HUMANLIKE FACE ANIMATION FOR ANIMAL CHARACTER USING MOTION CAPTURE BASED LINEAR REGRESSION

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ABCTRACT

Motion capture data utilization of human for animation animal characters is a challenge for animators, the same context with animation animal characters facial expressions are an important factor in establishing the atmosphere of the film when the story conveyed to the audience .

In current study focused on data processing motion capture of human actors face to face then integrated on the characteristics of the animal which has been modified to resemble a human face that has principle of mouth, nose , eyes and eyebrows on the forehead as well as humans can express (humanlike). With reference to the principle of Exaggeration motion capture animation, motion capture data is modified using transformation matrix to obtain the ideal position Exaggeration, the estimated range of values of variables obtained from the study can be used as a reference to the graphic editor and regression modeling to predict the dependent variable from different input transformation matrix motion capture data.

From the test results and regression analysis found the average standard error on .142 Upper Lip, Lower Lip 0.135, 0.112 L Corner Mouth, Mouth Corner 0.129 R, L and R Eye Brow Eye Brow 0.127 0.105 and regression diagram shows a positive correlation.

Keywords: animation, humanlike, motion capture, regression analysis

I. INTRODUCTION

Currently, a character in the animation film story is very diverse, in addition to general human characters are also many animal characters or even aliens, where the characters are humanized animals or aliens to be more humane and easier to understand and to be understood characteristics in bringing the story animation film .

Animation characters, especially character of animals would have criteria for being humane, such as having a face that can express such as human, have a mouth and eyes like human and adjustment morphology of native animals more humane towards animals.

Characteristics bones and vertebrate morphology of varying trigger its own problems for the animators, motion capture data utilization of human actors with models of diverse animal characters is a challenge for animators, as well as facial expressions of animated characters and animals is more value in the lives of communicate contents from film convey to the audience .

Character vertebrates used:

- Classification of mammals are represented hippopotamus
- Classification of pisces are represented fish
- Classification of animals are represented goose
- Classification of amphibious are represented frog
- Classification of reptile are represented crocodile

II. DISCUSSION

Movement data of the actor's face captured by the kinect camera and processed with software that is integrated with shape key and facial bones in a Blender 3D character animation. facial data movements tested on each character animation, this test is obtained from a number of data on the exact shape key as the ground truth face with appropriate Exaggeration and continues to find the range of values of variables that are ideal for facial animation Exaggeration.

Figure. 1. describes the use of a template by using a point shape key model and figure 2 illustrated the princip of animation exaggeration.

One of the principles of animation is Exaggeration, Exaggeration is an attempt to dramatize an animation in the form of engineering drawings that are hyperbolic. Created to showcase the extremities of certain expressions, and comedic typically made [8].

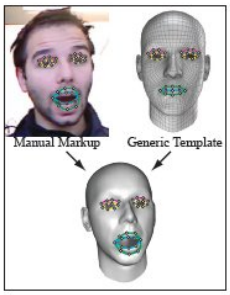

Figure 1. image reconstruction motion capture data to the model templates (*realtime performance based facial animation, ACM SIGGRAPH 2011*)

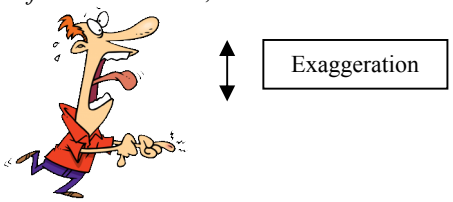

Figure 2 Exaggeration scene in the animation film *(www.staceyreid.com)*

Figure 3 show that modeling process in an animated character that will be used in this study starts from the preparation of drawings and sketches of animal models of characters that will be used as a reference for modeling. The results of sketch characters changed in such a way that the characters face similar character a human face without reducing the basic shape of the original animal character.

