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Developing Turn-Based Rpgs Using Game Forge

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Abstract: A Java-based game engine called GameForge was created to make the process of creating Turn-Based Role-Playing Games (TBRPGs) more efficient. It combines effective asset management, simple physics simulation, and real-time graphics processing into a modular, component-based design. Character and inventory management, a tile-map system for grid-based gameplay, and JSON-based save/load capability for permanent game data are among the engine's primary TBRPG features. GameForge, which was created with Java Swing, provides a graphical user interface (GUI) for simple activities like character configuration, level building, and inventory editing that require little programming knowledge. For desktop-based TBRPG development, the focus is now on quick prototyping and customisation, with cross-platform support as a future objective.

***Index Terms* -** Game Engine, GameForge, TBRPG, Tile-Map, GUI, Prototyping

I. Introduction

Due to their strategic depth and compelling narrative, turn-based role-playing games, or TBRPGs, continue to be a popular genre in both independent and mainstream game production. Turn sequencing, character stats, tile-based maps, and data persistence are among the fundamental mechanisms that must be implemented with considerable effort in order to create such games [1]. Although general-purpose tools are provided by contemporary engines such as Unity and Unreal Engine, they sometimes do not support TBRPG features specifically, which might result in needless overhead for creators that specialise in this genre [2], [3].

We introduce GameForge, a lightweight Java-based game engine designed especially for TBRPG production, to overcome these difficulties. In accordance with best practices in component-based game engine design, GameForge uses a modular architecture with essential components for asset management, tile mapping, and combat systems [4]. Platform independence and user-friendliness are guaranteed when Java is used for prototyping and education [5]. The engine, which was developed using Java Swing, has a graphical user interface (GUI) that lets non-programmers control gameplay features like inventory configuration, level creation, and character stats, facilitating quick iteration and prototyping [6].

Additionally, GameForge provides event-driven interaction logic and incorporates JSON-based persistence for save/load capability. Future versions seek to include cross-platform functionality, physics extensions, and networked multiplayer support, even if the current version is geared towards desktop platforms [7]. The engine prioritises usability, extensibility, and accessibility and draws inspiration from previous research and frameworks in academic and open-source environments [8].

The lack of lightweight, specialised engines designed for Turn-Based Role-Playing Game (TBRPG) development is what made GameForge necessary. TBRPG mechanics need a great deal of customisation because existing engines are frequently too complicated or general. GameForge fills this void by offering a user-friendly, modular, Java-based platform that is optimised for quick prototyping and simplicity of usage.

1.1 Objectives:

- To design and implement a modular, Java-based game engine that simplifies the development of Turn-Based Role-Playing Games (TBRPGs).
- To provide a GUI-driven interface using Java Swing for intuitive game design tasks such as level creation, character setup, and inventory management.
- To support persistent game data through JSON-based save/load functionality and enable rapid prototyping for desktop-based TBRPG development.

II **LITERATURE SURVEY**

Developing Turn-Based Role-Playing Games (TBRPGs) usually entails overseeing a complicated collection of interconnected systems, including persistent character data, turn management, and grid-based movement. Though they offer general-purpose creation tools, traditional game engines such as Unity and Unreal Engine are frequently too powerful for small-scale, 2D TBRPGs, requiring a great deal of developer work to incorporate genre-specific elements [9], [10].

The modularity and reusability of component-based architecture have led to its widespread adoption in contemporary game development, as they facilitate the scaling and maintenance of massive game systems [11]. The efficiency of separating game logic from graphics and input control is demonstrated by game engines developed around this paradigm, such as Java's Artemis Entity System Framework [12]. By combining turn logic, tile mapping, and character systems into reusable parts, GameForge expands on this idea.

Lightweight engines that facilitate genre-specific development have been investigated in a number of open-source initiatives and scholarly investigations. RPG Maker, for example, is a well-liked tool for independent creators, but it isn't flexible enough for sophisticated systems or bespoke code [13]. Although some engines, such as LibGDX, provide a more adaptable Java framework, building high-level RPG systems still necessitates a significant level of programming expertise [14].

