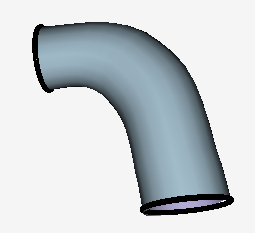
Bent generalized cylinder

# Definition

A bent generalized cylinder is a shape with circular cross-section having a planar spine curve and varying radii along the spine.



# Representation

## Parameters

Spine plane representation:

* , – 3D vectors representing an orthonormal basis for the spine’s plane
* – The “bottom” center of the primitive. This is the center of one of the end-point circles. “Top” and “bottom” are defined arbitrarily, based on the direction of the spine (explained later).

From now on, all parameters are 2D points/vectors defined by two parameters relatively to the plane spanned by , and passing through .

* and – the normal vectors of the top and bottom feature curves.
* Discrete spine parameters. For every point on the spine we have:
  + – the radius of the shape around point .
  + – Coordinates of the point on the spine.

**Definition**:

* This defines vectors in the spine’s plane.
* This defines points in the spine’s plane

## Internal constraints

* Orthonormal basis
* Normalized normals
* Normals parallel to the spine
* First spine point will be “bottom” center

## Feature curves

The bottom feature curve is the circle centered at having plane normal and radius .

The top feature curve is the circle centered at having plane normal and radius .

Those feature curves later participate in geo-semantic constraints (for example – orthogonal to other feature curve, or coplanar to other feature curve).

# Optimization method

2D spine computation

The output of this process is a set of spine points

Objective function