IEESE International Journal of Science and Technology (IJSTE), Vol. 6 No.2 , June 2017, 15-24
ISSN : 2252-5297

Implementation Of Perceptron Methods Of Attack Selection By NPC In Turn-Based RPG Malware Learning Game

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Abstract. Nowadays the development of technology can be said growing so fast. One of the fast develops technology is smartphone. The Smartphone has many features and those are very helpful for people to do their activities. But behind all of those features there are threats that threatening files inside the smartphone and even the smartphone itself. That threat is attack of malware. High amounts of smartphone usage rate make some irresponsible people spread their malware attack, that attack can steal or even worse destroy data or important information in a smartphone.

Because of that reason, knowledge about malware become very important to learn. Malware learning game created to attract people to learn about malware. Use video game as learning media, people will feel happy and also get knowledge from playing this game. In this game player will learn about malware by way fight against malware. To fight against malware player will understand attack of malware and how to resolve and prevent that malware. Perceptron method implemented in this game because the malware it has various attacks. By implementing this method into malware NPC, the NPC can make decisions which attack that it will choose depends on the situation.

Key Words: *Game, Classification, Perceptron.*

1. Introduction

Currently, the development of technology is very rapid. One of the technological developments rapidly is a smartphone. The Smartphone has become a thing that is no longer foreign to everyone. Almost every aspect of human life can be done through a smartphone. Starting from the communication, education, business, health, and other various aspects of life. The Smartphone also has penetrated the various circles of society. Starting from the upper-class society to a middle-class society down. The results of the latest survey from GFK, a market research institute showed Germany's largest Southeast Asia sales of smartphones last 12 months in Singapore, Malaysia, Thailand, Indonesia, the Philippines, Vietnam, and Cambodia reached 120 million units with valuations of U.S. $16.4 billion [1]. The high level of consumption of the community towards smartphones makes them unable to escape from their smartphone and always rely on their smartphones. Not least also the communities that utilize their smartphone to store documents or data which are very important and confidential for example, account numbers, personal data, ID card number, etc. This certainly can attract people who are not responsible for stealing or damaging the data.

According to the survey of the Juniper Network Mobile, a company that develops and sells networking products, on a 12-month period to March 2013, malware attacks to mobile devices go up 614 percent, with 92 percent are Android. This survey is considered very reasonable because 75 percent of the smartphone market in a world dominated by android [2]. The development of the malware is also supported by the fact that low public awareness of the dangers of malware, as well as lack of knowledge of the types and how to prevention and handling of such malware. The existence of this phenomenon is the author trying to learn how to increase public awareness of the dangers of malware in Indonesia as well as provide knowledge of malware.

In addition to smartphones as a medium of communication can also be utilized as a means of entertainment. One of the entertainment that is quite popular and often performed in smart phones is playing video games. But playing video games are often considered useful and not just for sheer entertainment. On the other side of video games not only serves as a mere entertainment, but can be used as a medium of instruction. Based on studies conducted by Vikranth Bejjanki and his colleagues from the National Academy of Sciences, was the conclusion that playing video games can increase the capabilities of perception, attention, and understanding. This is because video games enhance the learning of the structure and rules of an environment [3].

Based on the study authors want to make video games as media in learning about malware for android based Smartphones. This game is made in order to attract interest and facilitate users in learning and identify the types of malware in existence.

This game made with RPG turn-based genre. The player will play as a superhero fighting against malware. Each display will have malware and attack that varies according to the type of malware. These attacks will be used as learning materials in the form of attacks launched malware to the player in the game. Malware will choose one of the numerous attacks that are owned in accordance with them. But to be able to select the appropriate RAID when the right malware should know the time or the correct pattern. Based on these problems, then the perceptron method applied to the inside game to help malware in pattern recognition, so that it can be produced in accordance with the circumstances of the attack.

2. Material and Methods

This research was conducted based on several other studies that have been done before.

2.1 Video Game

Video games are a means of entertainment are played through a computer or mobile device. In its application of video games can not only be used as a means of entertainment, but can also be used as a medium of instruction. Video games can be a means of learning about the interesting malware as well as easy to understand.

