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Integrating Artificial Intelligence for Automated Storytelling in Turn-based Strategy Games

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Abstract

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This project is inspired by turn-based strategy games, *Final Fantasy Tactics, X-Com 2,* and modern turn-based strategy games. This project is structured around the use of artificial intelligence for storytelling within strategy games. The focus of this project utilizes artificial intelligence in creating a quest generation system for storytelling. The resulting quest system creates new quests dynamically after communicating with an artificial intelligence allowing players to potentially experience an ever-expanding story from quests

Table of Contents

Introduction

The primary objective of this project is to develop and implement a sophisticated generated quest system tailored for integration within a turn-based strategy game environment, with a critical emphasis on leveraging artificial intelligence techniques. The quest generation process will entail the utilization of intricate algorithms designed to consider many variables, including but not limited to quest archetypes, enemy configurations, available inventory items, player progression history, world location context, and narrative trajectory. These variables will be inputs to an artificial intelligence module tasked with dynamically crafting quests that adapt and evolve throughout gameplay. To facilitate this process, the developer will establish and maintain a comprehensive repository comprising predefined quest types, enemy variations, geographical locations, and usable items, which artificial intelligence will access and manipulate as variables during quest generation. The resulting quests created by artificial intelligence will be seamlessly integrated into the game environment, manifesting as immersive scenarios that players encounter upon reaching the designated quest locations. Through this meticulously crafted system, players will be offered a rich and ever-evolving gaming experience characterized by dynamically generated quests that resonate with the evolving dynamics of the game world and the player's journey.

Drawing from extensive experience in game design and thorough research in artificial intelligence, quest generation, and turn-based strategy systems, the culmination of this endeavor will yield a functional quest generation system infused with artificial intelligence inputs. This system will seamlessly integrate into a simplistic turn-based grid game framework, encompassing movement, combat, and ability mechanics. Central to this design is using player levels, items, location, and previously completed quests by artificial intelligence to dynamically

generate new quests and narratives tailored to the player's progress and interactions within the game world. By leveraging parameters, the core quest system will ensure that generated quests are challenging and contextually relevant, contributing to an immersive, dynamically evolving gameplay experience.

Literature Review

Turn-based Strategy Game

Turn-based strategy games constitute a prominent and enduring genre within video games, renowned for demanding strategic thinking and planning from players. Distinguished by their core gameplay mechanics, these games require participants to take sequential turns in making decisions and executing actions. Integral to the gameplay dynamics is the element of chance, which introduces unpredictability and uncertainty, influencing the outcomes of players' strategic maneuvers and adding a layer of complexity to the gameplay experience.

In turn-based strategy games, players make strategic decisions during their turns. This involves many choices, such as determining unit movements, selecting weaponry, and identifying optimal targets for attack. Success in these endeavors hinges on players' adept understanding of the game's mechanics and ability to discern and exploit enemy strengths and weaknesses.

A hallmark feature of turn-based strategy games is the leisurely pace at which they afford players to contemplate their moves. Unlike their real-time counterparts, where decisions must be made swiftly under pressure, turn-based games give players time to deliberate their options carefully. This allows players to devise intricate strategies and plans, fostering an environment

conducive to thoughtful decision-making, rather than mere reactionary responses to unfolding circumstances.

Furthermore, the diversity of units with distinct abilities and strengths inherent within turn-based strategy games contributes to the genre's rich tapestry of tactical intricacy. Mastery of each unit's capabilities and the adept utilization of strategic counters against opponents' units are pivotal elements underpinning success. Additionally, incorporating chance elements, such as dice rolls, injects uncertainty into the gameplay, ensuring that even the most meticulously crafted plans may yield unexpected outcomes, either in favor or against the player.

Since their inception, turn-based strategy games have garnered considerable popularity, with seminal titles like *Final Fantasy Tactics* and *Civilization* setting the benchmark for the genre. Modern titles, such as *Diofield Chronicles*, *Baldur's Gate 3*, and *X-COM 2*, continue to push the boundaries of innovation and gameplay depth, offering players diverse settings and scenarios to explore. Moreover, including multiplayer modes in many modern titles facilitates competitive engagements, enabling players to pit their strategic prowess against adversaries worldwide.

