NANYANG TECHNOLOGICAL UNIVERSITY

Lab 5 Report:

Morphing

CZ2003 – Computer Graphics & Visualization

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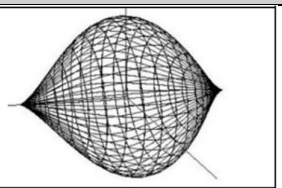
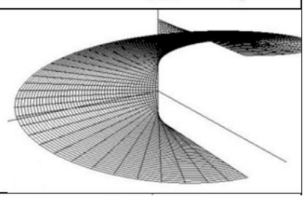
Lab Group: SSR2

Contents

Lab 5

5.1 Morphing of Parametric Surfaces

Reparameterization

7	$x = \cos(0.5\theta)(\sin(\varphi))^3$ $y = \sin(0.5\theta)(\sin(\varphi))^3$ $z = \cos(\varphi)$	$0 \le \theta \le 4\pi, \quad 0 \le \varphi \le \pi$	
8	$x = 0.5b\pi\cos(2\theta)$ $y = 0.5\theta - 0.5$ $z = 0.5b\pi\sin(2\theta)$	$0 \le \theta \le \pi, \quad 0 \le b \le 1$	

To achieve morphing between shape 7 & 8, reparameterization is applied to the parametric equations of both shapes.
In this experiment, all the domains *(θ,φ for Shape 7 & b,θ for Shape 8)* have been **reparametrized to a common base domain [0,1]**.
Next, by utilizing a **linear interpolation model with time parameter *t***, morphing animations can be produced.

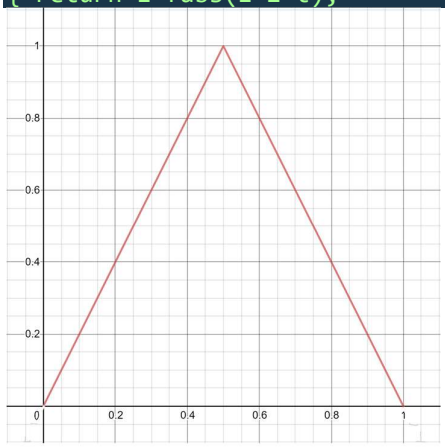
Domain Pairing between the 2 Shapes

I have experimented with 2 versions of the morphing.
In **morphing7to8_Version1.wrl**, [θ from S7 ⇔ b from S8] and [φ from S7 ⇔ θ from S8].
In **morphing7to8_Version2.wrl**, [θ from S7 ⇔ θ from S8] and [φ from S7 ⇔ b from S8].

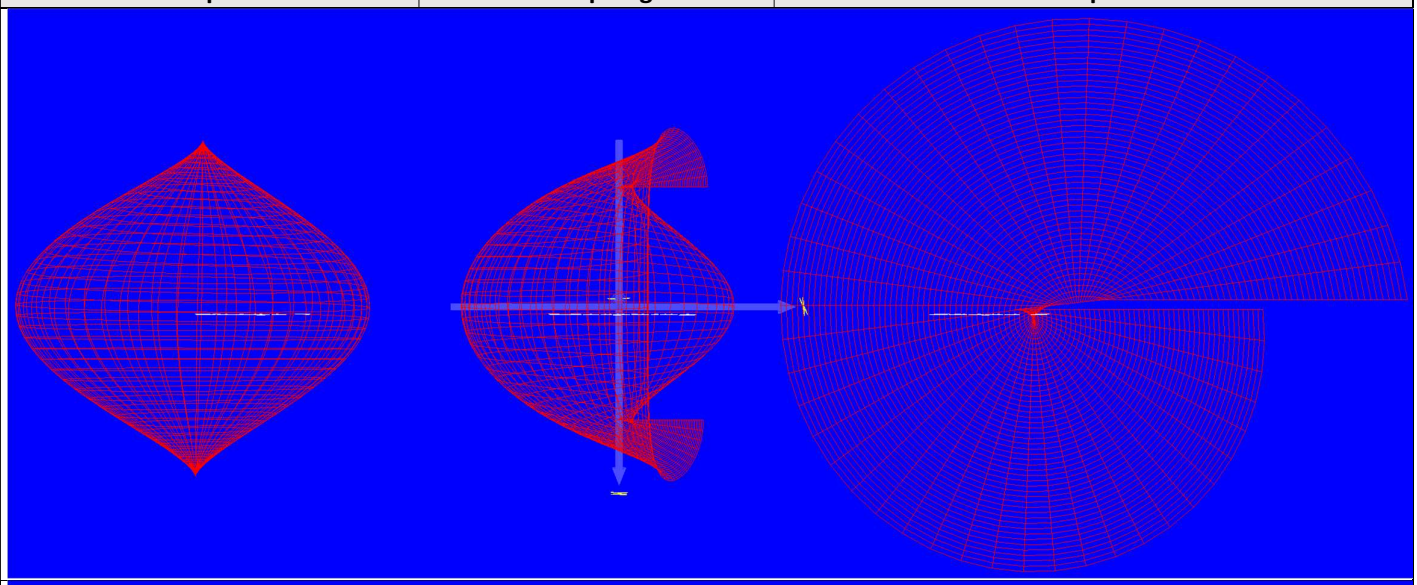
After experimenting with both versions, **morphing7to8_Version1.wrl** may be a better morphing animation as compared to **morphing7to8_Version2.wrl**.
This is so as **morphing7to8_Version1.wrl** animation looks like Shape 7 is unfolding to form Shape 8 which is easy to understand and visualize. In contrast, **morphing7to8_Version2.wrl** animation looks like it is folding into itself which is harder to visualize.

Further Experimentation

```
function back_n_forth(t)
{ return 1-fabs(1-2*t);                    }
```



To allow for back and forth animation between the 2 shapes, I have implemented the above function, **back_n_forth(*t*)**, which takes in parameter *t*. When *t* is cycled through domain [0,1]. It will ouput a value from 0 to 1 and since VRML cycles through the domain, we essentially have a periodic triangular function which allows for back and forth animation perpetually.

	Screenshots		
	Shape 7	**Morphing**	**Shape 8**
Top-down View			
Side View