Texturing on Patterned Cloth With Wrinkles in a 2D illustration (sap_0008)

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1 Introduction

This research presents the method to generate wrinkles on patterned cloth on a 2-D illustration from a sample texture. Because our method just uses simple affine transformation in 2-D space, users can be free from preparing or operating any 3-D models until they finish their work. This is useful especially for putting screen tones on comics or manga drawings for any type of cloth representation such as clothes, furniture, and so on. First, we prepare a sample texture. It is better the texture is generated to be able to wrap around because we pick nonexistence pixels from the opposite side. Then we draw wrinkle lines on the texture with a tablet pen or a mouse. The texture is warped taking into account the input properties. By using drawing input for control transformation, we can provide intuitive operation and inspiration especially for comics and manga artists.

2 Background

Patterns on cloth in illustrations need not to be correct as a 3-D form. Because they are used to convey the cloth’s material properties that is worked as a sign. Characters painted in Ukiyo-e sometimes wearing Kimono with complicated pattern on it. The pattern is not precisely attached to the cloth but show its beauty and dynamics in the planar representation. The similar representation is shown in comics/manga by using a screen tone. However, texturing using a screen tone has some differences caused by its nature. Originally, a screen tone is a patterned thin film put on ink drawing for comics/manga to apply textures. It is not warped, scaled nor transformed in the cumbersome way. This inflexibility adds feature to comics/manga representation, but illustrators sometimes want to use it more effective. Recently, many comics/manga are drawn by using digital tools and many representations are allowed. However, there is few radical innovation on using the screen tones even though manga artists wants to do. We believe that when we produce adaptive tools for certain purpose and more, manga representation develops and new method can appear. This research is one of the tools focused on screen tones based on this idea.

Figure 1: Wrinkle Line decides transform area where \( \alpha \neq 1.0 \)

3 Wrinkles on cloth

In a real 2-D illustration, Ukiyo-e, cloth with patterns and wrinkles is drawn as follows:

- Wrinkles are drawn as lines with curves on cloth to convey flexibility.

We implemented "wrinkle draw" based on this observation.

The wrinkle line is consisted by a set of line segments from a consecutive input \( p[n] \) from a tablet pen or mouse. For each pixel on the sample texture, we calculate transformations using parameters of the inputs. For dividing texture with drawing wrinkles, only the pixels on the right or left side of the wrinkle line is transformed. To detect the transform region with parameter \( t_o \), we use simple distance function between each pixel and a line segment \( L \) (Figure 1). We set transform area by \( t_o \): 

\[ L = t_o(p[i] - p[i - 1]) \quad i > 1 \]

The transform region toward width is decided by parameter \( r \) that is based on the wrinkle line length. Inside the effect region, texture is rotated "RotateDegree". The original coordinate of the sample texture and the rotated texture is blended by \( \alpha \):

\[ i \{d < r\} \alpha = 1 - d/r \]

\[ \text{movedPixel} = \text{RotateFunc} (\text{OriginalCoordinate} + (1 - \alpha) + \text{TransformCoordinate} + \alpha \cdot \text{RotateDegree}); \]

Where \( r = 2\pi \), \( \text{RotateDegree} = n \) and \( d \) = distance from the wrinkle line to a pixel.

4 Result

Figure2 show how our method works on simple pattern. Wrinkles are add on each texture and complex representation can be made by a few stroke drawings. Even though the wrinkle appearance is incorrect as 3-D form, we can recognize cloth flexibility on it. Simple affine transformation and drawing control are useful and it will contribute to the innovation of the digital comic. Our method also can be used for 2-D image correction by adding special warping and cutting on it.

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\[ \text{Figure 1: Wrinkle Line decides transform area where } \alpha \neq 1.0 \]

\[ \text{Figure 2: Results.} \]