns commonly used in Unity game development, and how do they contribute to the overall game architecture?
- What are some other computer programming model used in Unity Game Develoment (likes ECS – Entity Component System), and their benefits/constraints compared to OOP?

Potential Method(s):

- Literature Review: Finds some academic papers, books, articles, and online resources that discuss OOP principles, Unity game development, and their intersection.
- Case Studies:
    - Select a set of representative existing Unity game projects that have utilized OOP principles.
    - Analyze these case studies to identify the specific implementation of OOP principles, design patterns, and programming models used.
    - Extract key insights and lessons learned from the case studies.
- Experimental Evaluation:
    - Develops some experimental Unity project(s) that showcase different aspects of OOP principles.
    - Conducts systematic testing and profiling of the experimental projects to collect quantitative data.
    - Analyzes the collected data to evaluate the influence of OOP principles on game performance and identify any trade-offs or performance bottlenecks.
- Data Analysis and Synthesis:

- Organizes and analyze the data collected from literature review, case studies, surveys, interviews, and experimental evaluation.
- Looks for patterns, commonalities, and trends across the data to answer each research question.
- Identifies any limitations or gaps in the research and propose potential areas for future exploration.

Expected result(s):

- Reflecting how the application of OOP principles, as well as some popuplar design patterns, in Unity game development can impact code readability, reusability, maintainability, and performance. Through the analysis of case studies and experimental evaluations, I will be able to identify the specific benefits and challenges associated with using OOP principles in Unity.
- Providing practical guidance(s) and experiences for me in implementing effective and efficient OO solutions in Unity in the future.

Reflection in the unit's learing outcomes:

1. This project is to discuss how OOP's principles such as abstraction, inheritance, encapsulation, and polymorphism apply in game development, specially in Unity game engine, and also how they can be used to improve the codebase's readability, efficiency, reusability, and maintainability.
2. In this research project, I conduct my research(es) on the Unity game engine, which is based on the C# programming language, to develop object-oriented programs. This would allow me to develop a practical understanding of how to implement OOP principles in game development and leverage the associated class libraries provided by Unity.
3. With the available debug system of the Unity game engine, it might be possible for me to design, develop, test programs using OOP principles.
4. Of course, during this research project, the diagrams and illustrations, such as UML Class Diagram(s), are necessary for all object-oriented programs or projects, and will be presented in this research project
5. Conducting this project may requires me to describe and explain the factors that contribute to a good OOP solution, reflecting on my own experiences, skills and drawing upon accepted good practices, which are illustrated through my analysis of case studies and experimental evaluations. This helps me meet the intended learning outcomes of the unit.