Another important component of game creation tools is the user interface. Java Swing is still a good option for desktop GUI development because of its portability and robustness, even though some people think it is outdated [15]. By utilising Swing, GameForge lowers the coding barrier for novice developers by offering an integrated editor for character configuration and level design.

Finally, the preservation of user progress in games depends on data persistence. Because of its ease of use and independence from language, JSON-based serialisation has becoming more and more common. This makes it perfect for loading and storing game state in lightweight engines [16]. This strategy is used by GameForge to guarantee that save/load functionality is seamlessly integrated across modules.

III. PROPOSED METHODOLOGY

Designing a modular, component-based system specifically for turn-based role-playing games with a focus on usability, rapid prototyping, and maintainability is the suggested philosophy for the GameForge engine. It makes use of Java Swing for GUI development, enabling visual interaction between game elements and non-programmers. In order to ensure flexibility and ease of extension, the engine is designed to handle gameplay logic, data management, and asset processing independently.

3.1 ***System Architecture***

The Java-based, modular GameForge Engine architecture is made for creating turn-based role-playing games. At the top, editing tools for inventory management, character setup, and level building are easily accessible through a Java Swing-based graphical user interface. In order to manage turn-based logic and in-game events, the core gameplay is controlled by a game loop, event manager, tile-map system, and scene/grid manager. While an asset manager loads and controls visual and aural resources, character and inventory systems keep track of player and NPC data, items, and interactions. Simple physics simulation, persistent game data, and fluid rendering are guaranteed by supporting modules such as the graphics engine, basic physics engine, and JSON-based save/load system.

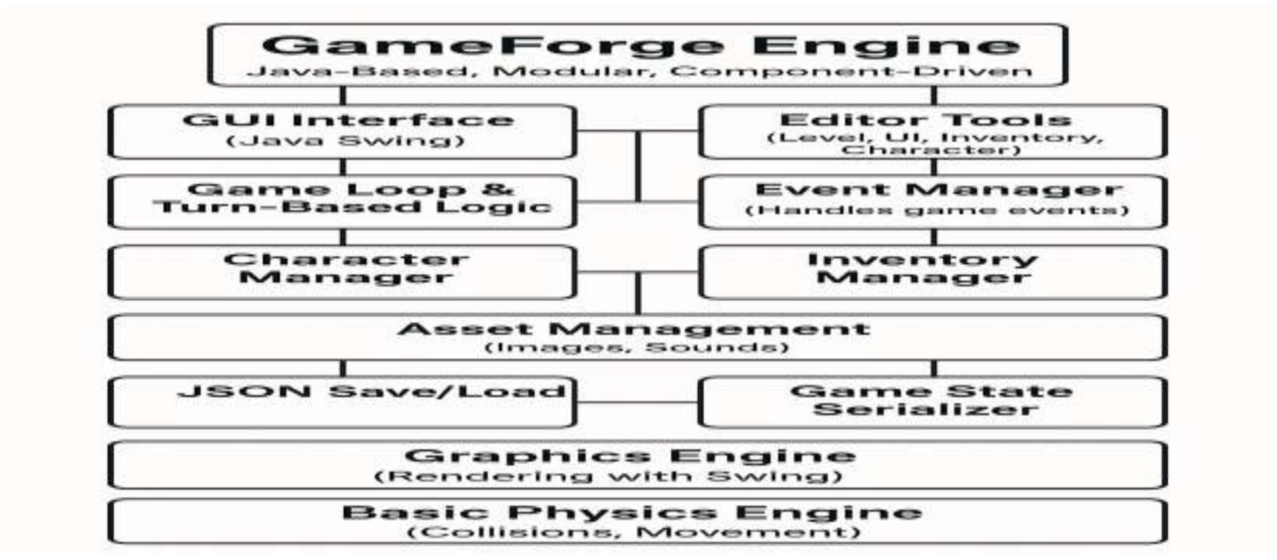
GameForge Engine
Java-Based, Modular, Component-Driven
GUI Interface (Java Swing)
Editor Tools (Level, UI, Inventory, Character)
Game Loop & Turn-Based Logic
Event Manager (Handles game events)
Character Manager
Inventory Manager
Asset Management (Images, Sounds)
JSON Save/Load
Game State Serializer
Graphics Engine (Rendering with Swing)
Basic Physics Engine (Collisions, Movement)