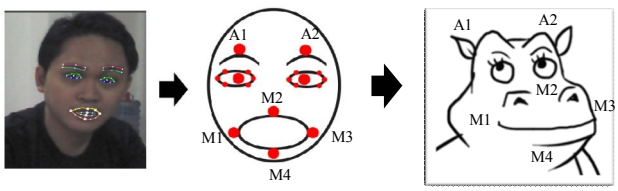

Figure 3. key points in the area of human actors shape

The flow of character modeling, animation creation process, deformation correction Exaggeration movement and regression analysis were used in this study is described in the flow chart as illustrated in Figure 4. When the deformation correction refers to the ground truth is determined through direct observation of the deformation shape Exaggeration key experience in the category of normal deformation.

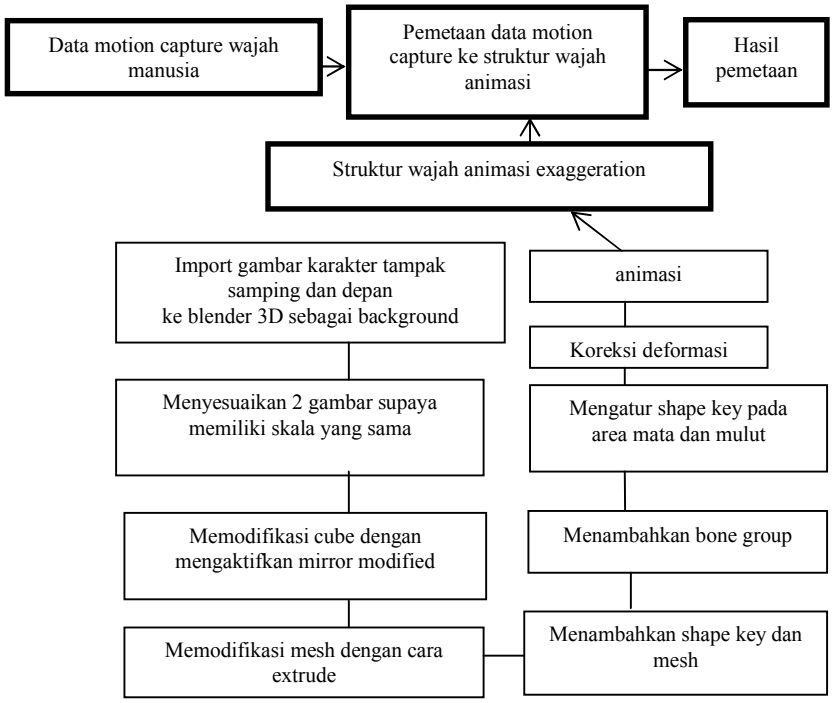

Figure 4. chart correction modeling face deformation in character animation and motion capture

Data test from the motion capture actor who demonstrate the expression of angry, happy, sad, surprise, disgust, fear, and sneer.

Figure 5. Reference facial expression animation test

The linear regression equation obtained from the motion capture data processing, the x-axis at one point the armature is made in the A-J equation, the y-axis is made in the B-K equation and the z axis in the C-L equation. The linear regression equation on a frog character depicted sequentially in Figure 6 to Figure 11 starts from Upper Lip, Lip lower, L mouth corner, R mouth corner, L eye brow and R eye brow.

