

The Estimation of Cartoons Effect on Children's Behavior Based on Exaggeration Action by Using Neural Network

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Abstract—Exaggeration is one of 12 basic principles of animation. The aim of exaggeration is to increase audience's significance or attention. Unfortunately, exaggeration action can be in the form of violence scenes. So, it may affect the child's psychology and behavior. This research aimed to make prediction system of cartoons which could have negative impact on children by using neural network method. The input parameters of our neural network were scenes duration, duration of exaggeration action, total duration of actions, and quantitative of exaggeration action. The output parameter of our neural network system are G, PG, PSG and R . These labels are MPPA rating value. Our neural network prediction system used three scenarios of parameters input set with back propagation method, the value of epoch: 0, number of epoch: 500, learning rate: 0.3 and momentum: 0.2. These scenarios were qualitative, quantitative and the combination of quantitative-quantitative parameters input set. The accuracy of our prediction system using quantitative parameters input set was 76%, second scenario got 63% accuracy rate and third scenario got 76% accuracy rate. This result showed that the exaggeration scene in an animation film is able to influence the behavior of children despite the scene have short duration.

Keywords— cartoons; exaggeration; neural network; backpropagation; MPAA

I. INTRODUCTION

Nowadays, cartoons are the most favorite entertainment watched by children. The development of media makes children easier to watch their favorite cartoons. Their time now replaced by watching cartoon for hours at home as it has been studied by [1]. Cartoons visualization was made by using attractive characters, light color in order to attract children's desire to watch it. The other way to make cartoons more attractive is by using animation principal. Exaggeration is one of the animation principle. This kind of animation principle is using to make cartoons more real and entertaining.

In the other hand, there are lots of cartoons which does not entertain the children very well because some scenes contained some violences. This thing will give impact on

children's psychology and behavior. References [1] told that without parental supervision when children watching cartoons make children don't know where scenes should and shouldn't be imitated. Several studies had been conducted to estimated how much cartoons influence children psychology [7]. Based on the study [2] reported that viewing cartoons' program containing violence scenes increase children's aggressiveness, desensitize children to understand the feeling of others and blur children's ability to distinguish the real life. The study [2] [3] using survey of primary data and secondary data.

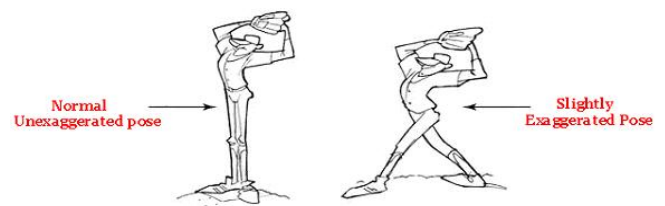


Fig. 1. Normal pose and exaggeration pose example



Fig. 2. Violence Action on Spongebob

It is uneasy process and needs a long time to conduct survey method to estimate the influence of cartoons on children's behavior. Therefore, some parameters on cartoons become alternative method in order to estimate its influence. References [3] used animation principle as parameter to predict how much audience's attention on cartoons. The study [4] predicted the successful box office by using neural network. This study used some inputs parameters, such as MPPA rating, competition, start values, genre, technical effects, sequel, number of screens. These input values are given by other people and not a content of the film.

Neural network is a method of learning pattern based on human neural network system [5]. Neural network requires learning and testing process. There are some components used in neural network, such as input layer, hidden layer, output layer and initial weight[11]. Neural network consists of a collection of nodes (neurons) and relationships. There are three types of nodes (neurons). They are the input, hidden and output. Every relationship connected to two nodes with a certain weight and also a direction that shows the flow of data in the process. Input node is the first layer in the neural network. Each input node represents an input parameter such as age, gender or income. Hidden node is a node that is located at the center. Hidden node receives input from input node on the first layer or from hidden nodes in the previous layer. Hidden node combines all inputs based on the weight of the connected relation, do calculations and provide outputs to the next layer. Output node represents the predicted attribute. The output of this node is usually a floating value between 0 and 1 [5]. Neural networks were first developed is a simple neural network[6]. One popular type of neural network is a backpropagation with supervised learning method. Weka application is very useful to implement backpropagation. According to [7], the method is quite successful for the case of data input and output do not have quite convincing relationship. Backpropagation also called multilayer neural network [8,9].

