AI-Enhanced Dungeons & Dragons (D&D) Variant

Project Proposal

Artificial Intelligence Course

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1. Project Overview

- **Project Topic:** We propose an AI-Enhanced Dungeons & Dragons (D&D) variant, where an AI Dungeon Master (AI-DM) dynamically generates quests, NPC (Non-Player Character) dialogues, and in-game events using strategic decision-making and natural language processing. Players will interact with both AI-generated and player-driven elements.

- **Objective:** The main goal is to develop an AI system that acts as a Dungeon Master by:

  - Generating procedural quests and challenges.

  - Managing NPC behaviors and dialogues.

  - Evaluating player actions and adjusting the storyline.

  - Utilizing strategic AI (Minimax) to simulate intelligent NPC opponents.

2. Game Description

- **Original Game Background:** Dungeons & Dragons (D&D) is a role-playing game (RPG) where players assume characters and embark on adventures guided by a Dungeon Master (DM). The DM controls the game world, narrates events, and determines outcomes based on dice rolls and player choices.

- **Innovations Introduced:**

  - **AI-DM:** Uses Minimax and heuristic algorithms to control NPC strategies and quest difficulties.

  - **Dynamic Quest Generation:** AI will create quests based on player actions and world events.

  - **Adaptive Storyline:** The AI adjusts the narrative flow by analyzing game states.

  - **NPC Intelligence:** AI-controlled NPCs will have strategic behaviors, responding logically to player actions.

3. AI Approach and Methodology

- **AI Techniques to be Used:**

  - **Minimax Algorithm:** To determine optimal moves for NPC opponents.

  - **Alpha-Beta Pruning:** To optimize decision trees for faster responses.

  - **Reinforcement Learning:** Optional — AI learns from past quests to improve future ones.

  - **Natural Language Processing (NLP):** For AI-generated quest descriptions and NPC dialogues.

- **Heuristic Design:**

  - **NPC Heuristics:** Evaluate game states by considering factors like player health, quest complexity, and NPC proximity.

  - **Quest Difficulty:** Scored based on task variety, enemy strength, and player progression.

- **Complexity Analysis:**

  - **Time Complexity:** Minimax with branching factor "b" and depth "d" -¿ O(b^d). Alpha-Beta Pruning reduces effective branching.

  - **Challenges:** Managing real-time quest generation without sacrificing game fluidity.

4. Game Rules and Mechanics

- **Modified Rules:**

  - AI-DM dictates quests, adjusting their complexity dynamically.

  - NPC actions are AI-driven, based on Minimax strategies.

  - Players can influence NPC decisions by interacting strategically.

- **Winning Conditions:**

  - Complete AI-generated quests and defeat key AI-controlled NPCs.

  - Players can "lose" if major quests fail or characters perish due to AI-driven challenges.

- **Turn Sequence:**

  - Players take turns performing actions (move, attack, interact).

  - AI-DM processes player moves, updates game states, and triggers NPC reactions.

5. Implementation Plan

- **Programming Language:** Python

- **Libraries and Tools:**

  - **Pygame:** For creating the game interface.

  - **NumPy:** For AI computations.

  - **TensorFlow:** (Optional) for reinforcement learning.

  - **NLTK:** For natural language processing.

- **Milestones and Timeline:**

  - **Week 1-2:** Define game rules and AI-DM role.

  - **Week 3-4:** Develop AI strategies (Minimax, heuristics).

  - **Week 5-6:** Code game mechanics and AI behavior.

  - **Week 7:** Integrate AI-DM and test.

  - **Week 8:** Final testing and report preparation.

6. References

- "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig.

- D&D 5th Edition Player's Handbook.

- Research papers on AI in procedural content generation and game design.