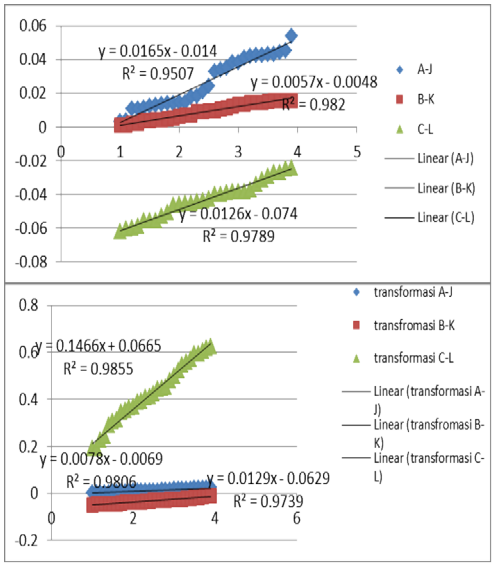

Figure 6. Upper lip frog character

Figure 7. Lip Lower frog character

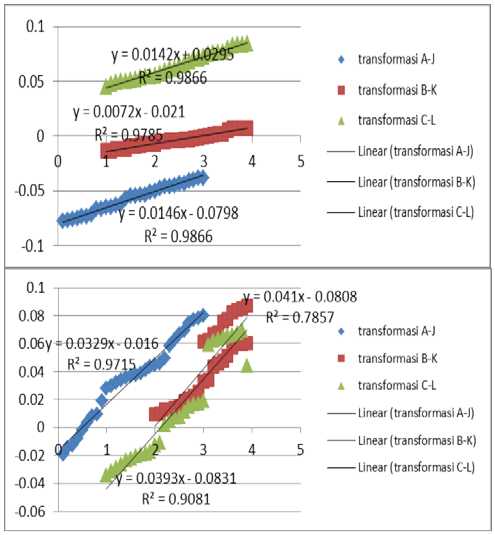

Figure 8. L Mouth corner frog character

Figure 9. R mouth corner frog character

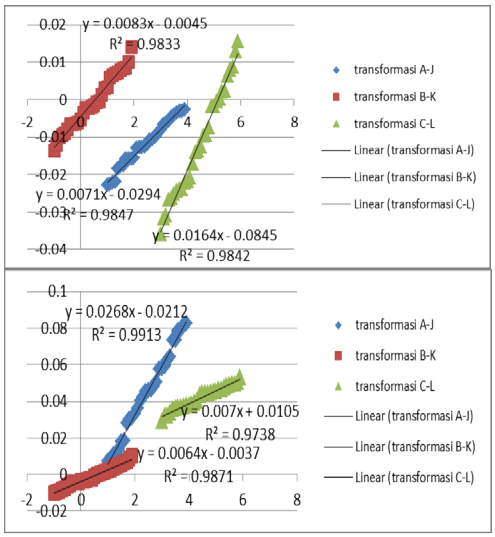

Figure 10. L eye brow frog character

Figure 11. R eye brow frog character

The linear regression equation on the hippopotamus character depicted sequentially in Figure 12 to figure 17 starts from Upper Lip, Lip lower, L mouth corner, R mouth corner, L eye brow and R eye brow.