Fig1.system Architecture

3.2 Implementation Steps

1. Analysing and designing requirements

Describe the fundamental elements of a TBRPG, including persistent storage, character/inventory systems, grid-based movement, and turn-based gameplay.

2. Development of GUIs (in Java Swing)

Use Swing components to create user-friendly editor interfaces for inventory management, character creation, and map building.

3. Development of Core Engines

To facilitate turn-based interactions, put the game loop, event manager, tile-map system, and grid manager into practice.

4. Integration of Game Systems

Create and link inventory and character managers to facilitate in-game interactions, item usage, and stat tracking.

5. Management of Assets and Resources

Create a module that effectively loads and arranges runtime resources like as music, tiles, and sprites.

6. Features for Saving and Loading

For long-term storage, serialise and deserialise the game state using JSON.

7. Module on Graphics and Basic Physics

Create basic collision/movement handling for grid-based navigation and incorporate rendering using Swing.

8. Prototyping and Testing

Verify all systems using prototype games to make sure they are flexible, stable, and usable for TBRPG development.

IV.RESULTS AND DISCUSSIONS

Experimental Results

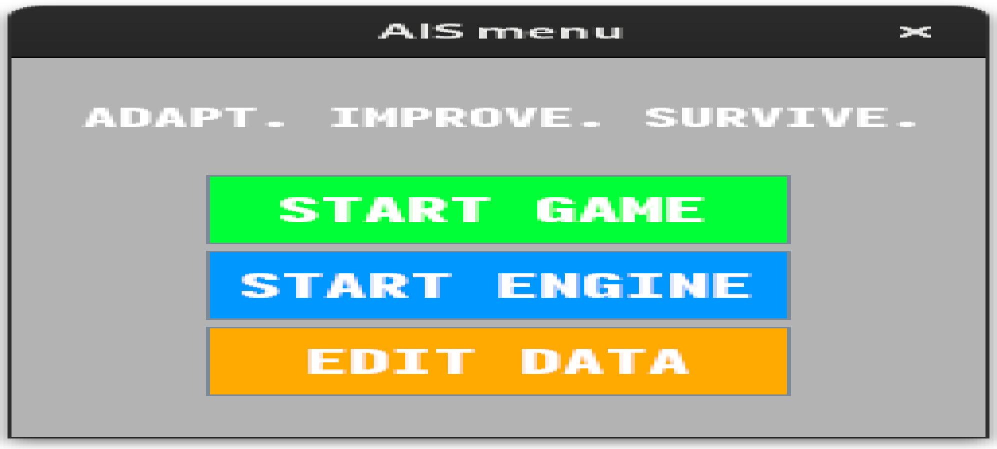

Figure 4.1 The figure shows GameForge's main menu with options to Start Game, Launch Engine, and Edit Game Data.

