

**MACAU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**School of Computer Science and Engineering**

**Faculty of Innovation Engineering**

**<<Software Project for Course Software Engineering>>**

Homework ID : Task1-Project Proposal

Report Title : Project Proposal for Rhythm Beat

Student Name : DUMINGYANG 1220025857

LIUSHIYU 1220032941

SUNSHIHAO 1220001191

Student No. : 1220025857 1220032941 1220001191

Date : 2025/9/28

# Table of Contents

[Table of Contents II](#_Toc209985331)

[Chapter 1 Project Team Organization 1](#_Toc209985332)

[1.1 Team Name: 1](#_Toc209985333)

[1.2 Team Leader: 1](#_Toc209985334)

[1.3 Team Member Profiles: 1](#_Toc209985335)

[Chapter 2 Project Selection 2](#_Toc209985336)

[2.1 Project Topic: 2](#_Toc209985337)

[2.2 Motivation: 2](#_Toc209985338)

[Chapter 3 Project Proposal Preparation 3](#_Toc209985339)

[3.1 Problem Diagnosis 3](#_Toc209985340)

[3.2 Proposed Treatment: 3](#_Toc209985341)

[3.3 Work Plan: 3](#_Toc209985342)

[Chapter 4 Project Proposal Writing 5](#_Toc209985343)

[4.1 Project Description: 5](#_Toc209985344)

[4.2 Functional Features: 5](#_Toc209985345)

[4.3 Technical Details: 5](#_Toc209985346)

[4.4 Algorithm Complexity Analysis: 5](#_Toc209985347)

[4.5 Team Member Roles & Responsibilities: 6](#_Toc209985348)

[Chapter 5 Project Submission Format and Evaluation Criteria 7](#_Toc209985349)

[5.1 Project Description: 7](#_Toc209985350)

[5.2 Short-term Work Plan: 7](#_Toc209985351)

[Chapter 6 References: 8](#_Toc209985352)

# Project Team Organization

## Team Name:

**Rhythm Masters**

## Team Leader:

**DUMIGNYANG**

**Responsible for coordinating team activities, organizing meetings, tracking progress, and ensuring project completion on time.**

## Team Member Profiles:

* **DUMINGYANG 1220025857**
  + *Profile*: Experienced in game development and programming, skilled in game logic design and project management, familiar with C++, Python, and Unity.
  + *Strengths*: Leadership, game development, and documentation.
* **LIUSHIYU** 1220032941
  + *Profile*: Backend development expert, specialized in database and configuration file parsing, skilled in Node.js, JavaScript, and data-driven development.
  + *Strengths*: Backend development, data management, system design.
* **SUNSHIHAO** 1220001191
  + *Profile*: Sound and visual designer, proficient in creating game sound effects and special effects, experienced with Adobe Suite and game engine sound handling.
  + *Strengths*: Sound design, effects creation, user experience optimization.

# Project Selection

## Project Topic:

**Rhythm Beat: A Music-Game Development Project**  
This project is inspired by classic rhythm games where players must match incoming notes with the correct key presses. The project includes:

* **High Freedom Customizable Sheet Music**: Players can create custom notes and configure note types (such as bomb notes, double notes, speed-up notes, slow-down notes).
* **Extensible Special Effects System**: Dynamic loading of notes and effects from configuration files to add variety and replayability to the game.

## Motivation:

* **Player Experience**: Music and rhythm-based challenges continuously engage players, enhancing interaction.
* **Technical Exploration**: Implementing special note behaviors (bomb, double, speed shift) allows exploration of game logic and data-driven design.
* **Scalability**: Storing note configurations in external files enables easy modification and expansion (e.g., adding new difficulty levels or note types) without changing core code.

# Project Proposal Preparation

## Problem Diagnosis

* **Problem Domain**: Traditional music games lack innovation and often rely on static notes and effects, limiting player creativity.
* **Specific Problems**:
  + Players lack sufficient freedom to create and modify game notes.
  + The types of notes and game tempo variations are often monotonous, leading to repetitive gameplay.
  + Game effects are often not well integrated with note behavior, reducing player immersion.