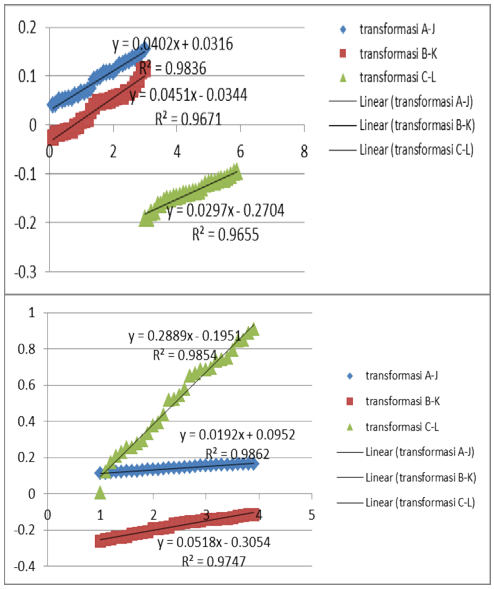

Figure 12. Upper Lip hippopotamus character

Figure 13. Lip lower hippopotamus character

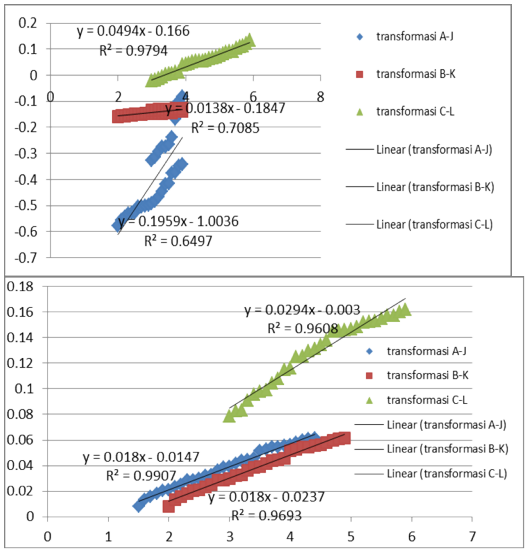

Figure 14. L mouth corner hippopotamus character

Figure 15. R mouth corner hippopotamus character

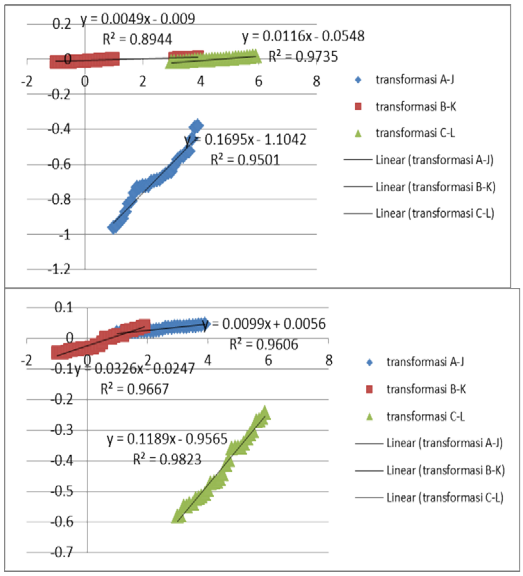

Figure 16. L eye brow hippopotamus character

Figure 17 R eye brow hippopotamus character

The linear regression equation on the goose character depicted in the image sequence of 18 to 23 images starting from Upper lip, lower lip, L mouth corner, R mouth corner R, L eye brow and R eye brow.

