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Implementation Of A Star Algorithm In Android Based Alien Shooter Games

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ABSTRACT

The development of games at this time is so rapid and a part of lifestyle. The Alien War game is a First Person Shooter (FPS) game using the first person's point of view to aim or kill an enemy in the form of an alien. The player only sees his hand and does not see the body of the character being played. This game uses the A Star method which is applied to Non Player Character (NPC) to find the location of players. This alien war game uses the Android operating system.

1. Introduction

First Person Shooter (FPS) game is a war game that uses firearms with a first-person perspective where the screen display simulates what is seen by the eyes of the character being played [2]. In this modern era, the demands of many aspects of life are increasingly heavy for most people. Of course this makes people feel the burden of thought or heavy stress. To channel this feeling of stress takes a lot of time which is not small for refreshing or resting like vacationing, watching movies, relaxing, etc. Along with the rapid advances in technology, making a variety of types and types of game choices. From traditional games such as enggrang, jumping rope, playing car cars and others. The game has become a digital game or 3 Dimensions (3D). Playing games has become the most efficient alternative in channeling stress in this modern era. Games have become a basic need of every individual to enjoy life and as a medium of learning [3]. Games have become everyday in our lives. In the past, games have only been a means of entertainment, but now games have become a widespread function, such as games being a means for learning, land for business, and a match for one of the sports branches of professionals [1]. Game or game is an activity that aims to entertain themselves from feeling bored or stressed. With the rapid advancement of technology at the moment makes the game increasingly varied types and amounts. Not just for entertaining, but gaming has become a very big industry. In the past, games have always been linked to childhood, but now it has attracted the attention of all people. Based on this background, it will be made an interesting 3D game in the preparation of this final project and taken the title of A Star Algorithm Implementation in Android Based Alien Shooter Game.

2. Research Methods

This algorithm is the Best First Serch (BFS) algorithm that combines Uniform Cost Serch and Greedy Best First Serch. The calculated costs are obtained from the actual costs plus the estimated costs. In mathematical notation written as: f (n) = g (n) + h (n). With this cost calculation, the A * (A Star) algorithm is complete and optimal. In a simple case search route, where there are no obstacles on the map. A * works as

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fast and as efficiently as BFS. In the case of a map with obstacles, A * can find a solution to the route without getting stuck by the obstacle. Algorithm A * solves the problem using graphs to expand its status space [4].
Searching using the A * algorithm has the same principles as the BFS algorithm, but with two additional factors.

a. Each side has a different "cost", the amount of cost to go from one node to another node.
b. Costs from each node to the destination node can be estimated. This can help with searching, so we are less likely to look in the wrong direction. The cost for each node does not have to be a distance. Costs can be time if we want to find the way with the fastest time to pass. For example, driving a normal road can be the closest distance, but taking a toll road usually takes less time.

The A * algorithm works on the principle that is almost the same as BFS, except with two differences, namely:

a. Nodes in the 'open' list are sorted by overall costs from the initial node to the destination node, from the smallest cost to the largest expense. In other words, use priority queue. The overall cost is calculated from the cost of the initial node to the current node plus the estimated cost to the destination node.
b. Nodes in the "closed" list can be added to the "open" list if the shortest path (less expense) to the node is found. Because the "open" list is ordered based on overall expenditure estimates, the algorithm checks the nodes that have the smallest estimated expenses first, so the algorithm looks for nodes that are likely to point to the destination node. Therefore, the better the estimated cost, the faster the search. Costs and estimates are determined by us. If cost is distance, it will be easy.

