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Implementation of AI Number Generator and A Using GDLC in Android Games

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ABSTRACT

The rapid development of information technology has brought significant changes in various aspects of life, including cultural preservation through digital media. Traditional Indonesian games such as sack racing and hide-and-seek have experienced a decline in interest among the younger generation due to modernization. This research aims to develop Android-based offline games of sack racing and hide-and-seek with the implementation of artificial intelligence (AI) using the Random Number Generator (RNG) algorithm for sack racing games and the A* pathfinding model algorithm for hide-and-seek games. The development methodology used is Game Development Life Cycle (GDLC) with Unity as the main game engine. The implementation of RNG in the sack racing game serves to produce dynamic and unpredictable NPC behavior, such as variations in jump speed and movement patterns. While the A* algorithm pathfinding model in hide-and-seek game allows the searcher NPC to find the optimal path in searching for hiding players, creating a realistic and challenging gaming experience. This research uses functional, performance, and user experience testing to evaluate the effectiveness of the AI implementation.

Keyword: Indonesian Traditional Game, Random Number Generator, A* Algorithm, Game Development Life Cycle, Unity.

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1. INTRODUCTION

The rapid development of information technology has brought major changes in various aspects of life, including in the world of digital entertainment and cultural preservation. One form of digital entertainment that is now increasingly popular is mobile-based games, especially on the Android platform. Meanwhile, traditional Indonesian games such as balap karung and petak umpet, which are part of cultural heritage, are starting to be forgotten due to the influence of modernization and globalization1.

Sack races, which are usually played during Indonesia's independence celebrations on August 17, contain important values such as sportsmanship, persistence, and togetherness that should be preserved [1] stated that Indonesian children and teenagers who have tried this

kind of traditional game show a decline in interest in traditional games. This condition raises concerns about the loss of cultural values inherent in traditional games.The A* algorithm is a highly efficient pathfinding method that is widely used in game development. It combines a greedy best-first search approach with Dijkstra's algorithm so that it can find the shortest path by considering the cost of travel and the estimated distance to the destination. In hide-and-seek games, the A* algorithm can be used to manage NPC behavior to find the best path and avoid obstacles, thus providing a realistic challenge for players.

Unity is one of the most popular and widely used game engines for creating Android-based games. This engine supports AI features such as NavMesh which makes it easy to implement the A* pathfinding technique and Random number generator functions that can be used to implement RNG [5]. Game development requires a systematic and structured approach, and the Game Development Life Cycle (GDLC) methodology which includes stages such as concept, pre-production, production, testing, release, and maintenance has proven effective for organizing the development process. Based on the above background, this research aims to develop an Android-based traditional Indonesian offline game of sack racing and hide-and-seek with AI implementation using A* and RNG algorithms. This game is expected to be a medium for preserving traditional culture while providing an exciting and challenging gaming experience thanks to the implementation of AI.

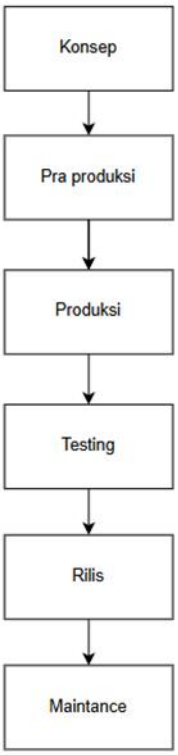

Figure 1 GDLC

2. METHODS

This research uses the Game Development Life Cycle (GDLC) methodology approach. GDLC is a game development method that consists of six main stages, namely concept, pre-production (design), production (material collecting and assembly), testing, release (distribution) and maintenance. This method was chosen because it provides a

systematic and structured framework, so that every aspect of game development can be considered properly. The implementation of AI in sack racing and hide-and-seek games is done through coding using the C# programming language in the Unity development environment. Implementation of AI in the Sack Race Game (Random Number Generator). The AI implementation approach in the sack racing game uses the Random Number Generator (RNG) algorithm which is done through coding to create unpredictable NPC behavior The implementation of AI in the hide-and-seek game uses the A* algorithm and pathfinding which is also done through coding to create intelligent and adaptive search behavior. The implementation process of A* algorithm and pathfinding model in hide and seek game involves several steps that have been conceptualized.