2.2 Turn-Based Strategy of Role Playing Game (TBSRPG)

Turn-based RPG or Turn-Based Strategy of Role Playing Game (TBSRPG) combines the features of TBS with features from ROLE-PLAYING games. The gameplay of this genre is a combination of TBS and RPG. While in this genre have gameplay similar to that of TBS, that is by turns in carrying out the action. When outside of battle this genre has gameplay similar to RPG.

2.3 Artificial Neural Network

Artificial neural network (ANN) is a network of a group of small processing unit modelled based on neural network humans. JST can change its structure to solve problems based on input that flow through the network. JST is a data modeling tool that can be used to model complex relationships between inputs and outputs to find patterns in the data.

The human brain contains millions of nerve cells responsible for processing information. Each cell works like a simple processor. Each of these cells interacting so it supports the ability of the human brain work [4].

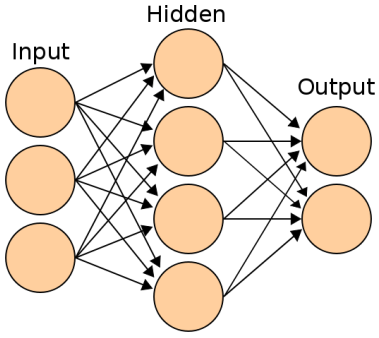


Figure 1. Artificial NeuralNetowork [5]

Perceptron is one of simple neural network models. Perceptron is usually used to classify a certain pattern types are often known by the linear separation. This network has only one layer with weights-weights are connected. This network only accepts input and then offer it directly will be output without having to go through the hidden layer [6].

Basically, the perceptron neural network with one layer has adjustable weights and a value threshold (threshold). The algorithms used by the perceptron rule will arrange free parameters through the learning process. The value of the threshold of the activation function is non-negative. The activation function is made such that it occurs between the restriction of positive and negative areas.

The dividing line between the positive and zero area have inequality:

$$w_1x_1 + w_2x_2 + b > \theta$$

While the dividing line between the negative areas with zero areas have the inequality:

$$w_1x_1 + w_2x_2 + b < -\theta$$

Perceptron network architecture similar to Hebb network architecture. This network consists of several units of inputs plus a bias, and has an output unit. It's just a function of activation is not a binary function (1, 0) or bipolar (1,-1), but has the possibility of values-1, 0 or 1.

2.4 Unity 3D

Unity 3D is a game engine that is multi-platform. Unity can be used to develop a mobile-based games such as android and iPhone as well as based PC or game console like the PS3 and X-BOX. The language used in unity is JavaScript, C #, and Boo.

3. Design System

3.1 The Game Consept

An application made in this research is a learning game with material about malware. This game was made for the android platform. In this game the player will fight a variety of malware. Malware-malware in this game have the look as well as various attacks (movevest). Users can learn about the malware from the appearance and moveset which is owned by the malware. To know the attacks made by the malware in the game, then the user can know what malware attacks when the smartphone or computer owned by the user being attacked in real life. In addition, players played by users also has a moveset, where one or more attacks from this moveset is weakness of the malware malware-malware, depending what was encountered by the player. In this case users can learn how to deal with malware that just when to deal with it in real life.

3.2 Finite State Machine Non Player Chacaracter

3.2.1 Adware

Because this game is a turn-based RPG genre, between players and NPCS will attack in turn. From the picture below when entering a turn the player, then the NPC is idle position or not doing, something until the turn of the player is finished. After the turn of the next player finishes is entering the turn of NPC. When entering the turn of NPC, the NPC will attack the player in accordance with the selected by the NPC attacks when Health Point from the NPC not less than equal to zero. When Health Point of NPC is less than, equal to zero, then the NPC will be dead or destroyed.

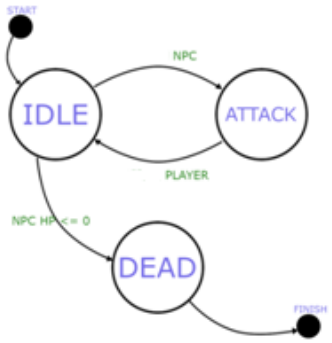


Figure 2. FSM NPC ADWARE

3.2.2 Virus

Computer viruses can reproduce itself when one activates the program that has embedded a virus inside. It is in the scenario described as an attack. Because when the virus has already spread into a system or computer, then attack of the virus will be more harmful or could be said to attack from viruses increase.