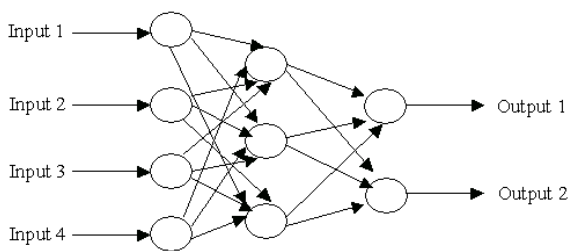


Fig. 3. Backpropagation neural network

This study used neural network with exaggeration as parameter. To estimate the influence of cartoons on children's behavior and psychology used neural network because of this method require a learning process or training process. In addition, neural network learning method require a research process to analyze training data and then go to the next process, such as designing neural network process, choosing architecture, network initialization, training and testing the network. The result of this method was the training data could

appropriate for using on learning phase and the label of this learning phase is the justification from MPPA rating value[10]. In conclusion, this study showed the influence of cartoon to children's behavior and psychology by using neural network. The assumption used the exaggeration scene on cartoon as the animation principle.

II. METHODOLOGY

A. Determination of Input Parameters value of Neural Network for quantitative scenario

Quantitative scenario means that the amount of exaggeration scenes have an influence on children's behavior.

- 1) Scene duration: the number of images per second in unit of frames
- 2) Total scene number: the number of scenes in animation
- 3) Total duration of action: the length of cartoons scenes include aggression action by references of camera movement on cartoons
- 4) Normal scene duration: the length of cartoon scene which does not contain exaggeration action
- 5) Normal scene number: the number of scenes which does not contain exaggeration action
- 6) Quantitative of exaggeration action: the number of scenes containing exaggeration action
- 7) Duration of exaggeration action: the number of scenes containing physical exaggeration in set number of frame

The classification of physical exaggeration aggression action (point 2,3,4) according Buss and Perry, such as:

- Direct physical active action such as stabbing, beating and shooting
- Direct physical passive action such as demonstration, silent and strike
- Indirect physical active action such as installing mines, hired killers and witchcraft
- Indirect physical passive action such as refuse to do some task, indifference

B. Determination of Input Parameters value of Neural Network for qualitative scenario

Qualitative scenario means that the frequency of exaggeration scenes have an influence on children's behavior

- 1) Scenes duration: the number of images per second in unit of frames
- 2) Total duration of action: the length of cartoons scenes include aggression action by references of camera movement on cartoons
- 3) Percentage of normal scene duration: the length of cartoon scene not containing exaggeration action compared to total scene number
- 4) Percentage of normal scene number: the number of scenes not containing exaggeration action compared to total duration of action

5) Percentage of quantitative of exaggeration action: the number of scenes containing exaggeration action compared to total scene number

6) Percentage of duration of exaggeration action: the number of scenes containing physical exaggeration in set number of frame compared to total duration of action

C. Determine of Input Parameters of Neural Network for combination of quantitative-qualitative scenario

1) Scene duration: the number of images per second in unit of frames

2) Total scene number: the number of scene in animation

3) Total duration of action: the length of cartoons scenes include aggression action by references of camera movement on cartoons

4) Normal scene duration: the length of cartoon scene not containing exaggeration action

5) Normal scene number: the number of scenes not containing exaggeration action

6) Quantitative of exaggeration action: the number of scenes containing exaggeration action

7) Duration of exaggeration action: the number of scenes containing physical exaggeration in set number of frame

8) Percentage of normal scene duration: the length of cartoon scene not containing exaggeration action compared to total scene number

9) Percentage of normal scene number: the number of scenes not containing exaggeration action compared to total duration of action

10) Percentage of quantitative of exaggeration action: the number of scenes containing exaggeration action compared to total scene number

11) Percentage of duration of exaggeration action: the number of scenes containing physical exaggeration in set number of frame compared to total duration of action

D. Determination of Film Label

Reference [10] was used to determine the label of animation film. Based on reference [10], there were 4 cartoons category for children, such as:

- G means general audience. Cartoons in this category is worth watched by public. Children between 5-10 years old could watch this kind of cartoon without any condition
- PG means parental guidance suggested. Cartoons in this category could watched by children with suggestion there are guidelines or supervision parents. Cartoons in this category may contain some content that could be considered not suitable watched by children based on parent's point of view. For example, there are not polite words, inappropriate action, a number of violence and information about drugs.