Turn-based strategy games are a testament to video games' enduring appeal of tactical decision-making and strategic planning. With their nuanced mechanics and emphasis on thoughtful deliberation, these games provide players with challenging and immersive experiences that resonate across generations of gamers, underscoring their status as a cherished and timeless genre within the gaming landscape.

Quest Generation Systems

"As a device, the quest transcends game genres and can be thought of as a means for structuring play within a virtual environment" (Ashmore, 2007, p. 504). Quests are a

fundamental storytelling mechanism pervasive in numerous video games, functioning as pivotal tools for narrative development and player engagement. By employing quest systems, game developers can effectively imbue their virtual worlds with purpose and direction, offering players tangible objectives and corresponding rewards that propel the overarching storyline forward. These quests provide structure and coherence to the gameplay experience and afford players a sense of agency and immersion within the game's narrative universe. Through the strategic implementation of quests, developers can intricately weave together plot threads, character arcs, and thematic elements, thereby fostering deeper player involvement and emotional investment in the story. Consequently, quests represent a powerful means through which developers can orchestrate player interaction with the game's narrative fabric, shaping the overall player experience and fostering a sense of narrative agency and progression.

Quest systems in video games exhibit diverse implementations, each offering unique approaches to narrative delivery and player engagement. Traditional quest design, exemplified in acclaimed titles like *Final Fantasy Tactics* and *Baldur's Gate 3*, underscores the meticulous craftsmanship employed by developers to construct immersive storytelling experiences. In these games, quests are intricately woven into the fabric of the game world, meticulously designed to align with the overarching narrative arc while offering players a sense of progression and purpose. Carefully written quests are defined by their bespoke nature, featuring intricate scenarios, compelling characters, and elaborate plot twists that captivate players and immerse them in fantastical realms. Through these meticulously crafted quests, developers exercise precise control over the pacing and narrative trajectory of the game, ensuring that each quest serves as a meaningful contribution to the overarching storyline.

Conversely, alternative quest systems found in games like *X-COM 2* and *Rimworld* adopt a dynamic approach to quest generation, introducing an element of procedural generation to the questing experience. In these games, quests are generated dynamically alongside the primary storyline, offering endless content to facilitate player progression and resource acquisition. While these dynamically generated quests may lack the intricacy and narrative depths of their handcrafted counterparts, they nonetheless enrich the gameplay experience by providing players with a constant stream of challenges and opportunities for exploration. Despite their procedural nature, dynamically generated quests in games like *Rimworld* are adept at leveraging contextual cues within the game world to create engaging side quests that resonate with players and contribute to the sense of immersion within the virtual environment.

By combining traditional and dynamic quest systems, game developers can cater to diverse player preferences and playstyles while enhancing their games' overall replayability and longevity. While traditional quest design prioritizes narrative depth and handcrafted experiences, dynamic quest systems offer unparalleled scalability and variety, continually presenting players with new challenges and opportunities for exploration.

In the contemporary landscape of video game development, quest generation is a pivotal aspect of crafting immersive and dynamic gameplay experiences. As succinctly stated by Ashmore and Nitsche (2007), "Quests consist of several recurrent properties, such as the objective, the task, and success or failure conditions." The quote underscores the foundational components that drive quest systems, highlighting the core elements that developers leverage to create engaging quests within games. At its essence, quest generation involves systematically creating objectives that guide players through narrative-driven experiences while offering opportunities for exploration and progression within the game world.

In practice, quest generation involves assembling quest components based on predefined templates or procedural algorithms, including objectives, tasks, success/failure conditions, and rewards. Developers often employ scripting languages or specialized tools to streamline the process and facilitate iteration and refinement. Quest generation algorithms may consider various factors to generate quests that are not only thematically coherent but also dynamically responsive to player choices.

Artificial Intelligence

Artificial Intelligence (AI) is a cutting-edge technology reshaping numerous industries, including the gaming sector, by facilitating the unprecedented sophistication of text and narrative generation. AI models, such as ChatGPT, character.ai, and Quillbot, have gained prominence for producing coherent and contextually relevant textual content across various applications. In gaming, developers are actively exploring the potential of AI-driven narrative generation to elevate player experiences and push the boundaries of interactive storytelling.