In the development of an Android-based Indonesian sack and hide-and-seek racing game that implements AI using the A* algorithm and Random Number Generator, GDLC allows developers to iterate and refine AI based on test results. That way, the resulting gaming experience can be optimized. In addition, this approach also helps to ensure that other important aspects such as gameplay design and user experience testing are taken into account.

3. RESULTS AND DISCUSSION

This game is a digital adaptation of two traditional Indonesian games balap karung and petak umpet. Developed as a 2D offline game based on Android, it combines traditional game elements with modern technology through the implementation of artificial intelligence (AI). The balap karung game uses Random Number Generator (RNG) algorithm to create dynamic NPC behavior, while the hide-and-seek game uses A* and pathfinding algorithm to create intelligent search behavior. This game aims to preserve traditional Indonesian games while providing an interesting and challenging gaming experience. Creating an entertaining and educational digital experience that reintroduces traditional Indonesian games to the younger generation through innovative AI implementation, so that the cultural values and fun of traditional games can be developed as an Android-based 2D offline game, this game combines traditional game elements with modern technology through the implementation of artificial intelligence (AI). The balap karung game uses Random Number Generator (RNG) algorithm to create dynamic NPC behavior, while the hide-and-seek game uses A* and pathfinding algorithm to create intelligent search behavior.

Table 1 Description system

Game Title	Permainan Tradisional Indonesia Balap Karung & Petak Umpet
Platform	Android
Target Audience	Semua kalangan
Genre	Casual and Racing
Game Mode	Single Player (offline)
Engine	Unity
AI	A Star (A*) dan RNG

3.1 Concept

The concept stage aims to find out the design that will be used in game development and is made to create a framework and game design that will be designed and worked on. The concept stage aims to find out the design that will be used in game development and is made to create a framework and game design that will be designed and worked on. this stage includes formulating the game concept, determining the target audience, and the platform to be used. For this sack racing and hide-and-seek game, the steps include, Determining the theme of traditional Indonesian sack racing and hide-and-seek games, Determining the racing game genre with arcade elements, Determining the main mechanics of players racing to jump in sacks, pressing random button patterns for sack racing games, avoiding enemies and finding roads or checkpoints to win matches for hide-and-seek.

Figure 2 Gameplay

This flowchart illustrates the structured navigation from starting the game to playing the two types of traditional games, with options to view information and exit the game, including tutorial steps and difficulty selection before starting the game. This ensures users have an organized and informative experience before and during play.

The implementation of difficulty levels (easy, normal, hard) on the AI in the sack and hide-and-seek racing game allows the game to customize the challenge to the player's ability. By adjusting AI parameters such as speed, detection range, and search strategy, each difficulty level provides a different gaming experience. With the dynamic difficulty adjustment system, the game can also automatically adjust the AI parameters based on the player's performance, ensuring that the challenges remain optimal even as the player's abilities evolve. This increases replayability and ensures that the game remains interesting for

different levels of player ability. The following table compares the difficulty level of the AI parameters for each difficulty level:

Table 2 sack race parameter level

Parameter	Easy	Normal	Hard
Jumps	4.5f	5f	5f
Speed Variation	4.5f	5f	5f
Jump Probability	2.2f	1.5f	0.5f
Reaction Time	2.5f	1f	0.5f

Table 3 hide and seek parameter level

Parameter	Easy	Normal	Hard
Movement Speed	2.5	3.5	4.5
Detection Range	5.0	8.0	12.0
Viewing Angle	60°	90°	120°
Search Time per Spot	3.0s	2.0s	1.5s
Memory Duration	5s	10s	20s
Percentage of Spots Inspected	40%	70%	95%

The testing phase in the development of this Indonesian sack and hide and seek racing game includes several important aspects, namely functionality, performance, and user experience for volunteers or respondents to test 5 devices with different android version specifications, testing there are several things User Experience Testing: The game was tested by users to get direct feedback on their gaming experience. For user experience data collection, a questionnaire with a Likert scale (1-5) is used which includes aspects of user experience, gameplay, AI evaluation, and difficulty level. Testing was conducted respondents who filled out the questionnaire through Google Form.