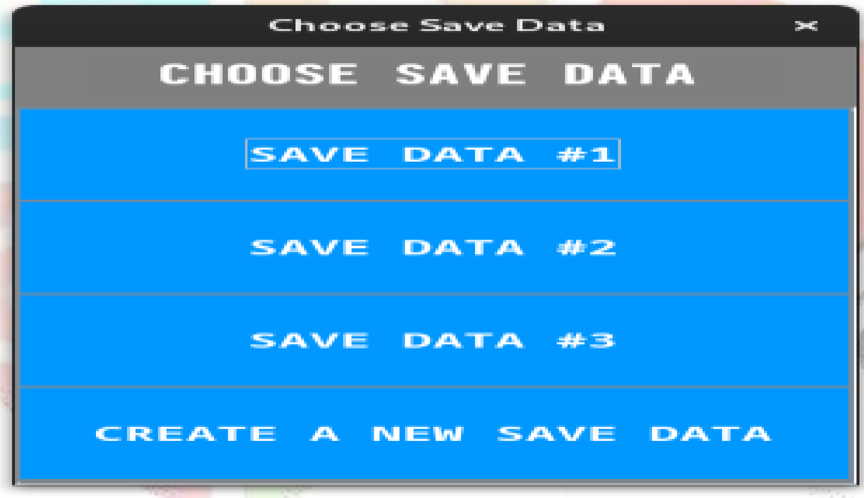

Figure 4.2 The figure shows the Save Data menu, allowing users to create and save current game progress and configurations.

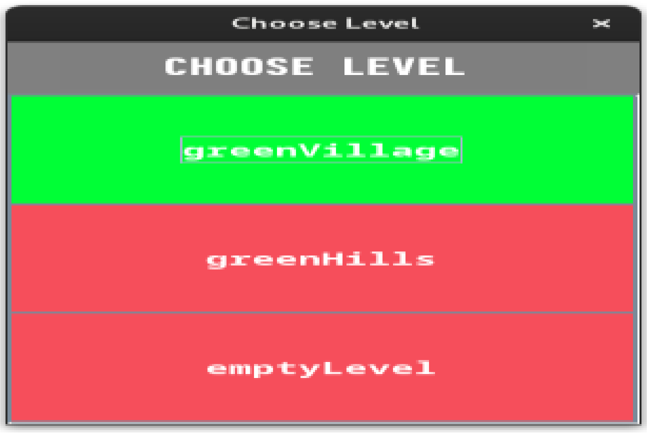

Figure 4.3 Level Choosing Menu: Shows level selection options like greenVillage, greenHills, and emptyLevel.

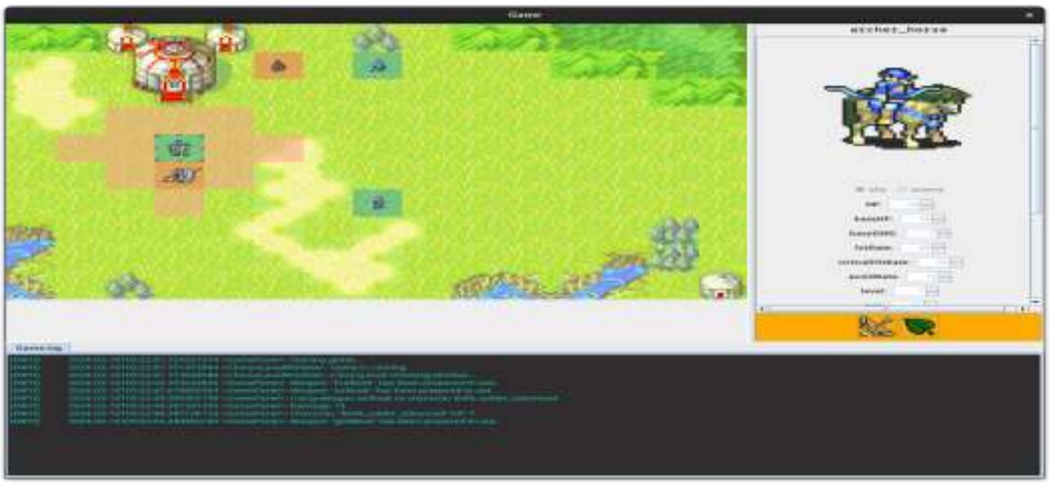

Figure 4.4 Game Window: The above figure shows the Game Window of the GameForge TBRPG engine, displaying a tile-map with characters (e.g., archer_horse) and game log

