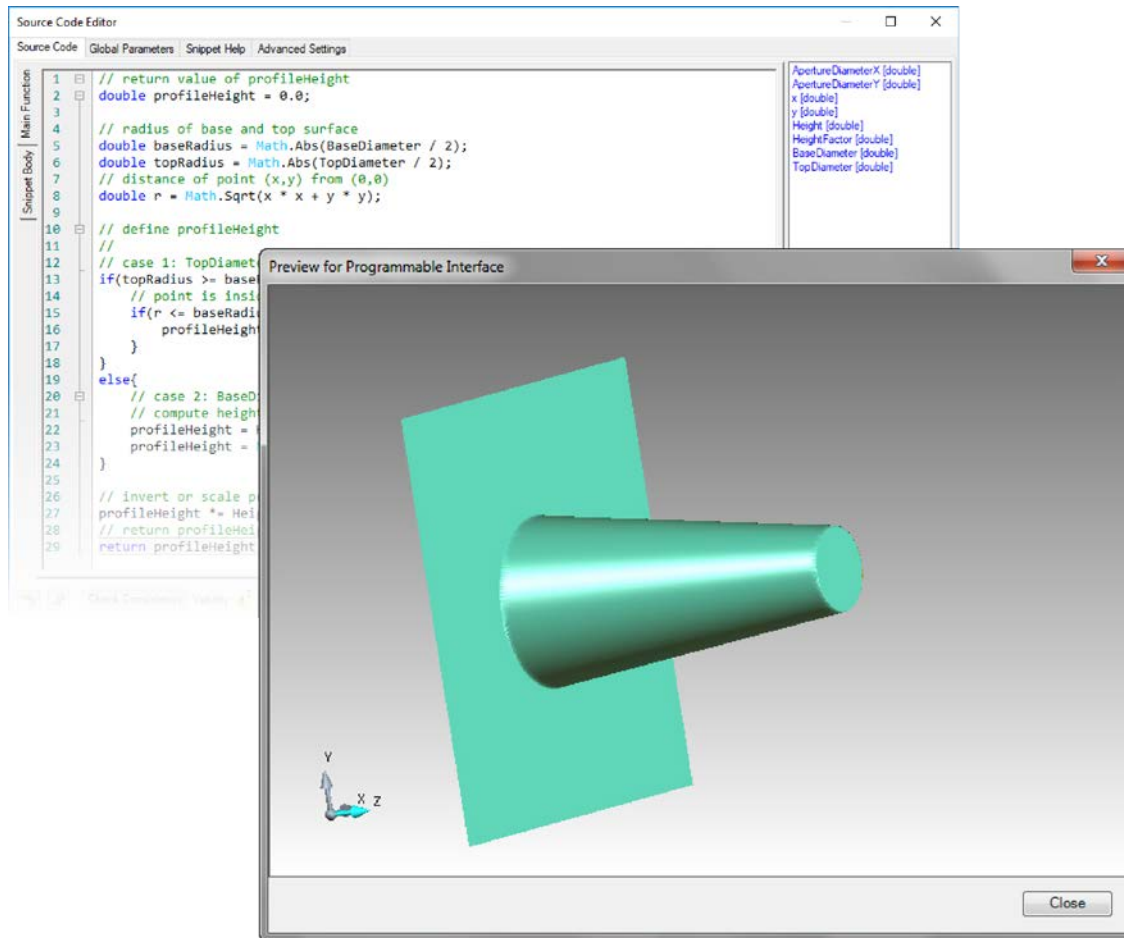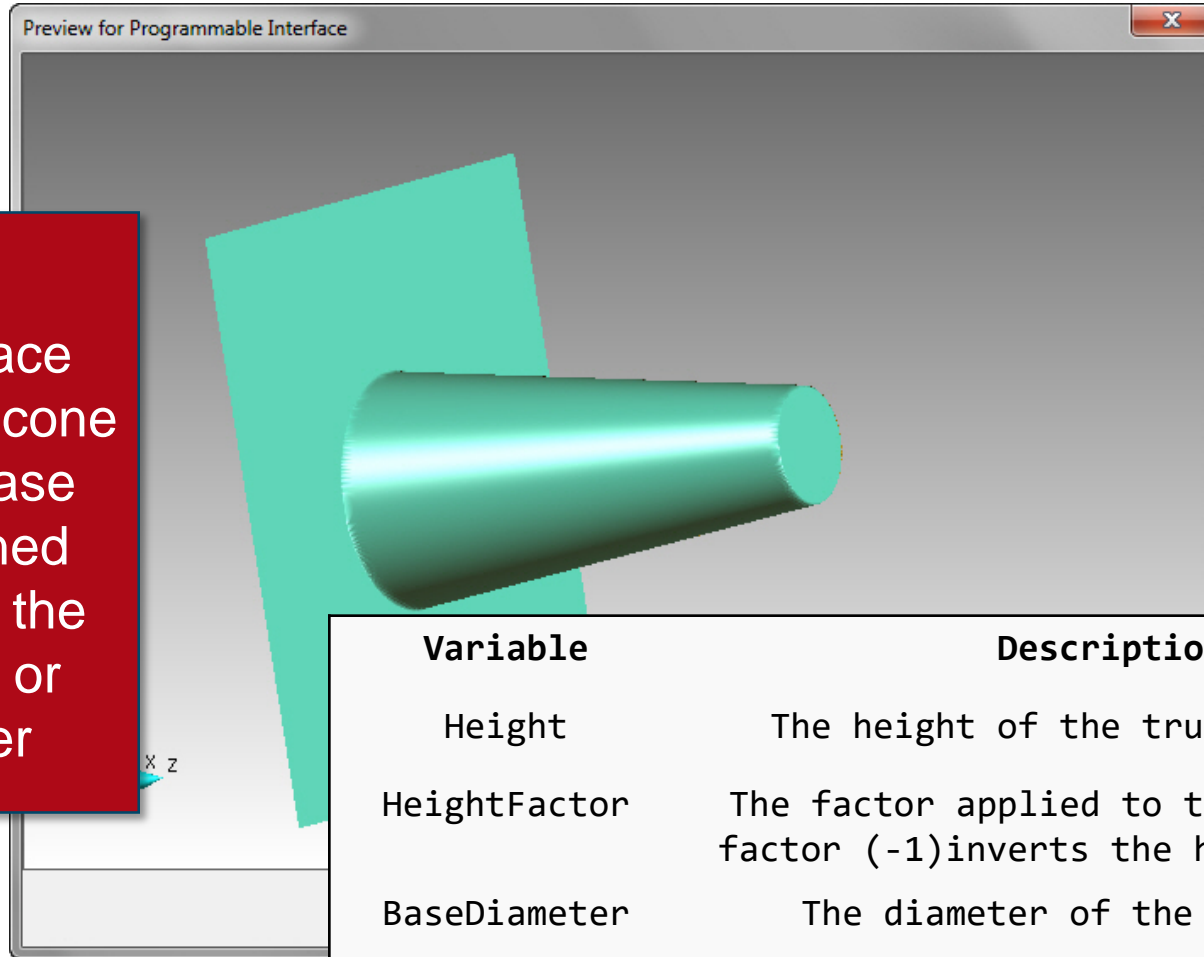# Programming a Truncated Cone Surface