- PSG means parental strongly cautioned. Cartoons in this category require children accompanied by their parents while watching because there are may contain adult elements in any action.

- R means restricted. Cartoon in this category require parents to check more detail why this cartoons not suitable for watched because this kind of cartoons may contain some scenes of sexual activity, criminal and so on.

III. DETAIL OF SET DATA COLLECTION AND IMPLEMENTATION

A. Data Experiment

This study used 144 cartoons episodes with various duration between 1 minutes until 19 minutes with category labelling from expert. The cartoons downloaded from www.youtube.com.

TABLE I. CARTOONS COLLECTION

| No | Cartoons Title | Duration | Label | Quantitative |
|----|--------------------|---------------|-------|--------------|
| 1 | BoboiBoy | 10-14 minutes | PG | 14 episodes |
| 2 | Doraemon | 6-14 minutes | PG | 14 episodes |
| 3 | Happy Tree Friends | 1-5 minutes | R | 25 episodes |
| 4 | Larva | 1-2 minutes | R | 20 episodes |
| 5 | Ninja Hatori | 5-13 minutes | PG | 14 episodes |
| 6 | Shinchan | 5-12 minutes | PG | 29 episodes |
| 7 | Tom and Jerry | 2-9 minutes | PG | 9 episodes |
| 8 | Upin Ipin | 16-21 minutes | PG | 19 episodes |

B. Parameter Values Input for Prediction System

The parameter information for prediction system were the number of normal action, the total duration of normal action, the number of directly physical active action, the number of indirectly physical active action, the number of directly physical passive action, the number of indirectly physical passive action and the total duration of every action. Verbal or text was not used for parameter because the language in every scene were not the same and not all of children can understand.

Films were formatted into images by using software Adobe premiere. The value was got by input the parameters manually by checking the image per image. All of the values were assigned as quantitative scenario input for parameters value. After that, the percentage value was calculated to get the qualitative scenario input parameters value.

C. Experimental Scenarios

This research used weka application with backpropagation method,, by using 4 hidden layers, learning rate = 0.3, momentum = 0.2 and the node activation function used

sigmoid function. There were three experiment scenarios used on processing obtained data such as:

There were several experiment scenarios used on processing obtained data such as:

- Scenario of quantitative value

The data used was primary data from experiment that were the total duration of normal action, the number of normal action, the number of directly physical active action, the number of indirectly physical active action, the number of directly physical passive action, the number of indirectly physical passive action and the total duration of every action. This scenario intended to see whether the quantity of actions on cartoons have influence on children's behavior or not.

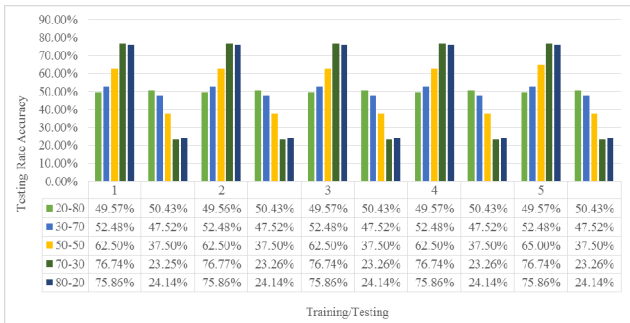


Fig. 4. The accuracy of scenario of quantitative value

This scenario showed the comparison of training data with testing data were 20:80 and 30:70. By five times of experiments, NN's accuracy was around 50%. By increasing training data and testing data became 50:50, NN's accuracy was around 60%. Several experiments had 38% but the result can be ignored because the final result of NN was configuration of NN's weight that used to predict the other data. So that the highest accuracy of NN's weight was used as the final result. The ratio of training data and testing data was 70:30. The result increased to 76,744% and these result didn't change when the ration increased to 80:20. In conclusion, the result of NN from every action by using these parameters was prediction rate of 76,744%. This result indicated that the quantity of exaggeration action influenced on children's behavior.