The current landscape of AI-driven narrative generation in gaming represents a frontier of innovation, with developers harnessing these technologies to create dynamic and immersive gaming experiences. By leveraging AI algorithms, developers can automate crafting narratives that respond dynamically to real-time player choices and actions. This dynamic approach to storytelling holds the promise of delivering personalized experiences tailored to individual players, enhancing player engagement and immersion.

Furthermore, AI-powered narrative generation tools offer game developers unparalleled scalability and efficiency in content creation. Unlike traditional narrative design methods reliant on manual authorship, AI-driven tools can generate vast quantities of textual content rapidly and adaptively. This scalability empowers developers to construct expansive game worlds with richly

detailed narratives and branching storylines, enriching the gameplay experience and extending player enjoyment.

However, while the current state of AI in gaming holds immense promise, developers must navigate technical and creative challenges to leverage its potential fully. Optimizing the integration of AI into game development workflows requires a nuanced understanding of AI capabilities, limitations, and ethical considerations. Additionally, developers must ensure that AI-generated content aligns with the game's creative vision and thematic elements, maintaining coherence and fidelity to established narrative motifs.

The current state of AI-driven narrative generation in gaming represents a dynamic intersection of technology and creativity, poised to redefine the landscape of interactive storytelling. By embracing AI-powered tools, game developers can unlock new dimensions of player engagement and immersion, ushering in a new era of innovative gaming experiences. However, realizing the full potential of AI in gaming necessitates ongoing research and ethical stewardship to navigate the complexities of this rapidly evolving technological frontier.

Methodology

Software Selected

The game engine used for this project is Unity. The decision to utilize Unity for this project stemmed from its reputation as a user-friendly game engine renowned for its accessibility and support network. Unity's intuitive interface lowers the barrier to entry for developers, enabling even novices to engage in game creation with relative ease. Beyond its usability, Unity boasts a thriving community of developers who readily share insights and advice through forums

and social platforms. This collaborative atmosphere fosters learning and problem-solving, enriching the development experience for all involved.

Moreover, Unity's extensive documentation and online tutorials are invaluable resources for developers at every stage of their journey. Whether grappling with basic concepts or tackling advanced features, developers can find guidance and instruction readily available. The engine's primary scripting language, C#, further enhances its appeal, offering a balance of power and accessibility. C# is widely recognized for its versatility and is seamlessly integrated into Unity, enabling developers to implement complex gameplay mechanics and optimize performance effectively.

Furthermore, Unity's accessibility is bolstered by its cost-effective model. Unity offers a free version that provides access to the engine's full suite of features, making it particularly appealing to independent developers and small studios with limited budgets. This free version allows developers to create and publish games without any upfront costs, lowering the financial barriers to entry into the industry. Additionally, Unity operates on a profit share mode, wherein developers only pay royalties on their game's revenue once it surpasses a certain threshold. This approach aligns the interests of Unity with those of developers, as it ensures that both parties benefit from the success of the games created within the engines.

The project utilizes the OpenAI model. Adopting OpenAI as the primary AI model for this project is a strategic choice rooted in its preeminence within artificial intelligence. OpenAI stands as a beacon of innovation and advancement in AI research and development, consistently pushing the boundaries of what is achievable in machine learning and natural language processing. Its position as a frontrunner in the field is evidenced by its widespread adoption across various industries and its recognition as the foremost AI solution available today.

Leveraging OpenAI provides developers access to state-of-the-art AI capabilities, empowering them to integrate sophisticated AI functionalities into their projects with relative ease.

Despite its prominence, the cost implications of utilizing OpenAI remain reasonable and transparent, aligning well with the project's budgetary constraints. OpenAI's pricing structure ensures access to its powerful AI technologies is within reach for developers of varying financial capacities. This affordability fosters inclusivity and democratizes access to advanced AI capabilities, enabling developers to explore innovative AI-driven features without significant financial or time barriers.