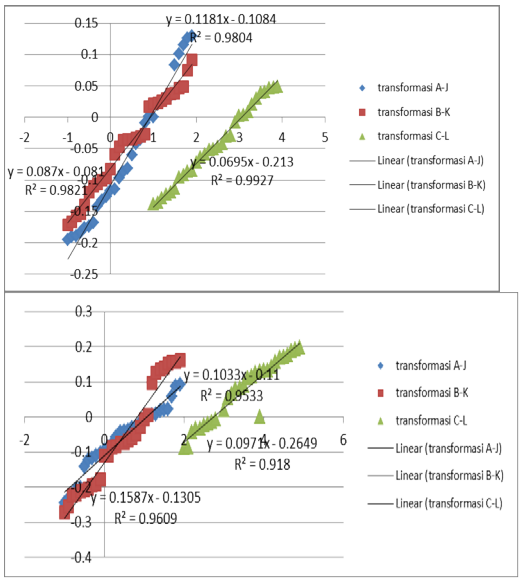

Figure 18. Lip Upper goose character

Figure 19. Lip lower goose character

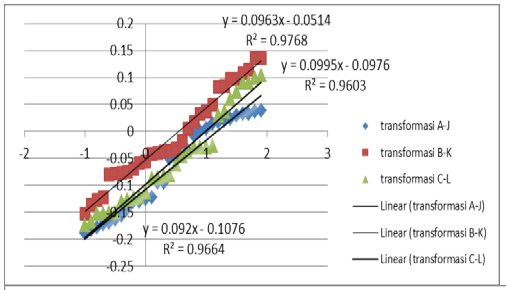

Figure 20. L mouth corner goose character

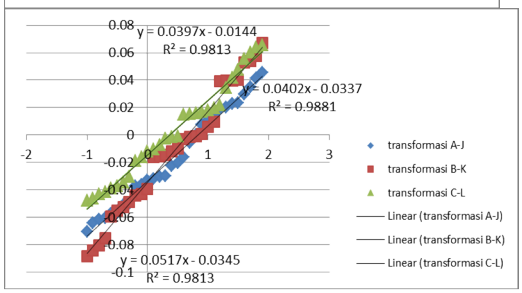

Figure 21. R mouth corner goose character

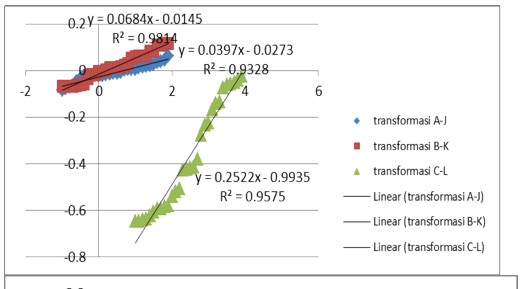

Figure 22. L eye brow goose character

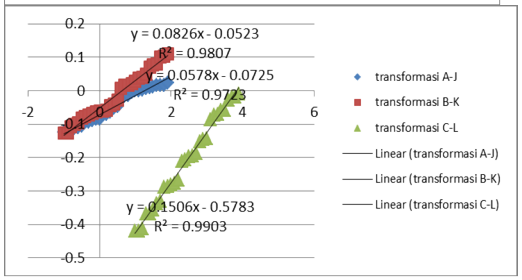

Figure 23. R eye brow goose character

The linear regression equation on the character of the fish depicted sequentially in Figure 24 to 29 images starting from Upper lip, lower lip, L mouth corner, R mouth corner , L eye brow and R eye brow.