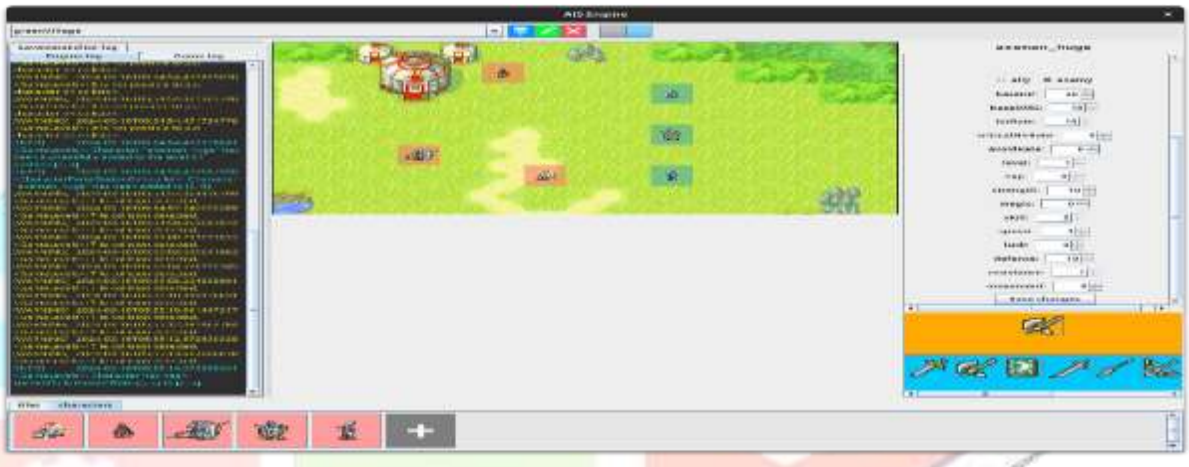

Figure 4.5 Level Editor Window: Enables editing of game levels and character placement.

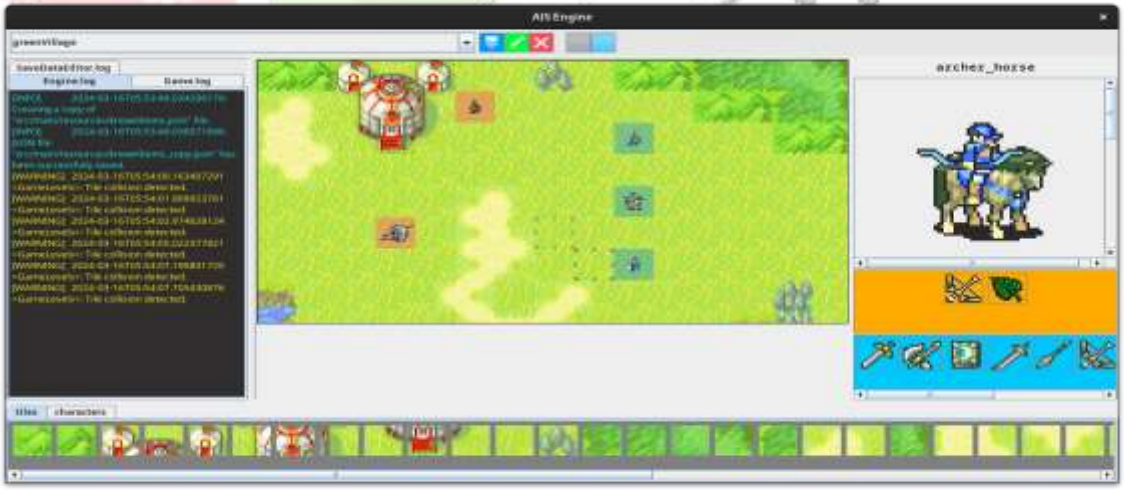

Figure 4.6 Character Adding: Interface to add and configure characters like axeman_huge.