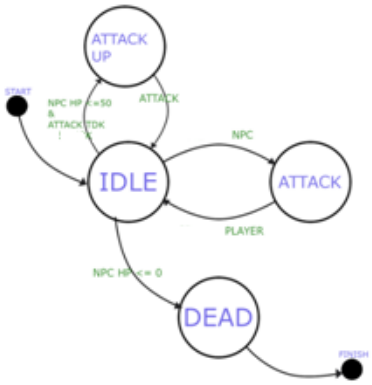


Figure 3. FSM NPC virus

3.2.3 Trojan

A Trojan is a program that has the goal to get the important information contained on an infected computer. In his Trojan tends to be hidden or stealth, undercover manner into programs that are fine. This capability in the scenario described as defense up. The ability of Trojans to disguise is an attempt to protect himself from being known by the user, or can be said to improve the defense from threats that could harm the Trojans.

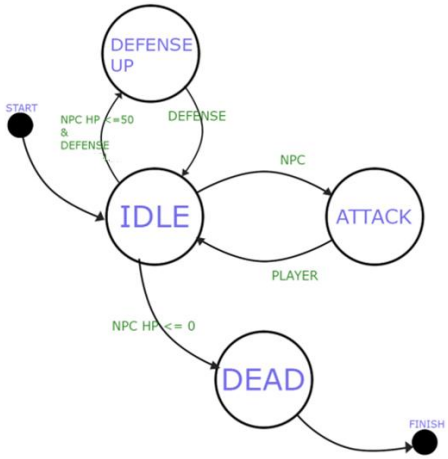


Figure 4. FSM NPC Trojan

3.3 Worm

Just like viruses, worms can multiply itself, but the worm does not require a third party to reproduce itself. The worm can reproduce itself in accordance with his own. In this scenario, it is described with the create clones. A Clone created will help launch an action in the wicked worm.

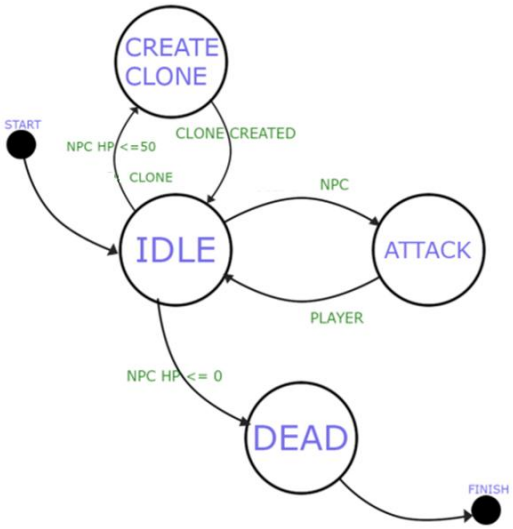


Figure 5. FSM NPC Worm

3.4 Designing of election attacks by NPCS Using Perceptron

In the case of the election of the NPC attack by using a single layer perceptron, because it provides a solution which is simple and that is to classify the type of attack. Perceptron is applied to the NPC consists of two inputs and an output. The resulting output is one of the three categories of the attack belonged to the NPCs, namely weak attack, heavy attack, or special attack. Determine the attack that will be selected by the NPC in the review of two factors or inputs, i.e. the player health and NON-health.

Because basically the perceptron algorithm used to classify two types of class, then needed special treatment so that the method of perceptron can be implemented into this game. To be able to classify three types of attacks using perceptron, then do the application of perceptron with two-stage or two-stage perceptron. Each class is classified with different classes and form some group.