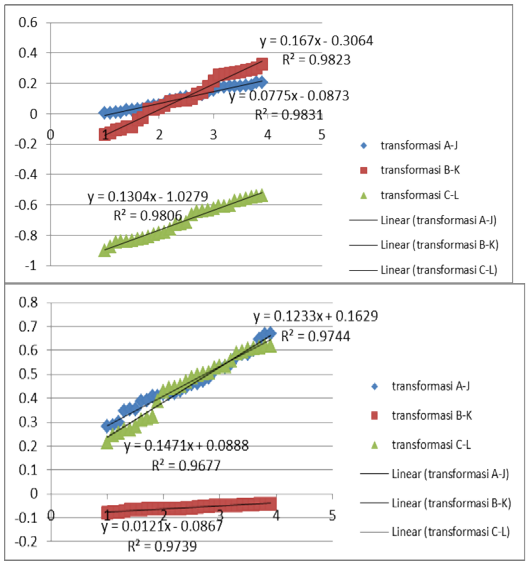

Figure 24. Lip Upper fish character

Figure 25. Lip Lower fish character

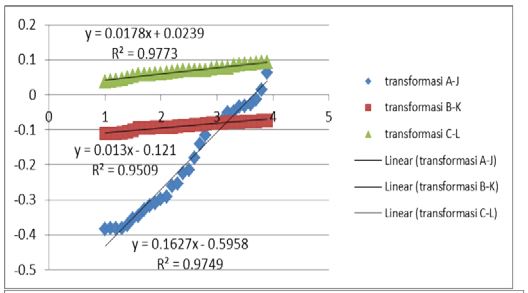

Figure 26. L mouth corner fish character

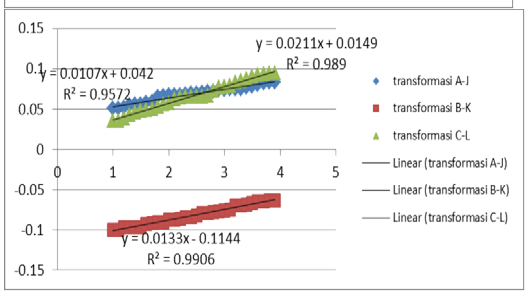

Figure 27. R mouth corner fish character

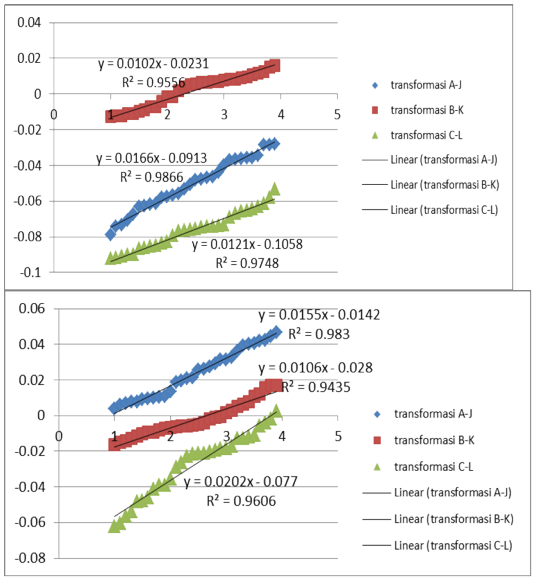

Figure 28. L eye brow fish character

Figure 29. R eye brow fish character

The linear regression equation described in a crocodile character sequence in Figure 30 to 35 images starting from Upper Lip, Lip lower, L mouth corner, R mouth corner R, L eye brow and R eye brow.