The cost between nodes is the distance, and the estimated expenditure from a node to the destination node is the sum of the distances from that node to the destination node. Or so that more easily can be shown as follows.

$$F(n) = g(n) + h(n)$$

With:
F (n) = evaluation function
G (n) = cost that has been incurred from the state to the state of n
H (n) = estimated cost to arrive at a destination starting from n
Note that this algorithm only works when the estimated cost is not greater than the actual cost. If the estimated cost is greater, the path found may not be the closest. The node with the lowest value is the best solution to first check on g (n) + h (n). With a heuristic function that meets these conditions, then searching with the A * algorithm can be optimized.
The research framework is as follows:

A. Research Framework

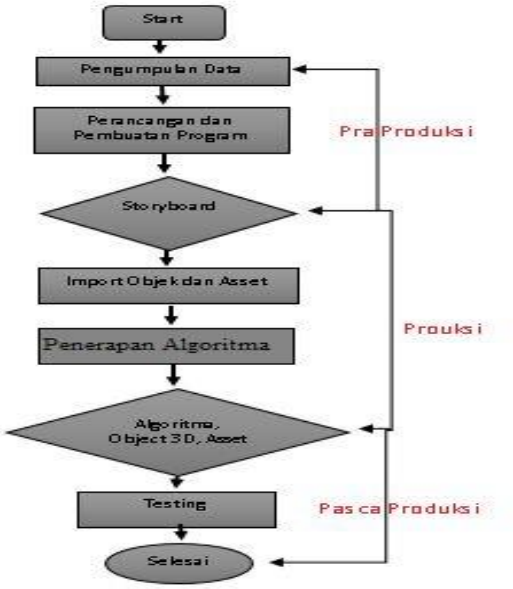

Fig 1. Research Framework

The above research framework explains how the game is made and begins with the pre-production stage where all the data will be used in the design, hardware, software, flowcart and storyboard requirements. Furthermore, in the production stage of object editing and the application of the A Star (A *) method to fit the desired concept if there is a discrepancy with the concept it will return to the data collection stage and will be

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corrected again if not, then will proceed to the post production stage for the process of entering 3D objects and voting in the game. The last step is testing and building an application into a game for Android and performing display testing, device testing, and algorithm testing.

B. Application Design

At the beginning of the game will go to the main menu of the game. In the main menu or main menu there are buttons - buttons like start, sound, exit, how to play and about me. In the start screen the player can choose the level to be played. In alien shooter games players can choose 3 levels including easy medium and hard levels. The application structure is shown in the figure:

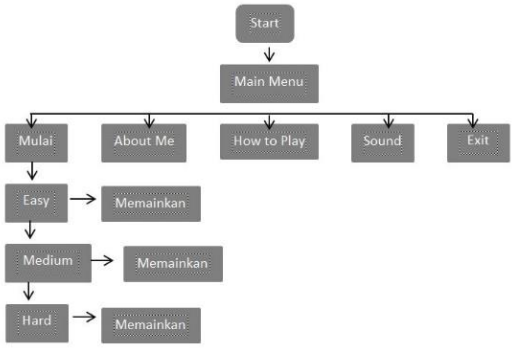

Fig 2. Application Structure

The following is the design that will be built by the author in "Android-Based Alien Shooter Game Application with the A Star (A *) Method".

1) App Display Main Menu

On the main menu form there are several menus including the "start" menu, "about me", "how to play", "sound", and "exit" menu to exit the application. It's in the picture:

Fig 3. App Display Menu Design

2) Display Selecting Level

In the "Start" form the player can choose the desired level such as Easy, Medium or Hard. By pressing on the desired Easy, Medium or Hard form. The "Home / Back" button is used to open the form back to the main menu. In the picture:

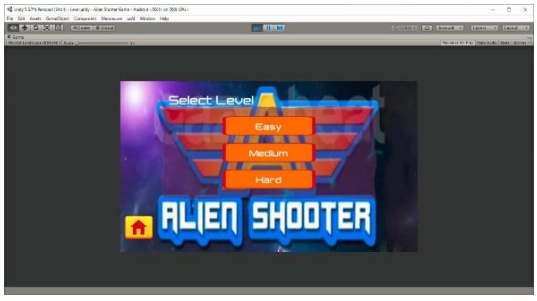

Fig 4. Display Selecting Level

3) Game Display

In the Form after we choose the level that we will play, the user can directly play the game. If the user can finish the game, then a pop up message will appear that you win. The "Home / Back" button is used to open the form back to the main menu. In the picture:

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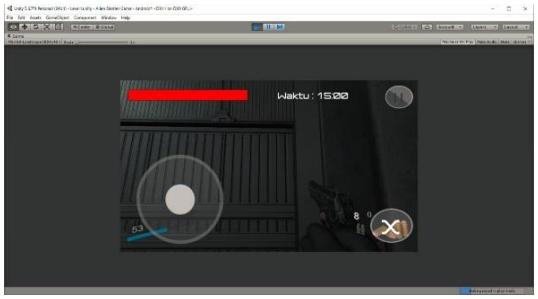

Fig 5. Game Display

4) Display Menu About Me

The About Me form menu contains the author's profile. The "Home / Back" button functions to open the form back to the main menu. In the picture:

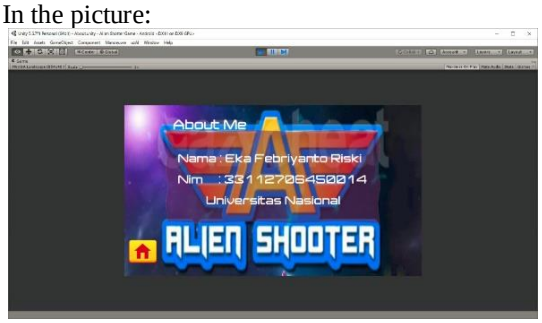

Fig 7. Display Menu About Me

5) Display Menu How To Play

In the How to Play form to display information about the procedures for playing the alien shooter game. In the picture:

Fig 8. Display Menu How To Play

3. Results And Discussion

A. Program Testing

The purpose of testing this application is to look for errors that occur in the application both in terms of the program and the display as well as the button in the Design of Alien Shooter Game Application Based on Android With A Star Method.

The author uses Black Box testing.

B. Black Box Testing

Black Box Testing is an application testing that is based on the user's perspective so that it makes it easier to identify existing problems to be repaired later. Here are the results of testing that the author has done:

1) Main Menu Testing Table

No	Item Yang Diuji	Sekenario	Hasil	Hasil Pengujian
1		Menekan Tombol Start Game	Menuju Layer Start Game	Sesuai
2		Menekan Tombol About Me	Menuju Layer About Me	Sesuai
3		Menekan Tombol How To Play	Menuju Layer How To Play	Sesuai
4		Menekan Tombol Exit	Menuju Layer Exit	Sesuai

Fig 9. Main Menu Testing Table

2) About Me Compliment Table

No	Item Yang Diuji	Sekenario	Hasil	Hasil Pengujian
1		Menekan Tombol About Me	Menuju Layer About Me	Sesuai
2		Menekan Tombol About Me	Tampilan Layer About Me	Sesuai
3		Menekan Tombol Back	Kembali Ke Menu Utama	Sesuai

Fig 10. About Me Compliment Table

3) Testing Table How to Play

No	Item Yang Diuji	Sekenario	Hasil	Hasil Pengujian
1		Menekan Tombol How To Play	Menuju Layer How To Play	Sesuai
2		Menekan Tombol How To Play	Tampilan Layer How To Play	Sesuai
3		Menekan Tombol Back	Kembali Ke Menu Utama	Sesuai

Fig 11. Testing Table How to Play

4) Testing Table Select Level

No	Item Yang Diuji	Sekenario	Hasil	Hasil Pengujian
1		Menekan Tombol Easy	Menuju Permainan	Sesuai
2		Menekan Tombol Medium	Menuju Permainan	Sesuai
3		Menekan Tombol Hard	Menuju Permainan	Sesuai

Fig 12. Testing Table Select Level

5) Game Display Testing Table

No	Item Yang Diuji	Sekenario	Hasil	Hasil Pengujian
1		Mainkan Game	Mainkan Game	Sesuai
2		Pause Game	Pause Game	Sesuai
3		Muncul Score	Muncul Score	Sesuai
4		Menekan Tombol Back	Menuju Menu Utama	Sesuai

Fig 13. Game Display Testing Table

6) Application Testing Tables on 2 Different Smartphones:

Pengujian Pertama

Spesifikasi	Versi Android	Hasil	Keterangan
Xiomi Redmi Note 8 Pro RAM 6 GB	Pie 9.0		Hasil pengujian paling baik dari segi grafis dan kelancaran game