Despite its many advantages, it is worth noting that OpenAI operates exclusively online, relying on cloud-based infrastructure for its services. While this online dependency may present logistical challenges for specific projects, such as latency issues or concerns about data privacy and security, it is a minor obstacle for the current project. Fortunately, the nature of this project's requirements aligns well with OpenAI's online model, allowing for seamless integration and utilization of its AI capabilities without encountering any adverse effects. However, exploring the potential of in-memory AI solutions could be beneficial for the project's future. In-memory AI, which operates directly on local hardware rather than relying on cloud-based servers, offers advantages, such as reduced latency and increased autonomy. As the project and its requirements evolve, investigating alternative AI frameworks, including in-memory solutions, may open up new opportunities for optimization and innovation.

Core Gameplay

Before integrating AI into the project, the initial phase focused on establishing the core gameplay mechanics seamlessly incorporating the AI system. This involved a step-by-step

approach, beginning with developing a grid-based combat system, enabling players to engage in strategic battles within a structured environment. Building upon this foundation, attention shifted towards crafting an overworld map that players could navigate, triggering dynamic battle sequences as they explore different regions. Subsequently, the project was expanded to include the implementation of a quest and shop system, enriching the gameplay experience with progression and reward mechanisms.

Among the various systems considered for AI integration, the quest generation system emerged as the prime candidate for leveraging AI capabilities. This system plays a pivotal role in dynamically generating new quests for players to undertake, thereby ensuring a constant influx of engaging content and meaningful challenges. By harnessing AI algorithms, the quest generation can autonomously generate diverse quests tailored to the player's progress and the game's overarching narrative. These quests may vary in complexity, story, objective, or rewards, offering players a dynamic and immersive gameplay experience that evolves with their actions. The project aims to enhance replayability and player engagement by integrating AI-driven quest generation, fostering a dynamic gaming environment that adapts and responds to the player's actions.

Results

Generating Quest Data

The quest system within the project boasts versatility in generating quest data, offering two distinct methods to cater to varying scenarios and player preferences. The primary approach involves leveraging the capabilities of OpenAI through its API, allowing for the creation of

quotes with a high degree of dynamism and creativity. By tapping into OpenAI's vast language model and machine learning algorithms, the quest system can produce various scenarios, ranging from conventional tasks to imaginative and unexpected challenges. However, this method requires an active internet connection to access OpenAI's services, requiring players to be online during quest generation.

In parallel, the project also incorporates a secondary method for quest generation, utilizing data stored within the game files as a fallback option. This approach is a reliable contingency plan in scenarios where internet connectivity is unavailable or access to OpenAi API is disrupted. By storing quest data locally, the game ensures continuity in quest generation regardless of external factors, such as network issues or server downtime. This redundancy safeguards against potential disruptions and enhances the game's accessibility, allowing players to engage with the quest system seamlessly under various circumstances.

The dual nature of the quest generation system, combining the dynamic potential of OpenAI with the reliability of locally stored data, underscores the project's commitment to providing a robust and uninterrupted gaming experience. Whether the players seek innovative and unpredictable quests or prefer a more traditional approach, the quest system accommodates their needs while maintaining flexibility and resilience in quest generation processes.

Quest System Implementation

The quest generation system implemented in the project represents a sophisticated fusion of algorithms and artificial intelligence technologies aimed at delivering dynamic and immersive quest experiences to players. The process begins with aggregating relevant data, encompassing crucial parameters such as quest difficulty, enemy types and quantities, quest location, and quest

type. These data points are meticulously curated and structured within a coherent framework, forming the basis of the quest generation process.

A series of custom-designed algorithms have been developed to dynamically generate quest parameters based on various factors to streamline this process. These algorithms are engineered to adapt to the player's progress, ensuring that quests are appropriately challenging and engaging. For instance, quest difficulty is calibrated based on the player's skill level and in-game accomplishments. At the same time, enemy types and quantities are tailored to the player's capabilities and strategic preferences. The quest location and type are also determined algorithmically, considering the game world's geography and narrative context.