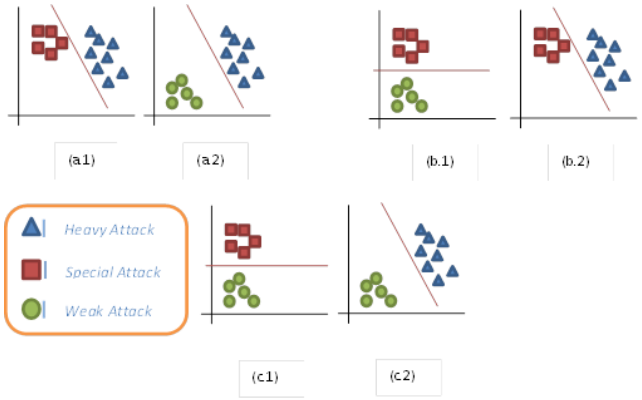


Figure 6. (a.1)Heavy1, (a.2)Heavy2, (b.1)Special1, (b.2)Special2, (c.1)Weak1, (c.2)Weak2.

Heavy1 is grouped between heavy attack with a special attack. Heavy attack value + 1 while the special value-1 attack. Heavy2 is a group between heavy attack with a weak attack. Heavy attack value + 1 while the weak attack worth-1.

Special1 is grouped between special attack with a weak attack. The Special attack is worth + 1 while the weak attack worth-1. Special2 is grouped between special attack with a heavy attack.

The Special attack is worth + 1 while the heavy attack-value 1. Is Weak1 group between weak attack with a special attack. Weak attack value + 1 while the special value-1 attack. Weak2 is a group between weak attack with a heavy attack. Weak attack value + 1 while the heavy attack-value 1. Heavy1 group and Heavy2 represent the classification class Heavy Attack, because the value of Heavy2 and Heavy1 Heavy Attack value + 1.

Special1 and Special2 group represents the classification of a class of Special Attack, Special1 and Special2 because of the value of Special Attack value + 1.

The group represents the Weak2 and classification Weak1 class Weak Attack, because the value of Weak2 and Weak Weak1 Attack value + 1.

After each group gets a value, the next step is to calculate a value of + 1 is obtained by each class. A Class that has a value of + 1 most is the class that is selected.

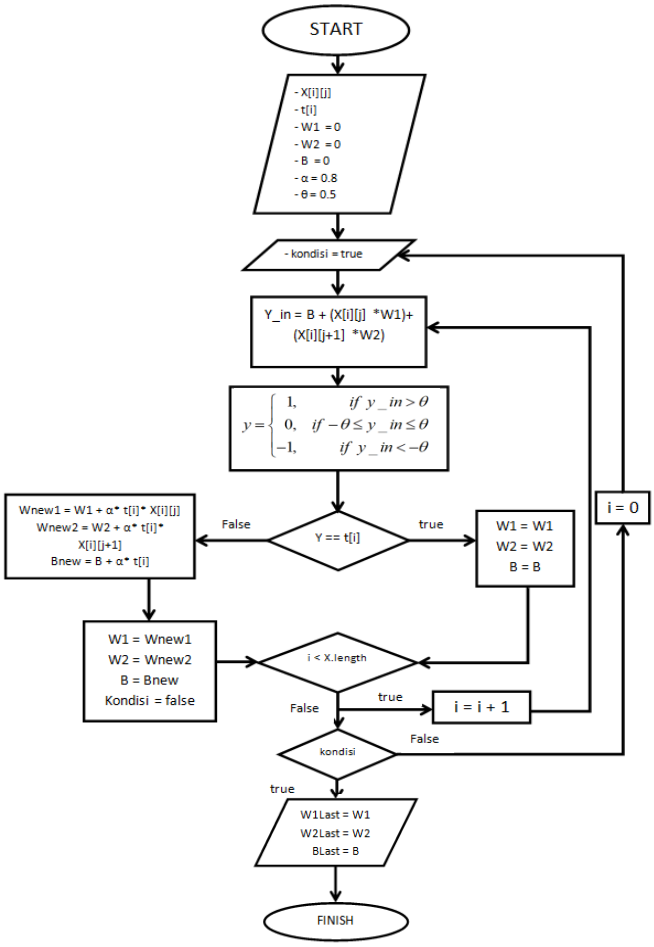


Figure 7. Flowchart Training.