- Scenario of qualitative value

The data used was secondary data from experiment related to the percentage of total duration normal action, the duration of normal action, the number of directly physical active action, the number of indirectly physical active action, the number of directly physical passive action, the number of indirectly physical passive action and the total duration of every action with the total duration every action on cartoons. The aim of this scenario was to see whether quality of actions on cartoons have influence on children's behavior or not.

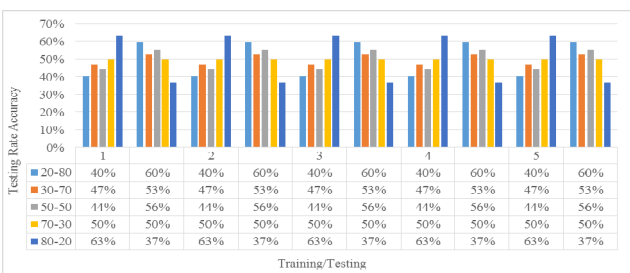


Fig. 5. The accuracy of scenario of qualitative value

This scenario showed the comparison of training data with testing data are 20:80, 30:70, 50:50, and 70:30. By five times of experiments, NN's accuracy was around 40-50%. The ratio of training data and testing data was 80:20. The result accuracy of NN was around 63%.

In conclusion, the result of NN from every action by using these parameters was prediction rate of 63%. This result indicated that the frequency of exaggeration action sufficiently influence on children's behavior.

- Scenario of qualitative-quantitative

The data used was combination of primary data and secondary data from experiment. The aim of this scenario is to see whether quantitative and qualitative of actions on cartoons have influence or haven't influenced on children's behavior or not

This scenario showed the comparison of training data with testing data were 20:80, 30:70 and 50:50. By five times of experiments, NN's accuracy was around 50%. By increasing training data and testing data become 70:30, NN's accuracy was around 65%. The ratio of training data and testing data was 80:20. The highest NN's accuracy was around 76,667%.

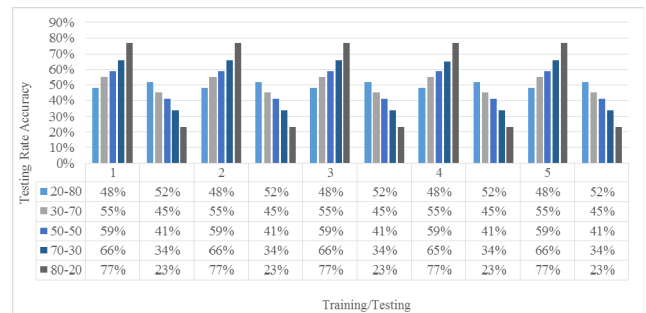


Fig. 6. The accuracy of scenario of qualitative-quantitative

This scenario showed the comparison of training data with testing data were 20:80, 30:70 and 50:50. By five times of experiments, NN's accuracy was around 50%. By increasing training data and testing data become 70:30, NN's accuracy was around 65%. The ratio of training data and testing data was 80:20. The highest NN's accuracy was around 76,667%.

In conclusion, the result of scenario of quantitative had pattern quite similar with scenario of qualitative-quantitative. The highest NN's accuracy of both scenarios was relative same with 76%. This result indicated that the quantity of exaggeration action was enough to influence on children behavior.

IV. CONCLUSION

This study has been conducted indicated that exaggeration action on cartoons influence children's psychology and behavior based on neural network prediction with accuracy rate around 76% by using quantitative aspects. Influence on children's psychology was reflected by cartoons

categorization based on MPAA ratings from G, PG, PSG and R. The result showed that the exaggeration scene in an animation film is able to influence the behavior of children despite the scene have short duration

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