Implementation of Decision Tree in Summoners War

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Abstract − **Tree is one of the topics that be discussed in one of ITB Informatics subjects in the second years called Discrete Mathematics. Nowadays, Simalarity between things are too many. Because of them, people become slow in responding and deciding what they want. For Instance, people when they want to buy a fan, they get confused which one is better, standing fan, wall fan or table fan. Tree here is the best solution in deciding what you are going to choose. Tree is a graph that connected with every node and does not have a circuit as a subgraph. That kind of tree is called Decision tree. Decision tree can be used in one of the most popular 3D MMORPG that called Summoners War. Decision tree in this games is used when engraving runes in a monster, choose best monster for fight.**

Keywords – Summoners War, tree, Decision, monster, engraving, status, PVP.

I. INTRODUCTION

MMORPG (Massively Multiplayer Online Role-playing Games) is a video game that take place in a fantasy world or virtual world with a lot of players that played in that game. MMORPG can be controlled single player or multiplayer. Mostly MMORPG games are building up the characters, experience, customize the character, evolving the character and wealthy. Entering dungeon, scenario, fight the boss are the usual thing that these games will face. The points of these games are like battle to get experience, get money, and get item to improve the character become better. In these games, planning a strategy is the most important parts. If the games play using team then player need to choose what kind of team that can win the games or what kind of character must be built so the character is not too weak. Because if player does not plan anything and play as they want, percentage of losing is higher than they expected and finally cannot continue to the next stage. Moreover, MMORPG cannot only depend on luck, although some games rely on luck. One of the example of MMORPG is RO (Ragnarok Online). But in this article, writer want to discuss more about Summoners War.

Picture 1. One of MMORPG game called Ragnarok Online 2.
(Source :
http://www.zam.com/story.html?story=31507, at 12.16, 6 Desember 2015).

II. SUMMONERS WAR(SW)

Picture 2. The Front Page of Summoners War.
(Source :
https://swskyarenaphguide.wordpress.com/getting-started/,at 12.20, 6 December 2015)

Summoners War or SW is a 3D MMORPG that provided in IOS or Android and published by com2us. This game does not really need quick decision but the best decision. This game is also divided into two categories. First is the main quests and second is the side quests. The main quests are quests that will continue the story progression and will unlock new scenario areas in the battle map. To access the best parts of the maps, player need to clear the each scenario area before he can continue to the next scenario. The main walkthrough of this game is there are evil summoners that trying to open rift of dimensional world's gate so evil monster can come to the world and disturb the balance of the world. At the beginning of the game, player or the game calls a summoner and he will be guided by a lady, name Ellia. She will teach the player all about basics of the game and also give the main quests. She also gives a summoning scroll

and ask the player to summon a monster and usually starts with fairy water. In this game, monsters are a little creatures that live on the island. The monsters consist of two : number of stars and level. The higher the stars the stronger the monster be. Each monster usually have 2 skills go along with them and awaken the monster make them 3. Some of the monsters have a leader skill, some do not have it. Some of them also have 3 skills go along with them although they have not awaken yet. The monsters are also be supported by runes that will be attached on them.

Picture 3. The island and monster live within it
(Source : Taken from own collection)

In this game, Firstly, it is important that players know about weakness that other monsters have and learn what their skill they have. For Instance, fire weak against water, water weak against wind, wind weak against fire. On the Contrary, fire strong against wind, water strong against fire, wind strong against water. In this game there are two special elements that weak against each other. They are dark and light. Knowing this you can kill enemy easier. Knowing skills of other monster is also important. With knowing their skills we can build good team. For example, in one team there are 2 nukers, 2 supports and 1 healer or 2 continuous damagers, 2 healers and 1 support. The team combo depends on the skill and what kind of runes the player give.