After all the required input data has been set next is calculating the result of activation with the following formula:

$$y\_in = b + \sum_i x_i w_i$$

After getting the value of the activation of the next step is to compare these values with the activation function as follows:

$$y = \begin{cases} 1, & if\ y\_in > \theta \\ 0, & if\ -\theta \le y\_in \le \theta \\ -1, & if\ y\_in < -\theta \end{cases}$$

The next step is to match the value of the function y namely activation with the desired target IE t [i]. If the value of y to the value t [i] have the same value, then no need for changes in the value of the weights and biases. But if the value of y to the value t [i] do not have the same value, then the value changes to do weights and biases. Here is the calculation of the value of the new weights and biases:

$$W_{new1} = W_1 + \alpha^* t[i]^* X[i][j]$$
$$W_{new2} = W_2 + \alpha^* t[i]^* X[i][j+1]$$
$$B_{new} = B + \alpha^* t[i]$$

After the tally is completed the next step is to continue the process of training to the next training data when there are, using new and old that the weights have been processed. The calculation process is done for all the existing

training data. If all of the data had been training might not trained that where the amount of data training represented by x.length, then it counts as one epoch. After the completion of one epoch, the next step is to check the condition, if an error occurs during the process of training, i.e. the value of y is not equal to the value t[i]. When in one epoch training still happens then the error condition is false and need to do a training process again from scratch using the values of the weights and biases of the last obtainable. If an epoch is not an error, then the condition will be true and process training stopped. The purpose of this training is the process of looking for the weights and biases which weights and biases that are able to use to classify class attack that will be selected by the NPC. This training process will be carried out to all the group classification, so that will be generated a new weighting 12 and 6 new bias. Then do the classification.

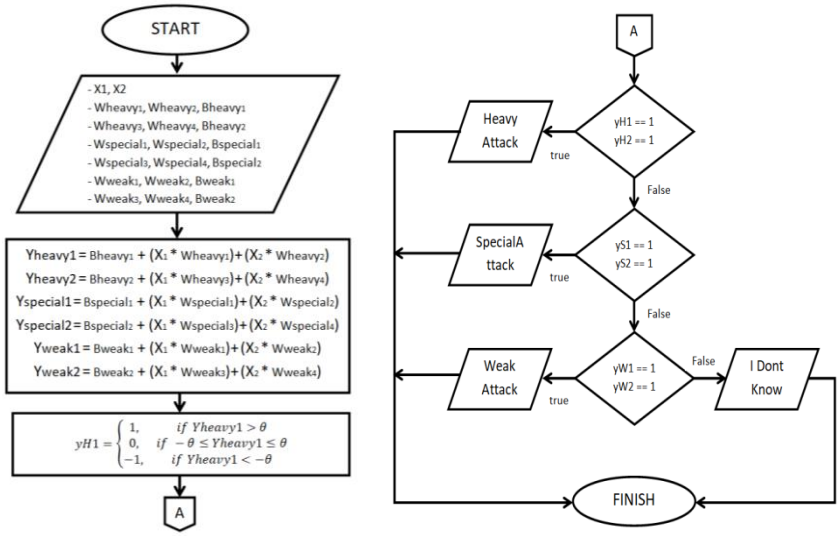


Figure 8. Classification process flowchart in Perceptron

4. Result and Discussion

This testing to see how the workings of the Perceptron algorithm, is already running correctly or not. It was used in testing the test data has been prepared.
The following is table1 shows off the results process training in each group.

Table 1. The result of the process of training.

GROUP	Weighted 1 Final	Weighted 2 Final	BIAS Final	EPOCH
Heavy1	-19.2	28	11.2	69 epochs
Heavy2	-20	22.4	20	80 epochs
Special1	-1.6	9.6	-21.6	32 epochs
Special2	20	-22.4	-20	80 epochs
Weak1	19.2	-28	-11.2	69 epochs
Weak2	1.6	-9.6	21.6	32 epochs