Abstract

In this example, a surface profile representing a truncated cone structure is generated using the Programmable Interface in VirtualLab Fusion. The specification parameters of the cone structure, e.g. the height, top and base diameters, are customizable for the user in different applications.

Task Description

Task:
Use the Programmable Interface feature to generate a truncated cone surface profile. The top and base diameter should be user-defined non-negative parameters, and the top diameter must be smaller or equal than the base diameter

Variable	Description
Height	The height of the truncated cone.
HeightFactor	The factor applied to the height. The factor (-1)inverts the height profile.
BaseDiameter	The diameter of the base area.
TopDiameter	The diameter of the top area.

Programming a Truncated Cone Surface Profile

Source Code Editor

Source Code | Global Parameters | Snippet Help | Advanced Settings

```
1   // return value of profileHeight
2   double profileHeight = 0.0;
3
4   // radius of base and top surface
5   double baseRadius = Math.Abs(BaseDiameter / 2);
6   double topRadius = Math.Abs(TopDiameter / 2);
7   // distance of point (x,y) from (0,0)
8   double r = Math.Sqrt(x * x + y * y);
9
10  // define profileHeight
11  //
12  // case 1: TopDiameter equals (or greater than) BaseDiameter
13  if(topRadius >= baseRadius){
14      // point is inside (for outside the profileHeight = 0 is set already)
15      if(r <= baseRadius){
16          profileHeight = Height;
17      }
18  }
19  else{
20      // case 2: BaseDiamter and TopDiamter are different
21      // compute height of side walls and cut off at 0 and Height, respectively.
22      profileHeight = Height * (baseRadius - r) / (baseRadius - topRadius);
23      profileHeight = Math.Max(Math.Min(Height, profileHeight), 0);
24  }
25
26  // invert or scale profileHeight if requested
27  profileHeight *= HeightFactor;
28  // return profileHeight values
29  return profileHeight;
```

ApertureDiameterX [double]
ApertureDiameterY [double]
x [double]
y [double]
Height [double]
HeightFactor [double]
BaseDiameter [double]

Check Consistency | Validity: | OK | Cancel | Help

Global Parameters (User Defined)

Variable	Value	Allowed range
double Height	4mm	0 mm – 1 m
double HeightFactor	1	-1 – 1
double BaseDiameter	4mm	0 mm – 1 m
double TopDiameter	2mm	0 mm – 1 m

Document Information

title	Programming a Truncated Cone Surface
document code	CZT.0041
version	1.0
toolbox(es)	Starter Toolbox
VL version used for simulations	7.4.0.49
category	Feature Use Case
further reading	- How to Work with the Programmable Interface & Example (Spherical Surface) - Programming an Anamorphic Surface - Construction of a Truncated Pyramid Surface