

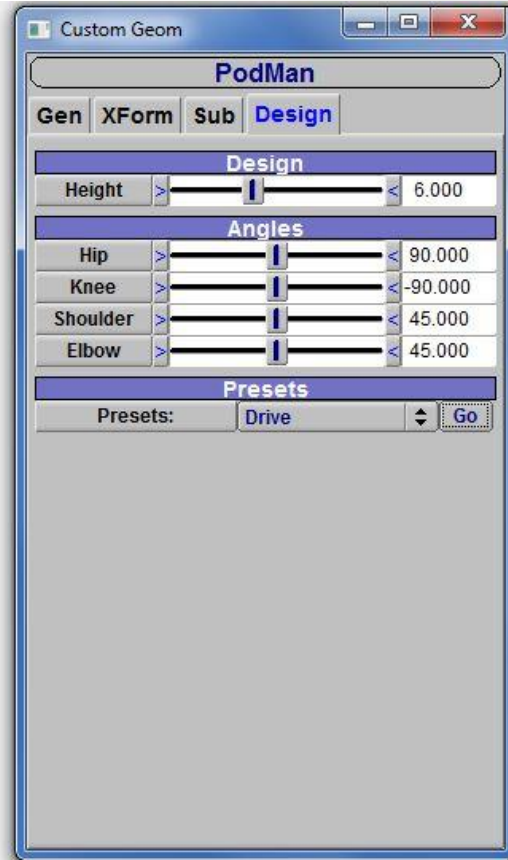
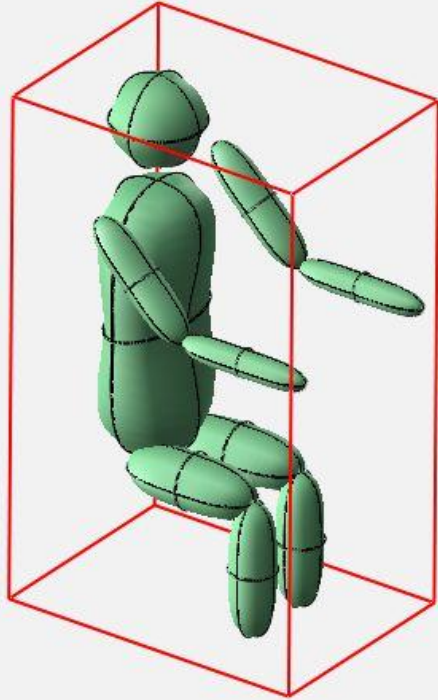
Custom Components

J.R. Gloudemans

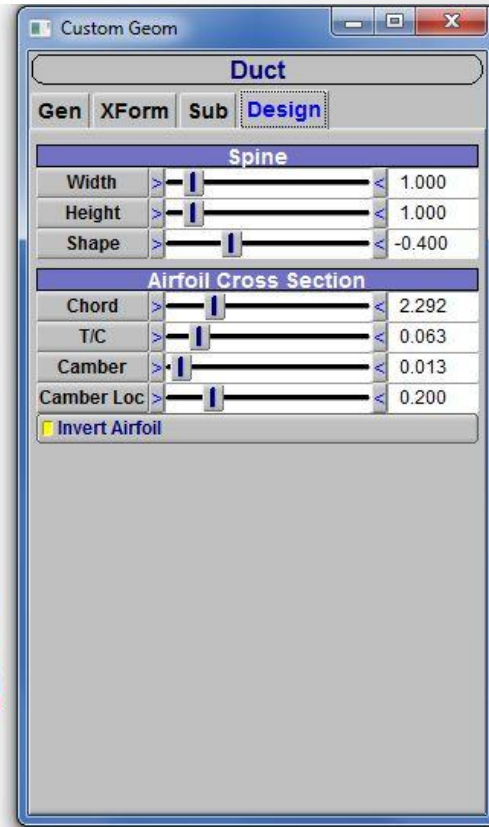
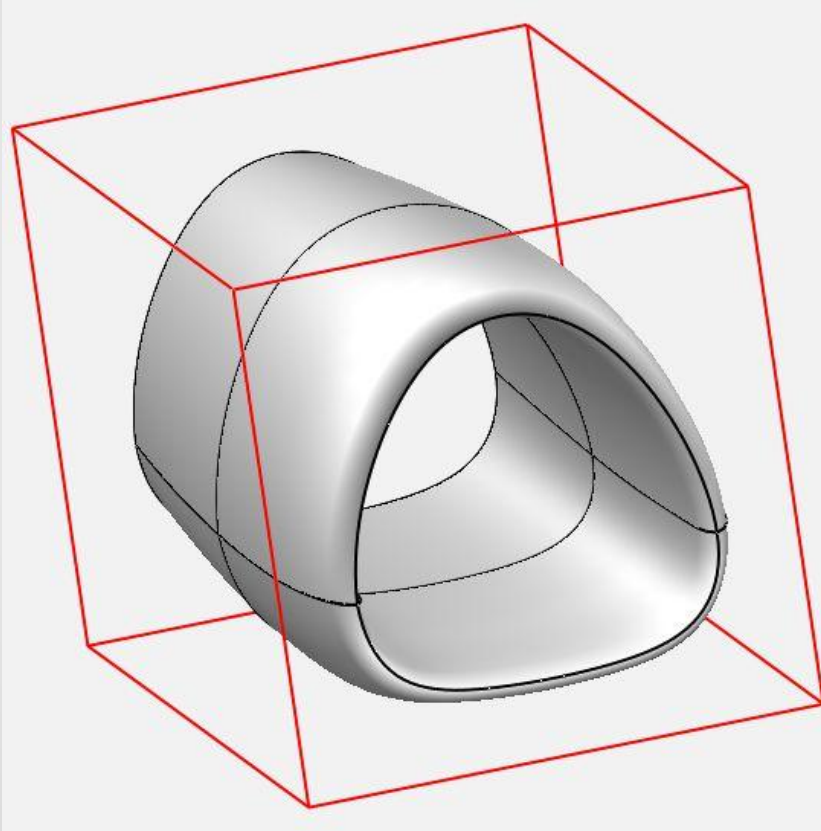
Why Custom Components

