CHAPTER 6

TEXTURE ANIMATION

6.1. INTRODUCTION

Animation is the creating of a timed sequence or series of graphic images or frames together to give the appearance of continuous movement. A collection of static images joined together and shown consecutively so that they appear to move. Moving diagrams or cartoons that are made up of a sequence of images displayed one after the other. Animations are created for entertainment, ad banners as well as instructional sequences. Everything in a scene is represented by numeric values and, as such, animation is also the process of changing these values-position, color, or any other property-over time.

Timing is very important in animation. Timing affects weight: Light objects move quickly and heavier objects move slower. Timing completely changes the interpretation of the motion. Because the timing is critical, the animators used to draw a time scale next to the key frame to indicate how to generate the in-between frames.

Data capturing for motion is used in movies and video games because it is able to realistically depict the human motion. One of its greatest limitations is the inflexibility for reuse in different projects. To get the exact shot that the user would like to require an individual motion capture session. This is not only costly but time consuming. Data capturing clips can be divided into different actions. It is difficult to piece these clips together in a reasonable way to create a desired longer motion. There have been many successful results in texture synthesis for a variety of textures. Some synthesize texture pixel by pixel based on the pixel's neighborhood [17], while others use patches which are overlapped and then sewn together along an optimal seam [18]. Recently there have been many advances made in the texture synthesis realm which can be applied to the growth of capturing data for motion, namely the specific treatment of near-regular textures [40].
This specific classification of textures has regularities and symmetries with the addition of a limited amount of random noise and imperfections. Near-regular textures are seen all over in nature, including cloth patterns, brick walls, and even gait patterns [41]. Algorithms have been tailored to near regular textures to exploit their regularity while still preserving their subtle differences [40].

Pullen et al [33] describe a motion synthesis method inspired by De Bonet’s et al [13] texture synthesis algorithm. Their approach decomposes the training data into frequency bands and synthesizes a new sequence, one frequency band at a time. The approach was applied to generate a realistic repetitive motion of a 2D character with the degrees of freedom.

Researchers have been able to piece together segments of motion capture data by specifying descriptions of motion in a specific order, such as “walk, run, jump” [49]. To reduce an animator’s workload, research has been done to key-frame a small number of joints and use motion capture data to fill in the remaining joints based on the correlation between the joints [50].

Motion is viewed as a set of linear dynamic systems and their accompanying matrix of transitions which contains how likely one system will transition to another [51]. The most widely used method to transition between two motion clips is linear interpolation. The physical correctness of interpolated motions has been justified by evaluating it in terms of standard physical properties such as linear and angular momentum, the contact between feet and the floor and the continuity of velocity. However, it is still not guaranteed to look natural. [43].

From the research surveys it is evident that not enough work had been done on animation by texture synthesis. The thesis focuses on joining the frames to animate from the result of texture Synthesis.
6.2 ANIMATION THROUGH SYNTHESIS

Motion is viewed as a set of linear dynamic systems and their accompanying matrix of transitions which contains how likely one system will transition to another [42]. The most widely used method to transition between two feet arms motion clips is linear interpolation. The physical correctness of interpolated motions has been justified by evaluating it in terms of standard physical properties such as linear and angular momentum, the contact between feet and the floor and the continuity of velocity. However, it is still not guaranteed to look natural. [43]. The texture synthesis algorithm is to explore the importance of correlation between joints.

Relating the texture synthesis algorithm (in chapter 3) to capture data for motion, consider two motions $m_1$ and $m_2$ and search for the best overlap between them over $n$ frames. This occurs at frame $t_1$ of $m_1$ and $t_2$ of $m_2$. Compute the optimal seam between $m_1$ and $m_2$ joint by joint. It means that over the $n$ transitional frames each joint $x$ could transition between $m_1$ and $m_2$ at different frames for a smoother transition. When $m_1$ and $m_2$ are the same motion, a threshold needs to be set for how quickly the motion can transmit (the minimum value of $t_1$). Without this threshold the best overlap will be computed at frame 1.

6.2.1. CORRELATING THE JOINTS

The format is that each joint is given a number and these numbered joints are laid out in sequential order in an array. Thus adjacent neighbors in the data structure may not be logical numbers. When using [17] these kinds of neighborhoods may be meaningless. To make the neighborhood meaningful look at the correlation score between joints. Quantify this correlation by using the correlation coefficient, $P_{cor}$ (chapter2). The coefficient value is between -1 and 1 which measures the linear relationship between two sets of numbers $s_1$ and $s_2$. 1 is a perfect correlation between $s_1$ and $s_2$, 0 is no relationship between the two sets, and -1 is an inverse relationship between the two.

Applying this to motion synthesis, compute the degrees of freedom for motion $m$. Store these values in an array and use them to weight the value of the physical neighbors of the degrees of freedom of joint $x$ during synthesis. For each degree of freedom of joint
x. finding the summation of the absolute value of neighbors weight with the frames. The value is taken because of positive and negative weights correlate the joints equally as they provide the same amount of information about the motion. It may be better to synthesize each joint of the motion instead of synthesizing the degrees of freedom of the joint separately. This is not straightforward as different joints it have different numbers of degrees of freedom.

6.3 RESULTS AND DISCUSSION

The synthesis algorithm, choose a random block of pixels from an input texture image. Every time it get a different output image (synthesized). Color has been applied to the output images.
The frames will be taken from the output of synthesized result. Correlating each synthesized output to joint the frames to make animation. If the number of frame increases, then the time also increases. For each and every output the synthesis algorithm has to execute. This chapter also works for gray-level outputs.
Cloud image is considered as a sample image shown in the Fig. 6.1., Fig. 6.2 to Fig. 6.10 shows the output synthesized result. Each result is considered as a frame. Collecting all the frames and stored in the .avi file.

![Cloud image](image.png)

**Fig. 6.11 Input Gray Scale Image**

Another sample is shown in the Fig. 6.11. Before storing, choose the number of frames to joint per second. If the numbers of frames are less then it animates slowly otherwise it animates fastly. This file will run on the Media Player version 10.0 or Real Player version 10.5.

![Synthesized frames](image.png)

**Fig 6.12 Synthesized frame 1**  **Fig 6.13 Synthesized frame 2**
Another sample image for animation is shown in the Fig. 6.22.

6.4. CONCLUSION

The input is a gray scale image, synthesis is done over the image to get a different outputs. Then color is applied over the outputs by applying the concept of chapter 5. Each output is considered as a frame. Correlation is made on the output of the synthesis to joint the frames for animation. Collect all the colored frames together and stored in the .avi file. Applications are Textile industry, film industry, computer games, and education.