Implementation Method A * (A-Star) For NPC Enemies In 3D Game Vocabulary Learning Arabic

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Abstract. For Muslims in particular, Arabic is a language that is very special, because the book for all Muslims use the Arabic. Learning Arabic obligatory for Muslims to know the contents of the book of the Qur'an. To learn Arabic language we need to know about Nahwu, Sorof, and also new vocabulary words from the Arabic language itself. For it made a 3D game learning Arabic vocabulary that is intended for beginners. By learning methods as is expected to increase the desire to learn from people who want to start learning Arabic. So when we play the game we do not only have fun, but we also get Arabic Studies of this game.
In this game players will be brought to the fantasy island in the island where there are characters who shaped the island's population and the number of fruits. And the player must deliver the character into the character of the house respectively. In order to increase the excitement in the game, A-Star algorithm is applied to the movement of The Enemy Non Player Game (NPC) that will also pursue the character of the population, if the player lost quickly with the enemy NPC player would not get the point. Tests conducted on mobile devices that use the Android platform.

Keywords: *3D games, path finding, A-Star*

1.   Introduction

Learning is a very important thing, especially in studying religion, in Islam cannot be separated from learning Arabic as the primary source of Islamic is the Qur'an and Hadith, and the native language of the Qur'an and Hadith it is Arabic. For that Arabic is one that must be learned, mastered, or at least understood by Muslims in order not to deviate and understand the laws of Islam.
About the importance of learning Arabic Rahiyallohu'anhu Umar Bin Khattab said:
"Learn Arabic, because actually the Arabic language it is part of your religion".
With the development of the times, we can now create a learning becomes more attractive. Learning is now not only through books alone, although the reading is still very necessary, now anyone can taste the practical technology. With the development of a learning technology is no longer boring, but can be very enjoyable. With the easiness today, modern humanity can use and not waste it.
As we all know the game is a tool to play, regardless of the form of the game itself, ranging from games that are simple to the most modern games. We can find the game on the PC, the website and smart phone. Many children and even adults who are very interested in the game. By John beck and Mitchell wale "game is the attention that has been proven" [1].
The effect is not always a good game, because it is basically the game is a means of entertainment. There are also some people who behave badly, which is caused by the game, but it also returned to each person who run them. There were some bad games that did not bring benefits to the player, it can even damage the moral disposition, the Shari'ah.

2.   Material and Method

2.1.   Game

The game is a game that consists of a set of rules that establish a competitive situation of the two to a few people or groups by selecting a strategy built to maximize their own abilities or even minimize the win against [2]. (Neumann, 1953).
Augustine's definition according Nilwan game Game is a computer game created with the techniques and methods of animation [3] (Nilwan, 1995).

Game is the purpose of this research is applied to the game smart phone android application.
Game (game) was first discovered by a group of mathematicians in 1994. The theory was invented by John von Neumann and Oskar Morgenstern [2] which provides:
"The game consists of a set of rules that establish a competitive situation of the two to a few people or a group by selecting a strategy that is built to maximize their own victory or to minimize the opponent victory. The regulations specify the possible actions for each player, some of the information received by each
as the players progress to play, and a number of victory or defeat in a variety of situations ".
According to Agustinus Nilwan [3] in his book "Animation and Game Programming Professionals", published by Elex Media Komputindo,
"The game is a computer game created with the techniques and methods of animation. If you want to explore the use of animation must understand making games. Or if you want to make a game, he must understand the techniques and methods of animation, because both are interrelated ".
According to Teresa Dillon (futurelab.com, 2005) the basic elements of a
Game: Game Rule, Plot, Theme, Character, Object, Text, graphics, sound, animation, user interface [4]