- User defined parameterization
- Custom geometry
- Simplified optimization
- Reduced GUI complexity
- Share designs

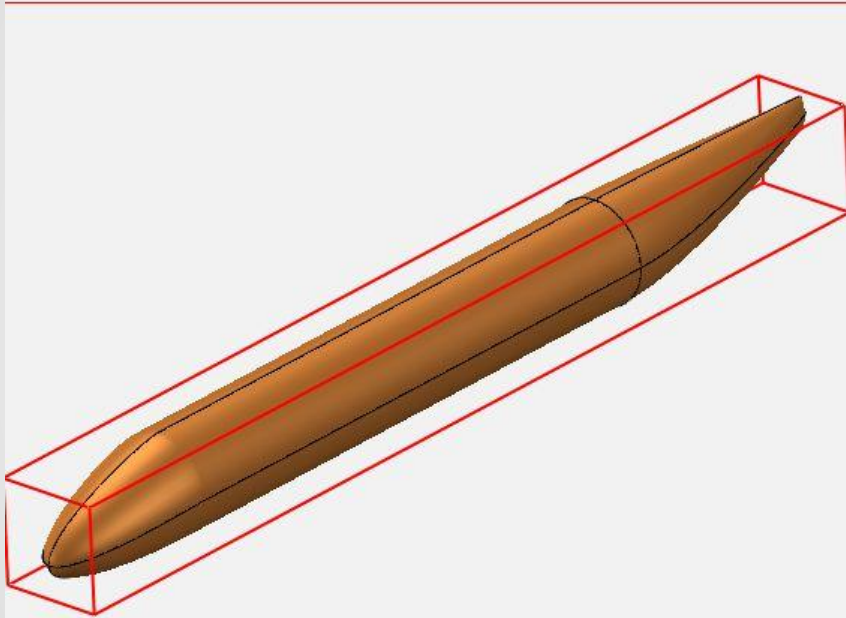
Examples



Examples



Examples



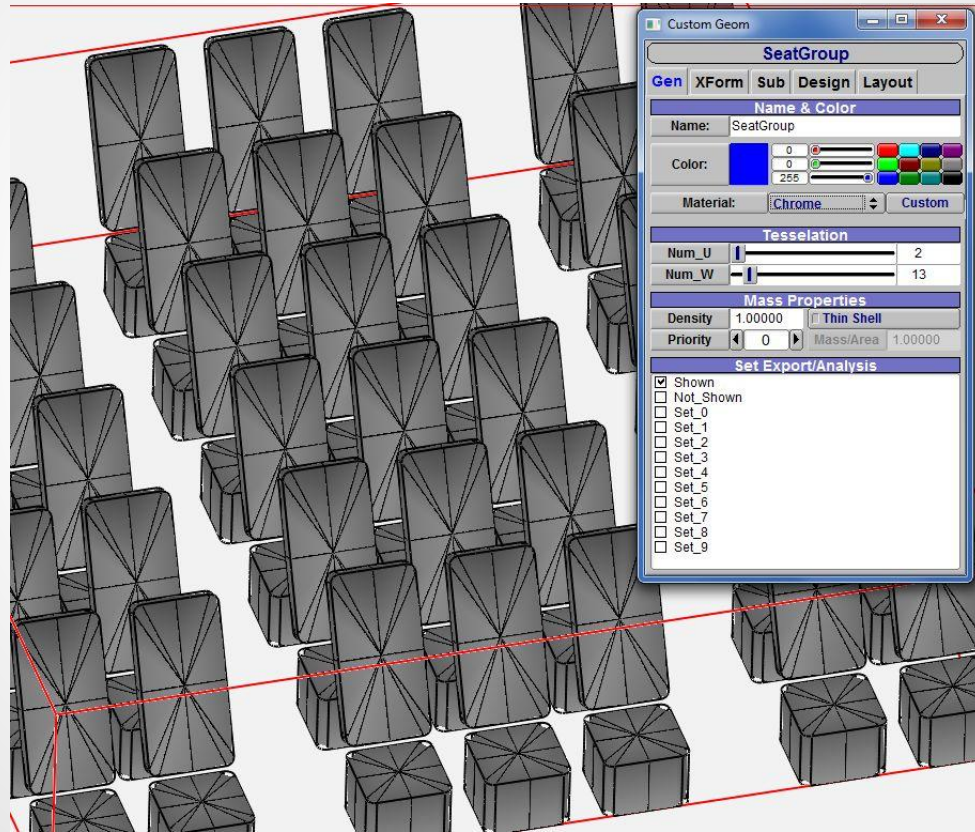
Custom Geom

TransportFuse

Gen XForm Sub **Design**

Design	
Length	10.000
Diameter	1.000
Nose Mult	1.500
Aft Mult	2.740
Nose Center	-0.200
Aft Center	0.300
Aft Width	0.100
Aft Height	0.300

Examples

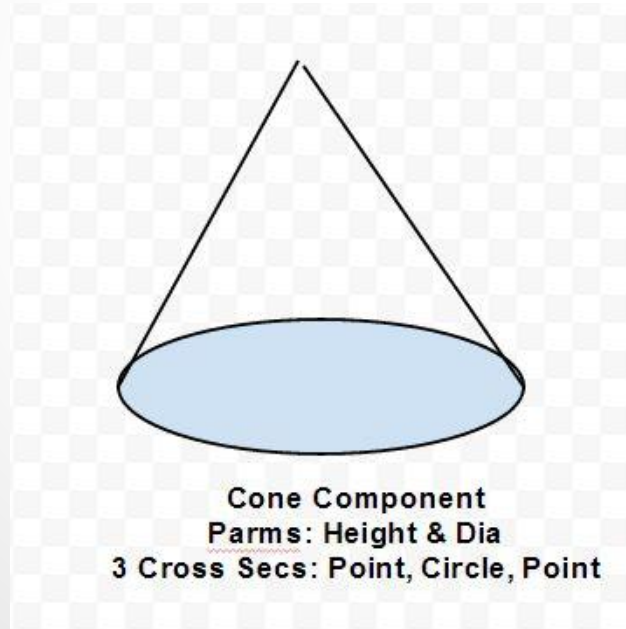


Implementation

- added a scripting language to VSP
- Anglescript is open source with a C/C++ syntax
- added a special custom component
- added programmable GUI

How To

- figure out desired shape and design parms



How To

- use pre-defined xsecs or
- generate xsecs programmatically
- one or many skinned xsec surfaces
- write script in AngleScript
- all functions/enums described in Wiki

Script

- name the file with “.as” suffix

- provide at least four functions:

void Init(): Create parms, xsecs and surfaces

void InitGui(): Create GUI

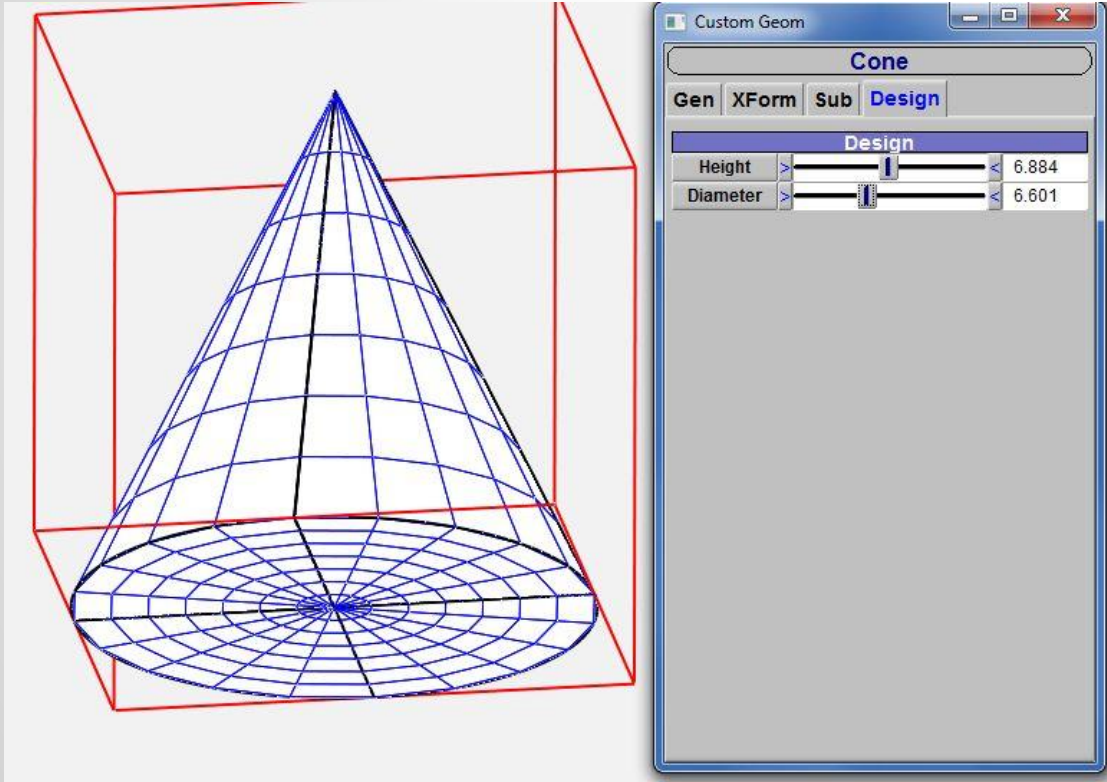
void UpdateGUI(): Interactive changes to GUI

void UpdateSurf(): Update surfaces based on parm changes

Use and Sharing

- place script in “CustomScripts” dir
- the script can also be saved in the .vsp3 file
- use the Type Editor to save imported scripts
- the OpenVSP Hanger will eventually host scripts

Cone Example



Cone.as Script

```
void Init()
{
    //==== Add Parm Types =====//
    string height = AddParm( PARM_DOUBLE_TYPE, "Height", "Design" );
    SetParmValLimits( height, 4.0, 0.001, 1.0e12 );
    SetParmDescript( height, "Height of Cone" );

    string diameter = AddParm( PARM_DOUBLE_TYPE, "Diameter", "Design" );
    SetParmValLimits( diameter, 8.0, 0.001, 1.0e12 );
    SetParmDescript( diameter, "Diameter of Cone" );

    //==== Add Cross Sections =====//
    string xsec_surf = AddXSecSurf();
    AppendXSec( xsec_surf, XS_POINT);
    AppendXSec( xsec_surf, XS_CIRCLE);
    AppendXSec( xsec_surf, XS_POINT);
}
```

Cone.as Script

```
//==== InitGui Is Called Once During Each Custom Geom Construction ====//
```

```
void InitGui()
```

```
{
```

```
    AddGui( GDEV_TAB, "Design" );
```

```
    AddGui( GDEV_YGAP );
```

```
    AddGui( GDEV_DIVIDER_BOX, "Design" );
```

```
    AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Height", "Height", "Design" );
```

```
    AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Diameter", "Diameter", "Design" );
```

```
    AddGui( GDEV_YGAP );
```

```
}
```

```
//==== UpdateGui Is Called Every Time The Gui is Updated ====//
```

```
void UpdateGui()
```

```
{
```

```
}
```

Cone.as Script

```
//==== UpdateSurf Is Called Every Time The Geom is Updated ====//
```

```
void UpdateSurf()
```

```
{
```

```
    string geom_id = GetCurrCustomGeom();
```

```
    //==== Set Base XSec Diameter ====//
```

```
    string dia_parm = GetParm( geom_id, "Diameter", "Design" );
```

```
    double dia_val = GetParmVal( dia_parm );
```

```
    //==== Get The XSecs To Change ====//
```

```
    string xsec_surf = GetXSecSurf( geom_id, 0 );
```

```
    string xsec1 = GetXSec( xsec_surf, 1 );
```

```
    string xsec2 = GetXSec( xsec_surf, 2 );
```