Table 4 question and likert scale

No	Question	Answer respondent(1 – 5)
1	This game is easy to play.	1. Strongly disagree
2	The graphics of this game are attractive.	2. Disagree
3	The controls are responsive.	3. Neutral
4	The AI features in this game add to the excitement.	4. Agree
5	This game reflects Indonesian traditional games	5. Strongly agree

3.2 Pre-production

In this stage, game design, prototyping, and testing of image design concepts using Canva were carried out. Some of the main activities are: Designing levels with racing tracks

that have different difficulty levels, Designing player characters and NPCs with diverse attributes, Designing UI/UX so that the interface is easy to use and attractive

3.3 Production

In this stage, game design, prototyping, and testing of image design concepts using Canva were carried out. Some of the main activities are: Designing levels with racing tracks that have different difficulty levels, Designing player characters and NPCs with diverse attributes, Designing UI/UX so that the interface is easy to use and attractive

Figure 3 Design

3.4 Testing

The production stage includes asset development and overall game implementation, including Collecting or applying graphical assets such as characters, backgrounds, and game objects. Collecting or applying audio assets such as background music and sound effects, Collecting other supporting assets such as fonts and icons. Next, all these components are integrated into the game using Unity. The gameplay mechanics and AI are implemented as designed, and the UI/UX is adjusted according to the design.

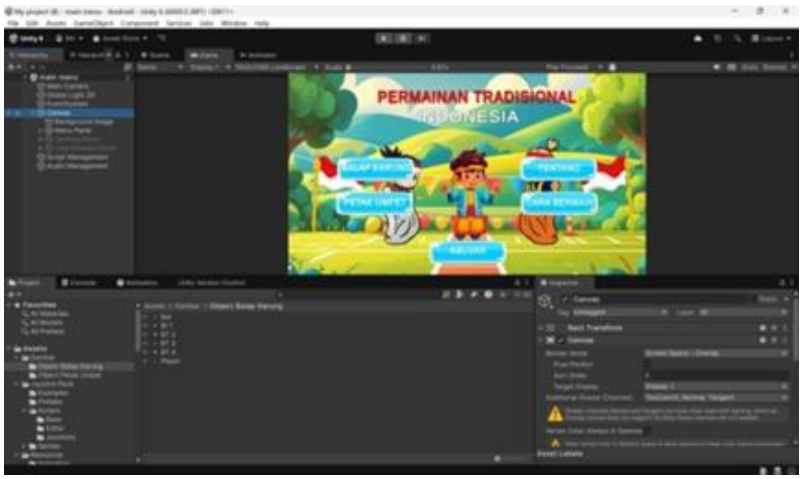

Figure 4 Implementation

3.5 Listing

The release stage is the process of distributing the game to the intended platform. For this sack and hide-and-seek racing game, the release stage includes Release preparation: Preparing all assets needed for publication on the Google Play Store or other platforms, Publication Uploading the game to the distribution platform Monitoring the number of downloads and reviews from users

3.6 Maintance

The maintenance phase is a phase of improvement based on user feedback after the official release. In the development of this sack and hide-and-seek racing game, user feedback on bugs, performance, and game experience is very important for further improvements.

CONCLUSION

The development of Android-based traditional games was successfully conducted using GDLC methodology. This game raised two traditional Indonesian games, namely sack race and hide and seek in 2D offline format. The implementation of the A* algorithm was successfully applied in the hide-and-seek game to regulate the behavior of search NPCs that are able to perform intelligent and adaptive navigation in finding players. The Random Number Generator (RNG) algorithm was successfully implemented in the sack race game to create unpredictable NPC behaviors such as variations in jumping speed and reaction time, which made the game more challenging.

Based on descriptive qualitative analysis of 21 respondents, it was concluded that the game succeeded in presenting a satisfying gaming experience. The implementation of AI using the A* (pathfinding) algorithm and RNG is considered effective in creating NPCs with dynamic and challenging behavior, although there are minor bugs in navigation on older versions of Android devices. The nuances of traditional Indonesian culture are strongly represented through the graphic design and game mechanics, recognized by 90% of respondents. The difficulty progression (easy-normal-hard) also proved to be balanced and meaningful.