2.2.   A Star Algorithm

This algorithm was first introduced in 1968 by Peter Hart, Nils Nilsson and Bertram Raphael [5]. In computer science, A * (pronounced as "A Star") is one of the search algorithm graph best able to find a path with expenses of at least the starting point is given to the point of interest expected (from one or more possible destination), A * algorithm is a refinement of the method BFS (Best First Search) by modifying the heuristic function. A * will minimize the total cost trajectory contained in the BFS method. In the right conditions, A * will provide the best solution in an optimal time. In the search simple cases, where there is no obstacle on the map, Astar works quickly and efficiently as BFS. In the case of a map with a hitch, A star can find these solutions without being trapped by any obstacles.
Some basic terminology contained in the A star algorithm is the starting point, the nodes, A, open list, closed lists, cost, unworkable. The Starting point is the terminology for the starting position of an object. A is the node that is being run in a shortest path search algorithm. A node is a small plot as a representation of the area of
path finding. This may be as a square, circle, and triangle. Open list is a place to store data nodes that may be accessed from the starting point or node that is being executed. Closed list is a place to store data before a node which is also, as of the shortest paths that have been successfully obtained.
A star has two main functions in determining the best solution. The first function is called g (n) is a function that is used to calculate the total cost required from the starting point toward a particular node. The second function which is commonly referred to as h (n) is a function of the estimated total cost of which is estimated from a node to the end node.
On A Star, each node of the starting node traced then calculated the cost of each node and inserted into the thick of priority. Nodes with the lowest cost will be given the highest priority level. Then the search continued on the node with the highest priority value to the table.

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

by:
n = position coordinates of the node
f (n) = function evaluation
g (n) = cost (cost) that have been removed from state to state n
h (n) = estimated cost to arrive at, a destination starting from n

F value is the approximate cost of a node is identified. F value is the result of f (n). Rated G result of the function g (n), is the number of steps required to get to the current node. Each node (node) should have the information value of h (n), the node price estimate is calculated from the destination node which results in the value of H.
Nodes with the lowest score is the best solution for the first checked on g (n) + h (n). With heuristic functions that meet these conditions, then the search algorithm A Star is optimal.
Heuristics are a technique that develops efficiency in the search process, but with the possible expense of completeness. Using a heuristic function to evacuate the circumstances of individual problems and determine how far it can be used to obtain the desired solution.
A Star as a search algorithm that uses a heuristic function to 'lead' s search, particularly in terms of development and examination of the nodes on the map (Stuart and Peter, 2003) [6]. There are some common heuristic functions that can be used for the A * algorithm is. One is known as 'Manhattan distance'. Heuristic function is now used in a case where the movement on the map just straight (horizontal or vertical), not allowed to move

diagonally (Arnold Nugroho, 2009) [7].
The Heuristic value calculation for the n-th node using the Manhattan distance is as follows:

$$h(n) = (abs(n.x\text{-}goal.x) + abs(n.y\text{-}goal.y))$$

Where h (n) is the heuristic value for node n, and the goal is the destination node. If the map papa diagonal movement is allowed, it is used in addition to the Manhattan distance heuristic function.
To come closer to reality, the cost to transfer diagonally and orthogonal node differentiated Cost diagonal is 1.4 times the cost of displacement orthogonal, than the heuristic function used is as follows:

$$h\_diagonal(n) = min(abs(n.x - goal.x) + abs(n.y - goal.y))$$
$$h\_orthogonal(n) = (abs(n.x - goal.x) + abs(n.y - goal.y))$$
$$h(n) = h\_diagonal(n) + (h\_orthogonal(n) - (2 * h\_diagonal(n)))$$

Where h_diagonal (n) is the number of rare diagonal can be taken to achieve the goal of node n. h_orthogonal are many rare straight that can be taken to achieve the goal of node n. Heuristic value was then obtained from h_diagonal (n) plus the difference h_orthogonal (n) with twice h_diagonal (n). In other words, the number of steps d.

2.3.   Unity

Unity 3D is an integrated software development to create a video game or other content such as architectural visualizations or real-time 3D animation. Unity 3D can be used on Microsoft Windows and MAC OS X, and the resulting game can be run on Windows, MAC, Xbox 360, OlayStation 3, Wii, iPad, iPhone, Android and Linux. Unity 3D can also generate a game for browsers using the Unity Web Player plugin. Unity 3D also has the ability to export a game built in the functionality of Adobe Flash 3.