Picture 4. Each element weakness
(Source :
http://summonerswar.wikia.com/wiki/Monsters, at 13,19 6 December 2015)

Secondly, it is important that players know how to choose the best monsters or team to face other monster or in the dungeon or scenario area which is this game calls the boss. The boss can be identified from the size of the body. In this game, the boss divided into two parts. One is the big boss which cannot be stun, freeze or any status that disable it skill or movement except slow and has a long bar

of hitpoints. Second one is the small boss which also cannot be stun, freeze or any status but still can disable it skill and the hitpoints is lower below the big boss. And in PVP, Player can choose a team by checking the other player team monsters skill and status in general. The reason in general because this game does not spilt out other player monsters' status. Usually PVP, 1 team consists of 4 monsters, in guild war against guild, 1 team consists of only 3 monsters, in Dungeon, 1 team consists of 5 monsters, in scenario area, 1 team consists of 4 monsters and the latest release Rift of World, 1 team consists of 6 monsters.

Picture 5. PVP with others player monster
(Source : Taken from own collection)

Thirdly, it is important that players need to choose which runes (something look pentagon shape that being attached into the monster and support it) is the best for the monster. The monster can be built into support, tanker, nuker as the players like, no one restrict them. Choosing the wrong runes will not give big impact to the monster and in contras, choosing the correct runes will give a lot of different about the monster status.

Picture 6. One of the runes
(Source :
https://swskyarenaphguide.wordpress.com/runes/, at 13.48, 6 December 2015)

And the last, player needs to count to their own luck when summoning a monster because the monster is randomly being summoned. Summoning scrolls consists of 4 type.

1. Unknown scroll, summon 1 to 3 stars monster.
2. Mystical scroll, summon 3 to 5 stars monster.
3. Mystical summon, using 75 gems to summon 3 to 5 stars monster.
4. Social summon, using 100 social points to summon 1 to 3 stars monster.
5. Exclusive summon, using 50 summoning stone to summon 3 to 5 stars monster (there is

monster list that can be summoned and every week change).

6. Summoning piece, collect from secret dungeon or guild war, summon monster with 1 to 5 stars.
7. Light and dark scroll, summon 3 to 5 stars light and dark monster.
8. Legendary scroll, summon 4 to 5 stars monster.

That is the basic that every player needs to know before decide what to do next.

Picture 7. One of randomly summoning monster.
(Source : Taken from own collection)

III. BASIC THEORY

3.1 Graph

3.1.1 Definition of Graph

A graph consists of nodes and edges that connected to the node. Graph can be defined as G = (V,E) which is V is a set of nodes that must not empty and E is a set of edges that connected to each node, E may be empty.

3.1.2 Types of Graph

Graph can be grouped as several types. They are groups that have a pair of edges, edges have a direction, or looped graph.

a. Graph can be grouped as looped or not looped graph or have a pair of edges or not.
   1. Simple graph, graph that does not have any loop in any of it's node. Look in picture 8, G1 is a directed simple graph.
   2. Unsimple graph, graph that have at least one loop in any of it's node. Look in picture 8, G2, is unsimple graph.
b. Graph can be grouped as edges have a direction or not.
   1. Undirected graph, graph that does not have any direction. Look in picture 8, G2 is example of undirected graph.
   2. Directed graph, graph that have a direction. Look in picture 8, G2 is example of directed graph.
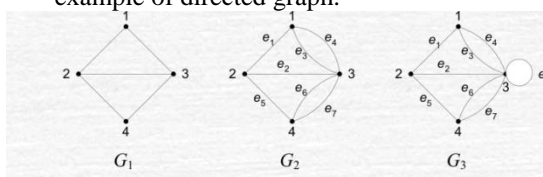
Picture 8 example of graph
(Source : Matematika Diskrit Edisi Keempat)

There are a lot of application that used graph. For example in electrical engineering, we can use graph to design the electrical circuit, in chemistry, we can use graph to design the CH_4 (methane), C_2H_6 (ethane) or C_3H_8 (Propane), in Informatics, we can use graph to test the program, etc. Below is one of the example of graph application.
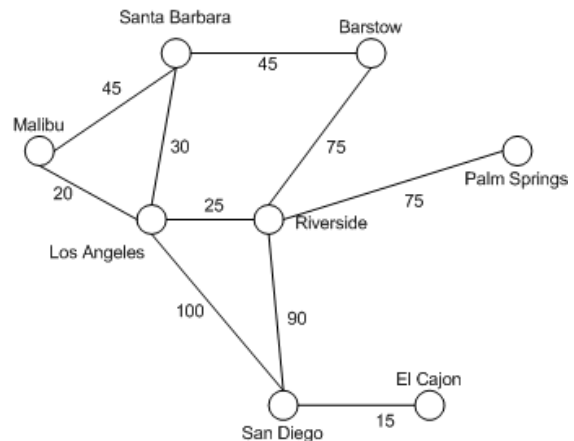
Picture 9. City Graph
(Source : https://msdn.microsoft.com/en-us/library/aa289152(v=vs.71).aspx, at 14.44, 6 December 2015).

