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|----------------------------|--|--------------------------------------|
| AGG_TRANSFORM_NULL | \mathbf{x} | |
| AGG_TRANSFORM_REVERSE | $[-x, y]$ | reverse direction of curve |
| AGG_TRANSFORM_PLANE_ROTATE | $\mathbf{x}_0 + (\mathbf{x} - \mathbf{x}_0)\mathbf{R}^T$ | rotate about \mathbf{x}_0 |
| AGG_TRANSFORM_SHRINK | $\mathbf{x}_0 + s(\mathbf{x} - \mathbf{x}_0)$ | scale about \mathbf{x}_0 |
| AGG_TRANSFORM_SHIFT | $\mathbf{x} + \Delta\mathbf{x}$ | 3D translation by $\Delta\mathbf{x}$ |
| AGG_TRANSFORM_SCALE | $s\mathbf{x}$ | global scale in plane |

Table 1: Transforms in order of application to a shape

Closed curves (“shapes”) used to define cross-sections are parameterized using x , $-1 \leq x \leq 1$ with $x < 0$ defining the lower portion of the curve and $x > 0$ the upper. The variable runs continuously from the trailing edge along the lower surface to the leading edge and back to the trailing edge. Coordinates are calculated as

$$y_U = x^{n_1}(1-x)^{n_2} \sum_{i=0}^n s_i^{(U)} S_{n,i}(x), \quad (1)$$

$$y_L = -|x|^{n_1}(1-|x|)^{n_2} \sum_{i=0}^n s_i^{(L)} S_{n,i}(|x|). \quad (2)$$

“Aerofoils” are defined similarly but in terms of the thickness distribution, the trailing edge thickness, and the camber line.

Definition of a sphere of unit diameter centred at $[0, 0, 1/2]$:

$$x = 2u^{1/2}(1-u)^{1/2}(|v| - 1/2); \quad (3a)$$

$$y = \text{sgn}(v)2u^{1/2}(1-u)^{1/2}|v|^{1/2}(1-|v|)^{1/2}; \quad (3b)$$

$$z = u, \quad (3c)$$

$$0 \leq u \leq 1, -1 \leq v \leq 1.$$

To generate using AGG:

```
global {
# syntax: <identifier> = "<expression>" (quotes required)
# diameter of sphere
D = 1.0
n1 = 0.5
n2 = 0.5
}
```

```
body ("sphere")
```

```
{  
  
  distribution("sphere", 0, 1, 24, "cosine")  
  {  
    shape("ellipse", -1, 1, n1, n2)  
    transform("shrink", 0.5, 0.0, "sqrt(s*(1-s))")  
    transform("scale", "2*D")  
    transform("shift", "-D", 0.0, "D*s")  
  }  
  
}
```