REFERENCES

[1] N. N. Hidayati, "Indonesian Traditional Games: a Way to Implant Character Education on Children and Preserve Indonesian Local Wisdom," Journal of Education and Learning, vol. 14, no. 1, pp. 114–122, 2020.

[2] A. S. Milak, E. W. Hidayat, and A. P. Aldya, "Penerapan Artificial Intelligence pada Non-Player Character Menggunakan Algoritma Collision Avoidance System dan Random Number Generator pada Game 2D Balap Egrang," Jurnal Teknologi Informasi dan Ilmu Komputer (JTIIK), vol. 7, no. 5, pp. 989–998, 2020.

[3] E. Regiana, A. Dwiyoga, and F. H. Prasetya, "Preservation of Indonesian Culture through Traditional Games Application," Journal of Information Systems, vol. 16, no. 2, pp. 78–89, 2020.

[4] S. Handayani, "Menggapai Permainan Tradisional Anak Indonesia Dalam Perangkat Berbasis Android," Jurnal The Messenger, vol. 8, no. 2, pp. 61–67, 2016 (Revised edition 2021).

[5] H. Aydın, A. Y. Ayas, A. Çetinkaya, and Z. Güney, "Artificial Intelligence (AI)-Based Self-Deciding Character Development Application in Two Dimensional Video Games," Bilgi ve İletişim Teknolojileri Dergisi, vol. 5, no. 1, pp. 1–19, 2023.

[6] D. Liu, "Research of the Path Finding Algorithm A in Video Games," Highlights in Science, Engineering and Technology*, vol. 12, pp. 45–52, 2023.

[7] E. Agung, D. Eridani, and A. Fauzi, "Implementasi Metode Pathfinding dengan Algoritma A pada Game Rogue-like menggunakan Unity," Indonesian Journal on Computing (Indo-JC)*, vol. 7, no. 3, pp. 81–94, 2022.

[8] E. Pangestu, P. D. Kusuma, and R. A. Nugrahaeni, "Implementasi Kecerdasan Buatan Untuk NPC Pada Permainan Racing Car Dengan Algoritma A," eProceedings of Engineering*, vol. 8, no. 5, pp. 7654–7661, 2021.

[9] A. G. Asrori, A. Y. Fernando, and A. F. R. Nuraissa, "Pembuatan Game Petualangan Matematika Menggunakan Algoritma A Dan Random Number Generator," Seminar Nasional Teknologi & Sains*, vol. 2, no. 1, pp. 112–119, 2023.

[10] N. Nabila and D. V. S. Y. Sakti, "Pengembangan Game Congklak Berbasis Kecerdasan Buatan Menggunakan Algoritma Alpha-Beta Pruning," Jurnal TICOM: Technology of Information and Communication, vol. 99, no. 9, pp. 50–56, 2023.

[11] F. A. Irawan et al., "Implementasi Permainan Tradisional Egrang Menggunakan Multiple Intelligences," Jurnal Pemberdayaan Masyarakat Mandiri Indonesia, vol. 7, no. 2, pp. 48–54, 2024.

[12] J. Smith and R. Johnson, "Integrating Artificial Intelligence (AI) into Game Development to Elevate Diverse Gameplay Elements," International Journal of Interactive Systems, vol. 15, no. 2, pp. 132–145, 2024.

[13] M. A. Rahman et al., "Artificial Intelligence (AI) Based Game Development 'Memory Game' for Training Functions Alzheimer and Dementia Cognitive," KNE Engineering, vol. 7, no. 1, pp. 45–55, 2023.

[14] L. Chen and Y. Wang, "The Application of Artificial Intelligence Technology in Game Design," Advances in Computer Engineering, vol. 9, no. 4, pp. 210–225, 2024.

[15] K. Lee and J. Park, "A Research of Artificial Intelligence Game Agent Application," Advances in Computer Engineering, vol. 8, no. 3, pp. 150–162, 2023.