Once the quest parameters are established, they are synthesized into a comprehensive, prompt message, which serves as input for the OpenAI API. This prompt encapsulates the essential details of the quest, providing context and guidance for the AI to generate a coherent quest title and description. Leveraging the immense language processing capabilities of OpenAI, the AI algorithm incorporates the provided information while infusing creativity and narrative depth into the quest narrative. This collaborative interplay between algorithms and AI ensures that each generated quest possesses the necessary context and relevance to the player's current situation, enhancing immersion and fostering a sense of continuity within the game world.

Moreover, the quest generation system's capabilities to generate detailed quests are directly correlated with the volume and richness of the data provided. As the system accumulates more data points and contextual information from the game world, it gains the capacity to generate quests with increasingly intricate narratives and diverse challenges. By incorporating a wide array of in-game variables, such as player decisions and world events, the quest generation system can tailor quests to reflect the evolving dynamics of the game world.

The project's quest generation system is poised for continuous evolution and enhancement. Future iterations of the system will leverage additional in-game world information to enrich the player experience further, offering quests that are not only contextually relevant but also profoundly immersive and responsive to player actions. This commitment to ongoing refinement and innovation underscores the project's dedication to delivering dynamic and engaging gameplay experiences that captivate players and propel the game's evolution over time.

Conclusion

At its core, this research venture represents a pioneering exploration into the intricate intersection of artificial intelligence and turn-based strategy gaming. By delving deep into the realms of game design, the project endeavors to revolutionize the way players engage with interactive entertainment. At the forefront of this endeavor lies the development of a quest generation system that transcends conventional boundaries, offering players an immersive journey through dynamically crafted adventures tailored to their unique experiences.

The quest generation system, meticulously crafted through the fusion of sophisticated algorithms and the cognitive prowess of OpenAI, stands as a testament to the symbiotic relationship between human creativity and machine intelligence. Gone are the days of static quest designs; instead, players are thrust into a dynamic landscape where challenges evolve in real time, responding intricately to their decisions and actions. Whether embarking on epic battles against formidable foes or unraveling intricate puzzles shrouded in mystery, each quest bears the hallmark of AI ingenuity, presenting an ever-changing tapestry of challenges that captivate and enthrall.

However, amidst these triumphs lie nuanced challenges that demand innovative solutions and strategic foresight. The reliance on internet connectivity for AI interactions emerges as a pivotal concern, potentially limiting accessibility and hindering gameplay experiences in offline environments. To navigate this obstacle, the project is poised to pioneer the development of in-memory AI architectures, laying the groundwork for seamless offline experiences without compromising depth or dynamism.

Moreover, prudent fiscal management emerges as imperative in navigating the intricacies of AI integration. While AI services hold the potential to elevate gameplay experiences to unprecedented heights, their utilization comes with burgeoning costs that must be carefully managed. Strategies from optimizing AI usage to exploring alternative frameworks with favorable pricing structures will be rigorously evaluated to ensure sustainable growth and scalability.

Looking towards the future, the trajectory of this project embodies an unwavering commitment to innovation and excellence, driven by the inexorable march of AI technologies. Beyond the confines of quest generation, the project envisions a vast landscape where AI permeates every facet of gameplay, from dynamic NPC interactions to emergent world events and procedurally generated content. This vision heralds a renaissance in gaming, where AI serves as the vanguard of player immersion and empowerment, ushering in an era where games evolve alongside their players, ever-adaptive and infinitely enthralling.

In broader terms, integrating AI into game design represents an inexorable evolution that promises to redefine the fabric of interactive entertainment. Beyond the confines of current implementations, AI holds boundless potential to revolutionize every aspect of game design,

from dynamic world-building to adaptive storytelling and beyond. As AI technologies continue to advance, future games will likely explore innovative applications of AI, ranging from real-time NPC behavior modeling to procedurally generated environments and quests that dynamically adapt to player choices and preferences. This symbiotic relationship between AI and game design heralds an era of unprecedented creativity and immersion, where games become living, breathing worlds that respond and evolve in concert with their players.

In embracing AI as a cornerstone of game development, the industry is poised to lead the charge in shaping the future of interactive entertainment, where the boundaries of imagination are limitless and the possibilities are endless. As the project continues to push the boundaries of possibility, it stands poised to redefine the essence of gaming, ushering in an era where AI and human creativity intertwine to create experiences that captivate, challenge, and inspire players around the globe.

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