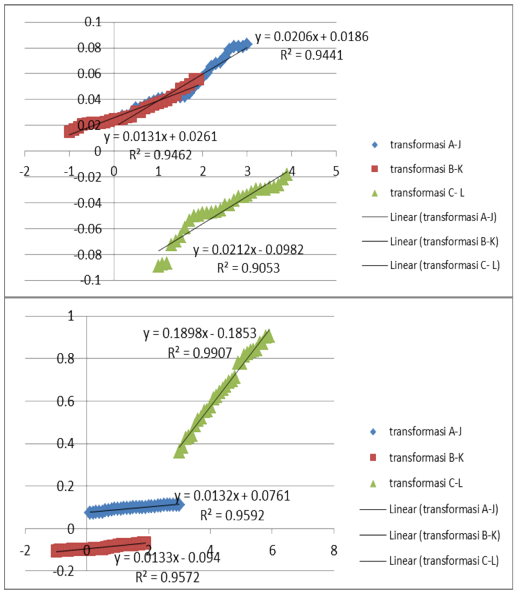

Figure 30. Lip upper crocodile character

Figure 31. Lip lower crocodile character

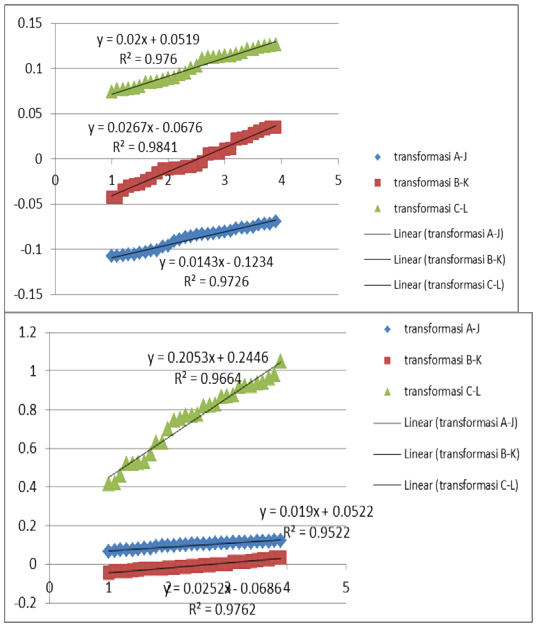

Figure 32. L mouth corner crocodile character

Figure 33. R mouth corner crocodile character

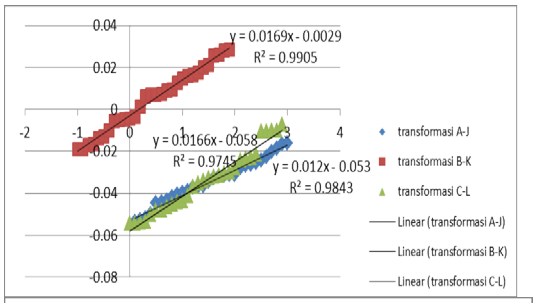

Figure 34. L eye brow crocodile character

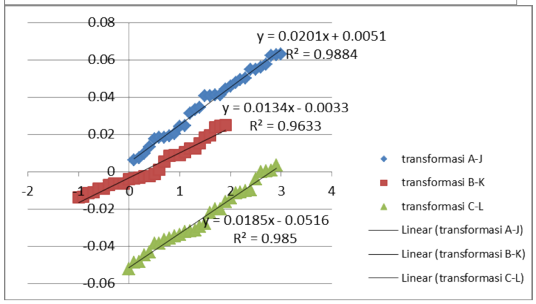

Figure 35 R eye brow crocodile character

Here is the value of a variable at frog character for ideal Exaggeration is as follows:

- upper lip, the scale on the x-axis range of 1.6 - 2.7, the scale on the y-axis range of 1.6 - 2.7, z-axis scale range of 1.6 - 2.7.
- lower lip, the scale on the x-axis range of 2.1 - 3.2, the scale on the y-axis range of 2.1 - 3.2, z-axis scale range of 2.1 - 3.2.
- L mouth corner, the scale on the x-axis range of 1.7 - 2.6, the scale on the y-axis range of 2.6 - 3.5, z-axis scale range of 2.6 - 3.5.
- R mouth corner, the scale on the x-axis range of 1.3 - 2.5, the scale on the y-axis range of 3.2 - 4.4, z-axis scale range of 2.2 - 3.4.
- L eye brow, the scale on the x-axis range of 2.2 - 3.3, the scale on the y-axis range of 0.2 - 1.3, z-axis scale range of 4.2 - 5.3.

• R eye brow, the scale on the x-axis range of 2.3 - 3.4, the scale on the y-axis range of 0.3 - 1.4, z-axis scale range of 4.3 - 5.4.

Here is the value of a variable at hippopotamus character for ideal Exaggeration is as follows:

- upper lip, the scale on the x-axis range of 1.4 - 2.4, the scale on the y-axis range of 1.4 - 2.4, z-axis scale range of 4.3 - 5.3.
- lower lip, the scale on the x-axis range of 2.4 - 3.3, the scale on the y-axis range of 2.4 - 3.3, z-axis scale range of 2.4 - 3.3.
- L mouth corner, the scale on the x-axis range of 3.1 - 4.2, the scale on the y-axis range of 3.1 - 4.2, z-axis scale range of 4.1 - 5.2.
- R mouth corner, the scale on the x-axis range of 2.5 - 3.7, the scale on the y-axis range of 3.0 - 4.2, z-axis scale range of 4.0 - 5.2.
- L eye brow, the scale on the x-axis range of 2.0 - 3.2, the scale on the y-axis range of 0.0 - 1.2, z-axis scale range of 4.0 - 5.2.
- R eye brow, the scale on the x-axis range of 2.0 - 3.3, the scale on the y-axis range of 0.0 - 1.3, z-axis scale range of 4.0 - 5.3.

Here is the value of a variable at goose character for ideal Exaggeration is as follows:

- upper lip, the scale on the x-axis range of 1.0 - 1.5, the scale on the y-axis range of 1.0 - 1.5, z-axis scale range of 3.0 - 3.5.
- lower lip, the scale on the x-axis range of 0.9 - 1.5, the scale on the y-axis range of 0.9 - 1.5, z-axis scale range of 3.9 - 4.5.
- L mouth corner, the scale on the x-axis range of 0.6 - 1.3, the scale on the y-axis range of 0.6 - 1.3, z-axis scale range of 0.6 - 1.3.
- R mouth corner, the scale on the x-axis range of 0.7 - 1.3, the scale on the y-axis range of 0.7 - 1.3, z-axis scale range of 0.7 - 1.3.
- L eye brow, the scale on the x-axis range of 0.8 - 1.2, the scale on the y-axis range of 0.8 - 1.2, z-axis scale range of 2.8 - 3.2.
- R eye brow, the scale on the x-axis range of 0.7 - 1.1, the scale on the y-axis range of 0.7 - 1.1, z-axis scale range of 2.7 - 3.1.