3.2 Tree

3.2.1 Definition of Tree

Tree is a graph that does not have any direction. Besides it does not have any direction, it also does not have any circuit in it.
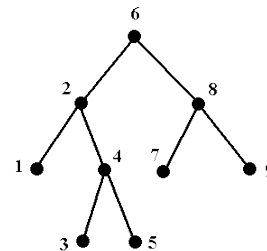
Picture 10. Example of a tree
(Source : http://www-math.ucdenver.edu/~wcherowi/courses/m4408/gtln8.html, at 15.00, 6 December 2015).

3.2.2 Features of Tree

Example G = (V,E) is a graph that does not have any direction and have n nodes. Then, every single point below is equivalent.

1. G is a tree.
2. every node in G connected in every circuit.
3. G connected and has m = n – 1 edges.
4. G is acyclic and has m = n -1 edges.
5. G is acyclic and adding one edges make G is cyclic
6. G connected and all edges are bridges.

3.2.3 Type of Tree
a. Coloring tree
b. Stretching tree
c. Root tree
d. Terminology of Root tree
e. Ordered Tree
f. n-ary Tree
g. Binary Tree

There are several application that used tree. For example, expression tree for counting, decision tree for take the best decision, Huffman code for compression code, binary search tree for searching effectively, etc.

The writer did not explain each types of tree because the writer was not talking about that in this article but he wanted to focus in decision tree

3.2.4 Decision Tree
Decision tree is one of the binary tree that use to modeling all issues that consist of every single decision that leads to solution. Each nodes is a decision and each leaf is a final solution.

Advantages of using decision tree are helping people in deciding which decision is the best because decision tree can pop out every single possibility with every condition.

Picture 11. Example of Decision Tree
(Source : http://www.sfs.uni-tuebingen.de/~vhenrich/ss12/java/homework/hw7/decisionTrees.html,at, 16.00, 6 December 2015).

IV. USING DECISION TREE IN SUMMONERS WAR

In Summoners War, the most interesting parts beside go to dungeon to fight boss and clear the main quest is play PVP (Player versus Player). In this game, PVP system is one of the player is in defend mode which is the player have no full control of the defend team, just set a team for defend. The attacker has a full control of what kind of team should be used to fight the defending monsters. Besides PVP, guild war also has the same system. PVP and guild war are the most challenging part in this game because the monsters that is defending mode is the monster that have been built quite tough. There are two main problems when battle against the defending monsters. First is the defender character level. If

the character level has reached above 35+ then the attacker should think twice to set up his team to battle because usually player with 35+ has very good runes attached in the monster. Second is defender with low level monsters. Sometimes defender is very low level monster because they want to farm a glory point. What is glory point? Glory point can be exchanged to get some rare items or ancient buildings or upgrade the ancient buildings. In Guild war, players do not get glory point but they get guild point. Guild point can be exchanged with rare items and summoning pieces. With very low level monster, player does not need to set up good monster to attack. Guild war also has the same with PVP.

Now it's time to choose a team to fight the defending monsters. First, player needs to check up what element of the defending monsters. Is it wind, fire, water, light or dark? It's important to know like in part 2 of this article told before, by knowing the weakness of the other monsters we can easily counter them. Second, player need to check up their support skills. Are the monsters have a support or not? Usually, player will build supports monster with the fastest attack bar to give buff[1] to its team. Besides checking support skills, player should check up their debuff[2] skills. Is there any continuous damage or not. The way to overcome the harmful effects is to take healer along the team. Third, player chooses a team to battle with the defending monsters. Choosing the team depend on what the player has checked in first and second. Picture number 12 is one of the examples of choosing the team. Two Fire element monsters and two water element monsters against two wind element monsters, one light element monster and one water element monster. The reason the writer brought two water element monsters because one of the water element is a tanker so the highest chance is the defender with wind element will hit the water element and two fire elements attack both wind elements monster. Moreover, when the writer checked one of the wind monster's 3rd skill is quite dangerous, writer decided to use one of the fire monster that make the skill cool down. Decision tree can help in choosing the attack team.