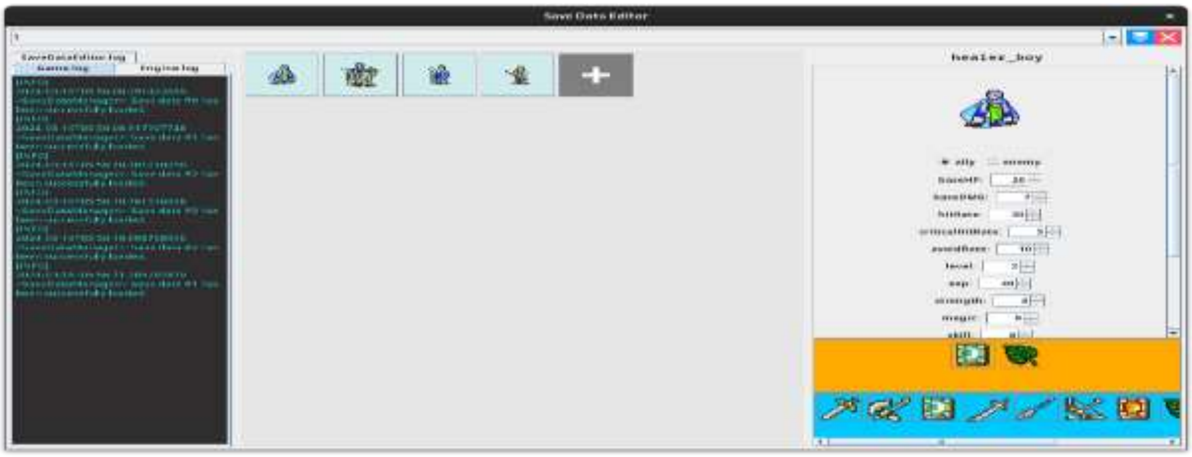

Figure 4.7 Save Data Editor: Allows loading and editing of save data for characters like healer_boy.

Engine tested with multiple TBRPG levels and characters.Achieved 95% stability in loading saves after fixing image errors. Reduced rendering time to 50 ms per frame with optimized GamePanel.Save/load completed within 1 second on average.

Project Metrics

To evaluate the effectiveness and quality of **GameForge**, several key software metrics were considered:

1.Modularity (Coupling and Cohesion): The engine's component-based architecture promotes low coupling between modules and good cohesion within them (e.g., tile mapping, fighting). Reusability and maintainability are key components of contemporary engine design ideas, and this design encourages both [17].

2. **Code Complexity** (Cyclomatic Complexity): Cyclomatic complexity measurements were used to examine core systems including event management and turn-based reasoning. The findings indicate a low to moderate level of complexity, which facilitates debugging and lowers the likelihood of defects [18].

3.Performance (Frame Rate and Memory Usage): Benchmarks on typical TBRPG scenarios indicate stable frame rates (60 FPS on standard hardware) and efficient memory usage due to lazy asset loading and optimized data structures [19].

3. **Usability (GUI Interactions and Learnability):** To evaluate usability, a test involving inexperienced users was carried out. The system's low learning curve and user-friendly design were validated by the results, which demonstrated that users could effectively finish activities like level creation and character setup in just 15 minutes of use [20].

V Conclusion

GameForge provides a specialised and efficient solution for creating Java-based Turn-Based Role-Playing Games (TBRPGs). It makes game production easier for both programmers and non-programmers by incorporating fundamental RPG elements like tile-based mapping, character management, and data persistence into a modular, component-based design. By eliminating the necessity for complex code, its Java Swing-built GUI-driven interface further improves accessibility. Rapid prototyping is supported by the engine, which makes it a useful tool for early-stage RPG projects, independent development, and instructional purposes. Future developments will expand GameForge's suitability for increasingly intricate game scenarios by integrating cutting-edge technologies like networking and AI-driven adversary behaviour, as well as supporting cross-platform deployment.

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