

DEVELOPMENT OF DAMATHEMAGICAL: DAMATH-BASED BOARD
GAME UTILIZING ALPHA-BETA PRUNING

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INTRODUCTION

The study specifically seeks to explore the potential of Alpha-Beta Pruning in Damathemagical game development. The study lays the groundwork for the continued evolution of AI-powered technologies in the field of education and beyond, benefiting the broader community. This AI board game³ could potentially overcome limitations and provide a more engaging where the board includes random elemental power-ups that gives interactive learning experience for players. It can also be beneficial within the community as it can be used by local organizations and institutions as an innovative educational tool to help children. Damath is a board game developed in the Philippines by a teacher named Jesus L. It was promoted by the Department of Education (DepEd) as one way for a Filipino to learn math (LeeBrago, 2010) The game blends the strategy game Dama with the concepts of Damath. It also offers an entertaining way for students to gain knowledge through computer games while honing their cognitive skills. The Damathemagical game application gives an idea to the professors to provide a novel approach on teaching mathematics.

METHOD

The application's AI system will be assessed by the researchers based on its functional suitability, performance efficiency, portability, and usability. The researchers test the performance of the game by testing it on the play mode. The AI accurately predict the game winning outcome based on the current board state. The player can access the game's options panel by pressing the play button. The players can also manage the volume and the volume slider of the board game using slider and delete the account of the user. The evaluation instrument that will be used to assess the acceptability of the Damathemagical mobile application development will be based on the ISO/IEC 2501062 software quality models. The proposed system design involves users navigating the menu to choose the viewpoints and mode of gameplay. The main developer tracks the progress of each programmer using the list of tasks in Asana. The algorithm is used to maximize the complex decisions made by the AI system to beat the moves of the player. The Play button launches the game, the How to Play button, which provides instructions, and the Quit button ends the application. In the AIDamath class of the game the minimax algorithm incorporates alpha-beta pruning to improve the efficiency of finding the best move. The pause button lets the player stop the game for a while; it also gives the option to continue the game using the Resume button. The Power Up file will happen when the attacker jumps over the opponent's piece. The game uses several evaluation methods to assess the possible moves of the AI. The game uses the 3-point Likert Scale, which forces users to rate the system on multiple areas. The project plan and design for the Damath-based web game includes the development of unique assets, game elements, and a 2D board game. The goal is to ensure that the AI system can deliver timely and efficient results, even when faced with high or high-putational demands. The system evaluation will use the 3/3 LikERT Scale. The main goal of this study is to create a virtual strategy board game named Damathemagical. The game is based on the classic Damath board game. Players can customize the AI's level of difficulty to suit their preferences, ensuring a challenging and flexible gaming experience. This chapter contains a thorough analysis of the project design, development, and testing procedures of the game. It also

provides an overall indicator of how frequently the AI system predicts the right thing. The user must be able to successfully install and run the game on their device. The game was programmed by researchers using the Unity game engine and Visual Studio code to edit and debug codes. The algorithm serves as the main evaluator of potential moves for the AI. The researchers received a good review about the UI and the concept of the game because of its creative concept and challenges. This review helps the developers to develop the system and to be adaptive and user-friendly. The AI successfully strategize its optimal move based on its viewpoints and the player's own performance. Planning, executing, and evaluating are the main tasks of the Agile Kanban. Asana is a web or mobile taskmanagement and collaboration tool. It consists of board, Gantt chart and calendar to provide visualization to the progress of the project. It assesses how well the system can carry out its duties, deliver precise outcomes, and successfully meet the objectives or needs for which it was created. It also assesses the level of skill in the game concerning accuracy and speed.

RESULTS

This section provides the summarized outcome of the test executed and acquired data based on their functional stability, performance efficiency and portability. This information is essential for assessing how well the AI system performs, especially in situations where precise positive or precise negative predictions are needed. The outcome signifies that the AI system overall performance in the viewpoints application is functional, efficient, portable and stable. The True Positive Rate, which quantifies the AI's sensitivity, or True Positive rate, is shown in table 21. The main screen of the Damathemagical board game is depicted in Figure 19, where the player can choose to play, view gameplay instructions, go to settings, or end the game. The game option panel shows whether the player wins or loses to its AI opponent. The score shows the player's entire score, including any power-up points they have earned. A resume button allows the player to return to the game, while a surrender button allows them to give up and proceed. The player will get a modal window after selecting the How to Play button on the main menu screen. The AI system has an overall accuracy rate of 86.67% for professionals and 88.33% for non-professionals. The True positive receives the highest score 81.65%, to be followed by True Negative, 10% Game Difficulty: The player can choose the difficulty level of the AI opponent from beginner, novice to advanced. The game is powered by the Alpha-Beta Pruning algorithm. The player can choose the board game types whether counting, integer, fraction, or rational numbers that the player wants to play. elemental power-ups placed on its tiles which are double it and lose half for scores then add time and subtract time for the player or opponent game time. Sliders for the game's sound effects and background music are located in the settings panel. Professionals and non-professionals were shown and given an evaluation of the functionality test results to verify their authenticity.

DISCUSSION

The Damathemagical game has been successfully designed and developed. The game board integrates mathematical equations involving addition, subtraction, multiplication, and division. It was tested using the ISO 25010 software model and ISO 25059 for AI quality testing system. The study achieved a Very Acceptable rating for the software. The AI system also achieved a True Positive rating for its performance. It is recommended that the game be enhanced to make it more engaging and rewarding for new and experienced players alike. Damathemagical was developed using the Unity Game Engine, Visual Studio Code, Adobe Photoshop 2024, GitHub, and Git Version Control. The development environment consisted of a Windows 10 system with at least 8GB of RAM, an AMD Ryzen 5 or Intel i5 equivalent processor, and a minimum of an integrated GPU. The game was evaluated using the ISO 25010 criteria, where it received an all weighted mean score of 2.72, translating to a "Highly Acceptable" rating.