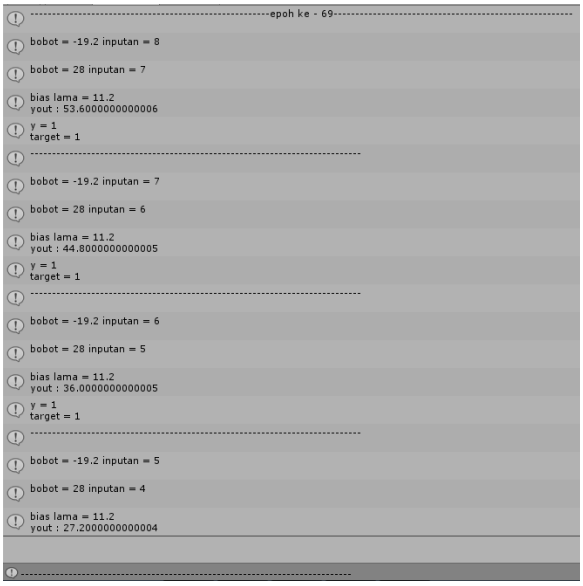
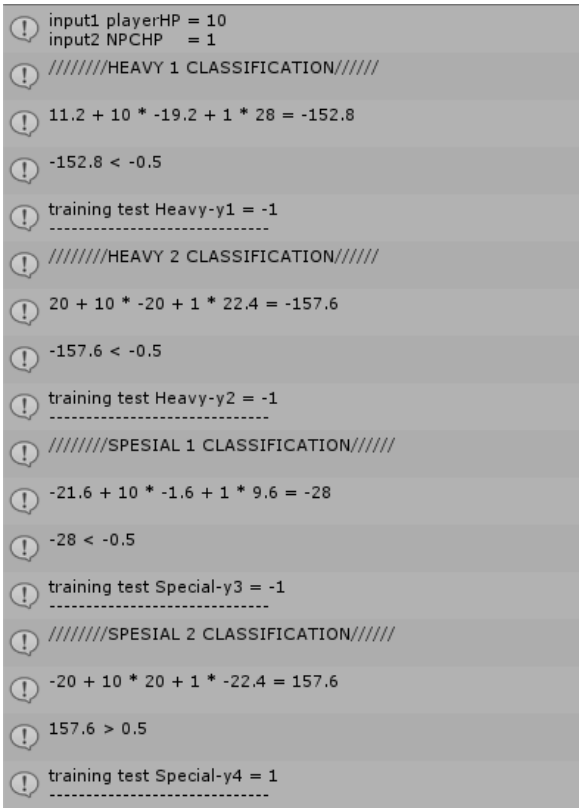


Figure 9. Perceptron Training Results

In Figure 9 and figure 10 describes that algorithms Perceptron was able to complete training on group heavy1 and training completed in the epoch of 69. The classification Heavy 1 = -152,8, Heavy 2 =-157,6, Spesial 1 =-28, Spesial 2= 157,6 , weak 1 =152,8, weak 2 =28. The final results weak attack.



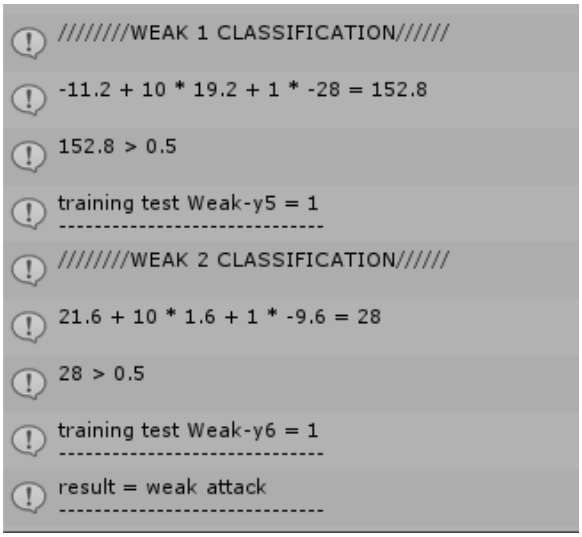


Figure 10. Classification Results

5. Conclussion

Perceptron algorithm can be implemented into the game application learning this malware. With this, the perceptron algorithm NPC can choose attacks that will be waged to the player based on input HP owned by NPC and a player. NPCS are able to choose one of three options for existing attack, i.e. heavy attack, special attack, and weak attack.

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