Cone.as Script

(UpdateSurf() continued)

```
//==== Set The Diameter ====//
```

```
string xsec1_dia = GetXSecParm( xsec1, "Circle_Diameter" );
```

```
SetParmVal( xsec1_dia, dia_val );
```

```
//==== Set The Height ====//
```

```
double ht_val = GetParmVal( GetParm( geom_id, "Height", "Design" ) );
```

```
SetCustomXSecLoc( xsec2, vec3d( ht_val, 0, 0 ) );
```


```
SkinXSecSurf();
```

```
}
```


GUI Script

- each device on new row: `AddGui(int dev....)`
- override with:
 - `GDEV_BEGIN_SAME_LINE`
 - `GDEV_END_SAME_LINE`
- override default device widths:
 - `GDEV_FORCE_WIDTH`

GUI Layout



```
AddGui( GDEV_TAB, "Design" );
AddGui( GDEV_YGAP );
AddGui( GDEV_DIVIDER_BOX, "Design" );

AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Height" );

AddGui( GDEV_YGAP );
AddGui( GDEV_DIVIDER_BOX, "Angles" );
AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Hip" );
AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Knee" );
AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Shoulder" );
AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Elbow" );

AddGui( GDEV_BEGIN_SAME_LINE );
AddGui( GDEV_CHOICE, "Presets:", "Presets", "Design" );
AddGui( GDEV_ADD_CHOICE_ITEM, "Stand" );
AddGui( GDEV_ADD_CHOICE_ITEM, "Sit" );
AddGui( GDEV_FORCE_WDTH, "30" ); // Force the Button Small
AddGui( GDEV_TRIGGER_BUTTON, "Go", "PresetTrigger", "Design" );
AddGui( GDEV_END_SAME_LINE );
```

XSecs and XSecSurfs

- predefined types (XS_POINT, XS_ELLIPSE, ...)
- user defined xsec points:
 - XS_FILE_FUSE and SetXSecPnts
- place xsec in surf with:
 - SetCustomXSecLoc and SetCustomXSecRot
- clone surfs with CloneSurf

Skinning

- Specify continuity and tangent angles at each xsec:

SetXSecContinuity

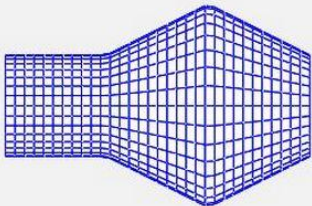
SetXSecTanAngles

SetXSecTanStrengths

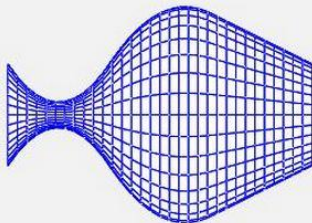
SetXSecCurvatures

- Experiment with the fuselage component

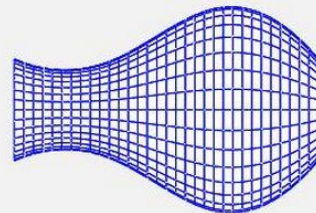
Skinning Examples



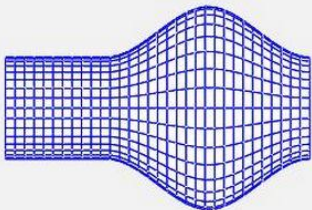
C = 0



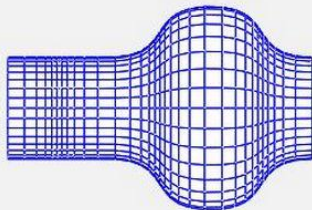
C = 1



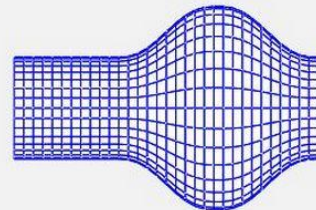
C = 2



C = 1
Tan Ang = 0.0
Tan Str = 1.0



C = 1
Tan Ang = 0.0
Tan Str = 2.0



C = 2
Tan Ang = 0.0
Tan Str = 1.0
Curvature = 0.0

Hands On

Modify your “cone.as” script to allow offsetting the nose in Z.

- add nose offset parm
- add gui
- add surface changes

Hands On

In Init() add:

```
string noseoffset = AddParm( PARM_DOUBLE_TYPE, "NoseOffset", "Design" );  
SetParmValLimits( noseoffset, 0.0, -1.0e12, 1.0e12 );
```

In InitGUI() add:

```
AddGui( GDEV_SLIDER_ADJ_RANGE_INPUT, "Nose Offset", "NoseOffset", "Design" );
```

In UpdateSurf() add:

```
double off_val = GetParmVal( GetParm( geom_id, "NoseOffset", "Design" ) );
```

In UpdateSurf() change:

```
SetCustomXSecLoc( xsec2, vec3d( ht_val, 0, off_val ) );
```

End