Picture 12. PVP with other player monster
(Source : Taken from own collection).

[1]buff : beneficial effects
[2]debuff : harmful effects

one of the consideration to build what kind of monster is.

Picture 13. Example of monster type.
(Source : Taken from own collection).

Second, player should check what the monster's skill. It is necessary to know what the monster capable of or what the effect of the skill. For example, if one of the monster's skills describes that the damage increases according to attack speed. The best to build that kind of monster is giving speed runes and sub-stats that support speed into the monster.

Third, player should decide what type of runes should be set. For example, player wants to build monster into a tanker[4] and speed, then player just need 1 set of energy rune and 1 set of swift rune and with stats support all 2,4,6 (spd, %HP, %HP) or player wants to build a monster into a full tanker, then he just need 3 set of energy rune with stats support all 2,4,6(%HP, %HP, %HP). Besides main stats, sub-stats is also important. Good sub-stats are sub-stats that consist of %HP, %Def, %Att, Spd, % critrate, %crit damage, %accuracy, %resistant. But it does not mean that every rune with no percentage is bad. When the player has decided what kind of monster to be built, searching the runes and grade is the problem. Looking for 6 stars and 5 stars runes are really hard.

After choosing a team, attaching good runes[3] in the monster is also necessary. There are 6 slots of runes that can be equipped to a monster in order to increase the monster's stats. The runes can be set into 2 or 4, with each set has a special effect to the monster. Runes consist of 16 types, energy, swift, focus, shield, fatal, guard, blade, despair, endure, violent, revenge, nemesis, destroy, will, vampire, rage runes. Runes also have their rarity rate, normal, magic, rare, hero, legendary, they have grades and they have sub-stats too.

Slot Number		Options
Odd Numbers	1	ATK (+)
	3	DEF (+)
	5	HP (+)
Even Numbers	2	ATK (+), ATK (%), DEF (+), DEF (%), HP (+), HP (%), Spd (+)
	4	ATK (+), ATK (%), DEF (+), DEF (%), HP (+), HP (%), Crit Rate (%), Crit Dmg (%)
	6	ATK (+), ATK (%), DEF (+), DEF (%), HP (+), HP (%), Effect RES (%), Effect ACC (%)

Table1 . Runes slot numbers and main effects.
(source :
http://summonerswar.wikia.com/wiki/Runes, 6 December 2015, 16.00)

Before using decision tree, first, player should check what type the monster is. Because the type is

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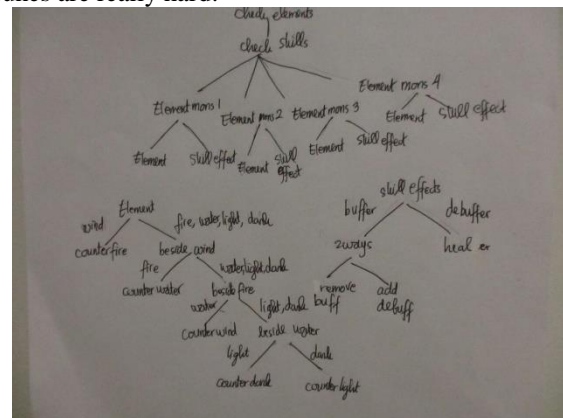
[3]runes : special attachment that can increase monster's stat
[4]tanker : monster with huge HP

V. Conclusion

Using decision tree in MMORPG is a good choice because the player can know every single of decision he makes. For example in Summoners war, using decision tree, he can know how much the monster increases using different runes without waiting the remove runes event to remove the runes. In this game, removing runes cost some mana.

REFERENCE

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PERNYATAAN

Dengan ini saya menyatakan bahwa makalah yang saya tulis ini adalah tulisan saya sendiri, bukan saduran, atau terjemahan dari makalah orang lain, dan bukan plagiasi.

Bandung, 10 December 2015

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