2.4.   FSM NPC penduduk dan NPC Enemy

Finite State Machines (FSM) is a control system design methodology that describes the behavior or the working principle of the system by using the following three points: State (state), Event
(Events), Action (action). FSM pretty much used as the base design application that has continued like Game.
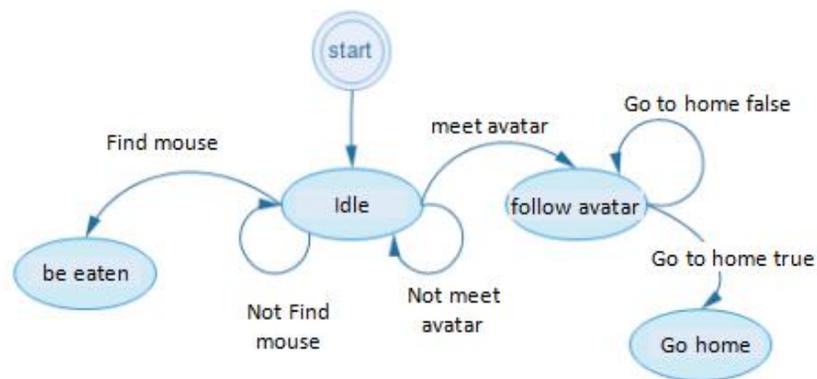FSM on 'kampoeng arab' population.

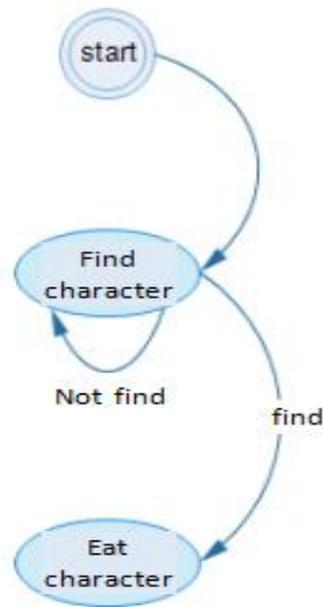**Figure 1.** FSM NPC Character 'kampoeng Arab'

Figure 2. FSM NPC Enemy Character

3. Results and Discussion

A * algorithm is applied to determine the price of the F, G and H as well as the performance of the algorithm in finding a route. This process is tested by taking the coordinates of the enemy and the player.

Target Position: X: 1347; Y: 3; Z: 782
NPC Position :
     X: 1752; Y: 6; X: 1103

Table 1. Results Test A Star Algorithm.

Nilai G minimum	Nilai H minimum	Nilai F minimum	Current X, Current Y
2057.606619351717	-702	1355. 606619351717	(1752, 1079)
2043.577255696491	-675	1368. 577255696491	(1752, 1052)
2029.81008963893	-648	1381. 81008963893	(1752, 1025)
2016.310490962981	-621	1395. 310490962981	(1752, 998)
2003.083872432705	-594	1409. 083872432705	(1752, 971)
1821.676425713414	-567	1254. 676425713414	(1752, 944)
1977.471365152982	-540	1437. 471365152982	(1752, 917)
1917.108238989129	-459	1458. 108238989129	(1698, 890)
1893.235590200015	-432	1461. 235590200015	(1671, 890)
1869.448046884427	-405	1464. 448046884427	(1644, 890)
1845.748899498521	-378	1467.748899498521	(1617, 890)
1822.141597132341	-351	1471. 141597132341	(1590, 890)
1798.629756231115	-324	1474. 629756231115	(1563, 890)
1775.217169813316	-297	1478. 217169813316	(1536, 890)
1765.777449170761	-297	1468. 777449170761	(1509, 917)
1757.116956835828	-297	1460. 116956835828	(1482, 944)
1719.857552240883	-243	1476. 857552240883	(1455, 917)
1697.077782542686	-216	1481. 077782542686	(1428, 917)
1674.42228843264	-891	1485. 42228843264	(1401, 917)

1637.063224191418	-135	1502. 063224191418	(1374, 890)
1599.74310437645	-81	1518. 74310437645	(1347, 863)
1585.340657398277	-54	1531. 340657398277	(1347, 836)
1571.270186823387	-27	1544. 270186823387	(1347, 809)
1557.540689677159	0	1557. 540689677159	(1347, 782)

4.   Conclussion

Based on the results of the implementation and testing conducted by researchers, it can be concluded as follows :

Use of the A * algorithm was successfully applied to generate the search behavior of the NPC. Shown with trials in Table 4.6. In the search process, the NPC is able to pass through any obstacles and managed to locate the whereabouts of the location of the NPC population. Game "Browse kampoeng arab" has been tested to Nine different operating systems on the android platform, in a variety of peripheral devices of this game shows the different levels of success in the test system and display.

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