Pengujian Kedua

Spesifikasi	Versi Android	Hasil	Keterangan
Xiomi Redmi Note 4 G RAM 2 GB	KitKat 4.4.2		Hasil pengujian baik, game normal

Fig 14. Application Testing Tables on 2 Different Smartphones

7) Testing the Application of the A star Method in Applications:

After testing the A star method applied in the alien shooter game, the results are in accordance with what the authors expect in this study. Where NPCs can find players entering NPC territory. Following is the script for applying the A star method to this game:

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```
void Patrol() {

    // tell nav agent that he can move
    navAgent.isStopped = false;
    navAgent.speed = walk_Speed;

    // add to the patrol timer
    patrol_Timer += Time.deltaTime;

    if(patrol_Timer > patrol_For_This_Time) {

        SetNewRandomDestination();

        patrol_Timer = 0f;

    }

    if(navAgent.velocity.sqrMagnitude > 0) {

        enemy_Anim.Walk(true);

    } else {

        enemy_Anim.Walk(false);

    }

    // test the distance between the player and the enemy
    if(Vector3.Distance(transform.position, target.position) <= chase_Distance) {

        enemy_Anim.Walk(false);

        enemy_State = EnemyState.CHASE;

        // play spotted audio
        enemy_Audio.Play_ScreamSound();

    }


} // patrol
```

4. Conclusion

Based on the stages that have been carried out in "Designing the Alien Shooter Android-Based Game Application with the A Star Method" and the completion of this research, it can be concluded several things as follows: a. Use the A Star Method on NPCs to find the location of players entering their territory. The NPC can find the location of the player without crashing into obstacles.
b. Smartphone specifications that are used are very influential on the smoothness of this application, especially on the GPU device because it requires a fairly high graphics

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5. References

[1] Agung Pamungkas, Eka Puji Widiyanto, Renni Angreni, "Penerapan Algoritma A* (A Star) Pada Game Edukasi The Maze Island Berbasis Android ",Jurusan Teknik Informatika, STMIK GI MDP, Palembang.
[2] David," Perancangan Game Mobile Android Bergenre Horror", Sekolah Tinggi Manajemen Informatika dan Komputer, Jln. Merdeka No. 372 Pontianak, Kalimantan Barat.
[3] Januar Pangestu, Jeanny Pragantha, Darius Andana Haris "Pembuatan Game FPS-Rail Shooter "Hide Mission" Berbasis Android", Program Studi Teknik Informatika, Universitas Tarumanagara, Jakarta 11440 Indonesia.
[4] Muhammad Haki Fauzi, Rodiah, "First-Person Shooter 3D "Gamashoot" Dengan Blender dan Unity 3D", Program Studi Teknik Informatika, Universitas Gunadarma.
[5] Patah Herwanto, Trisna Sonjaya, "Rancang Bangun Game 3D "Ena Burena" Dengan Algoritma A* dan Collision Detection Menggunakan Unity 3D Bberbasi Desktop Dan Android".
[6] Refi Meisadri, Nelly Indriani, "Pembangunan Game First Person Shooter 3D Alien Hunter", Universitas Komputer Indonesia (UNIKOM), Jl. Dipati Ukur No.114-116, Bandung 40132.
[7] Robert Theophani Singkoh, "Perancangan Game FPS (First Person Shooter) Police Personal Training", Sekolah Tinggi Manajemen Informatika Dan Komputer Multi Data, Palembang.
[10] Ryan Mahendra Kusuma Putra, "Perancangan Game First Person Shooter 3D "Zombie Hunter" dengan Menggunakan Metode A*", Jurusan Teknik Informatika Sekolah Tinggi Informatika & Komputer Indonesia (STIKI), Malang.

[11] Siti Asmiatun, "Penerapan Algoritma Collision Detection dan Bayesian Untuk Strategi Menyerang Jarak Dekat Pada NPC (Non Player Character) Menggunakan Unity 3D", Fakultas Teknologi Informasi dan Komunikasi, Universitas Semarang.
[12] Yoma Nuruzzuha, Robbi Hendriyanto, Ady Purna Kurniawan "Aplikasi Game FPS "Horror Of Campus".

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