## Proposed Treatment:

* **Solution**: Develop a highly customizable music game system that allows players to create sheet music and load different types of notes and effects. The system will include:
  + Customizable sheet music functionality, allowing players to create and modify notes.
  + Multiple note types (e.g., bomb, double, speed-up, slow-down) to increase gameplay challenges.
  + Effects and note types loaded dynamically from configuration files for easy expansion.

## Work Plan:

1. **Requirements Collection & Planning (Week1&2)**:
   * Define game requirements, note types (bomb, double, speed-up, etc.), and configuration file structure.
2. **Design & Architecture (Week3&4)**:
   * Create system design diagrams, define core classes and interfaces for note handling, collision detection, timing mechanics, and scoring logic.
3. **Core Development (Week5&6&7&8)**:
   * Implement the basic game loop (rendering, input handling).
   * Integrate special note behaviors (bomb, double, speed-up, slow-down).
   * Implement the note configuration file reading module.
4. **Testing & Integration (Week9&10&11&12)**:
   * Conduct unit tests for each note type.
   * Integrate special notes into the main game flow, ensuring stable configuration file loading.
5. **Refinement & Documentation (Week13&14&15)**:
   * Polish game mechanics, optimize performance.
   * Prepare project documentation and user guides.
6. **Final Review & Submission (Week16&17)**:
   * Conduct final bug fixes and stability checks.
   * Submit the completed project deliverables.

# Project Proposal Writing

## Project Description:

**Rhythm Beat** is an innovative music rhythm game that allows players to create customizable sheet music and load different types of notes and effects dynamically. The game will feature various special note types (e.g., bomb, double, speed-up, slow-down) to enhance gameplay challenge and replayability.

## Functional Features:

* **Customizable Sheet Music & Note Creation:** Players can create and modify notes freely.
* **Multiple Special Note Types:** Bomb notes, double notes, speed-up notes, slow-down notes, etc., providing more challenges.
* **Effects & Notes Loaded from Configuration Files:** Dynamic configuration for easy expansion of new notes and effects.

## Technical Details:

## Algorithm Complexity Analysis:

* **Note Collision Detection Algorithm:** We employ a spatial partitioning algorithm to divide the game screen into smaller regions for more efficient collision detection, reducing unnecessary calculations and improving performance.
* **Note Sorting:** Using quick sort algorithm to sort notes by their timestamps, ensuring the proper order of events during gameplay.
* **Data Structures:** The game notes will be stored using hash tables, and the note configuration file will be stored in JSON format. Timestamp-based sorting will be used to handle notes and game events.

## Team Member Roles & Responsibilities:

* **DUMINGYANG**: Project leader, responsible for backend development and database design, implementing MVC design pattern to separate data and user interface.
* **LIUSHIYU**: Backend development and data management, responsible for parsing configuration files.
* **SUNSHIHAO**: Sound design and effects creation, user experience optimization, enhancing the visual and sound effects to increase immersion.

# Project Submission Format and Evaluation Criteria

* **Project Title**: Rhythm Beat: A Music-Game Development Project
* **Group Number**: 6
* **Project Website URL**: https://github.com/YTyounger/Software-Engineering-Assignment-Project-Rhythm-Beat.git

**Team Profile:**

* **DUMINGYANG**: Leadership, game development, and project management.
* **LIUSHIYU**: Backend development and data management, configuration file handling.
* **SUNSHIHAO**: Sound design and effects creation, user experience optimization.

## Project Description:

The system allows players to create and edit music game levels, offering highly customizable note behavior, a variety of special notes, and effects to improve the challenge and replayability.

## Short-term Work Plan:

* **Week 1-2**: Requirements analysis and note type confirmation, UI design.
* **Week 3-5**: Backend development and special note integration.
* **Week 6-8**: Frontend development and sound integration.
* **Week 9-10**: Functionality testing and optimization.
* **Week 11-12**: System integration and documentation.

# References:

1. Anderson, C., & Reed, B. (2018). *Interactive Music Game Design*. ACM Journal of Entertainment Technology.
2. Smith, J., & Wang, L. (2020). *Implementing Real-Time Systems for Rhythm Games*. Proceedings of the International Conference on Game Development, 47-58.