Here is the value of a variable at fish character for ideal Exaggeration is as follows:

- upper lip, the scale on the x-axis range of 2.6 - 3.4, the scale on the y-axis range of 2.6 - 3.4, z-axis scale range of 2.6 - 3.4.
- lower lip, the scale on the x-axis range of 2.3 - 3.3, the scale on the y-axis range of 2.3 - 3.3, z-axis scale range of 2.3 - 3.3.
- L mouth corner, the scale on the x-axis range of 2.5 - 3.4, the scale on the y-axis range of 2.5 - 3.4, z-axis scale range of 2.5 - 3.4.
- R mouth corner, the x-axis scale in the range 2.3 - 3.1, the scale on the y-axis range of 2.3 - 3.1, z-axis scale range of 2.3 - 3.1.
- L eye brow, the scale on the x-axis range of 2.4 - 3.4, the scale on the y-axis range of 2.4 - 3.4, z-axis scale range of 2.4 - 3.4.
- R eye brow, the scale on the x-axis range of 2.3 - 3.2, the scale on the y-axis range of 2.3 - 3.2, z-axis scale range of 2.3 - 3.2.

Here is the value of a variable at crocodile character for ideal Exaggeration is as follows:

- upper lip, the scale on the x-axis range of 1.3 - 2.3, the scale on the y-axis range of 0.2 - 1.2, z-axis scale range of 2.2 - 3.2.
- lower lip, the scale on the x-axis range of 1.3 - 2.4, the scale on the y-axis range of 0.2 - 1.3, z-axis scale range of 4.2 - 5.3.
- L mouth corner, the scale on the x-axis range of 2.7 - 3.4, the scale on the y-axis range of 2.7 - 3.4, z-axis scale range of 2.7 - 3.4.
- R mouth corner, the scale on the x-axis range of 2.0 - 2.9, the scale on the y-axis range of 2.0 - 2.9, z-axis scale range of 2.0 - 3.9.

- L eye brow, the scale on the x-axis range of 1.5 - 2.4, the scale on the y-axis range of 0.4 - 1.3, z-axis scale range of 1.4 - 2.3.
- R eye brow, the scale on the x-axis range of 1.2 - 2.3, the scale on the y-axis range of 0.1 - 1.2, z-axis scale range of 1.1 - 2.2.

III. CONCLUSSION

Based on testing of two actors in motion capture animated animal characters obtained an average standard error on the Upper Lip 0.142, 0.135 Lower Lip, Mouth Corner 0.112 L, R Mouth Corner 0.129, 0.127 L and R Eye Brow Eye Brow 0,105. From the results of the overall test animal character animation using motion capture two different actors, regression diagram shows a positive correlation.

For further research can be continued to impose limits on the movement area of animal shape key characters over the limit so as not to deform the shape key should be. Adding more complex armature on the animated character's face to obtain the results of performance comparisons between the armature and the application of key shapes 6 nodes with more complex. And with the use of regression models tested the results of this study on the classification of invertebrate animal character or other characters.

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BIOGRAPHY

Didit Prasetyo, SMA Negeri 2 Kediri graduated in 2004, went on to study at the Institute of Technology (ITS) Department of Industrial Product Design Visual Communication Design Program and graduated in 2009, In 2010 the author went on to study Master of Multimedia Intelligent Networking expertise concentration Game Technology in Electrical Engineering Department of ITS. In addition to lectures and actively teaching, the author

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