Chapter 2.
Scheme Extensions

Topic: Ignore

Scheme is a public domain programming language, based on the LISP language, that uses an interpreter to run commands. ACIS provides extensions (written in C++) to the native Scheme language that can be used by an application to interact with ACIS through its Scheme Interpreter. The C++ source files for ACIS Scheme extensions are provided with the product. *Spatial*'s Scheme based demonstration application, Scheme ACIS Interface Driver Extension (Scheme AIDE), also uses these Scheme extensions and the Scheme Interpreter. Refer to the *3D ACIS Online Help User's Guide* for a description of the fields in the reference template.

blend:chamfer

Scheme Extension: Blending, Modifying Models

Action: Attaches a chamfer blend attribute to a sequence of edges.

Filename: blnd/blnd_scm/nblndscm.cxx

APIs: api_blend_graph, api_fix_blends, api_set_const_chamfers, api_smooth_edge_seq

Syntax:

```
(blend:chamfer edge left–range right–range
    [”fix” | ”single”])
```

Arg Types:

edge	edge
left–range	real
right–range	real
“fix”	string
“single”	string

Returns: boolean | entity

Errors: None

Description: The default action is to place attributes on the smoothly connected edges of the given edge. The last argument, if given as ”fix” completes the blend for the sequence. If given as ”single”, the attribute is placed only on the picked edge (not the sequence).

edge is an input edge.

left–range is a distance between the original edge and spring curve edge on the left side of the edge. Left side is defined with reference to direction of edge.

right–range is a distance between the original edge and spring curve edge on the right side of the edge. Right side is defined with reference to direction of edge.

fix completes the blend for the sequence.

single places the attribute only on the picked edge.

Limitations: None

Example:

```
; blend:chamfer
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block’s edges.
(define list1 (entity:edges block1))
;; list1
; OUTPUT Original

(blend:chamfer (car list1) 5 8 ”fix”)
;; #t
; OUTPUT Result
```

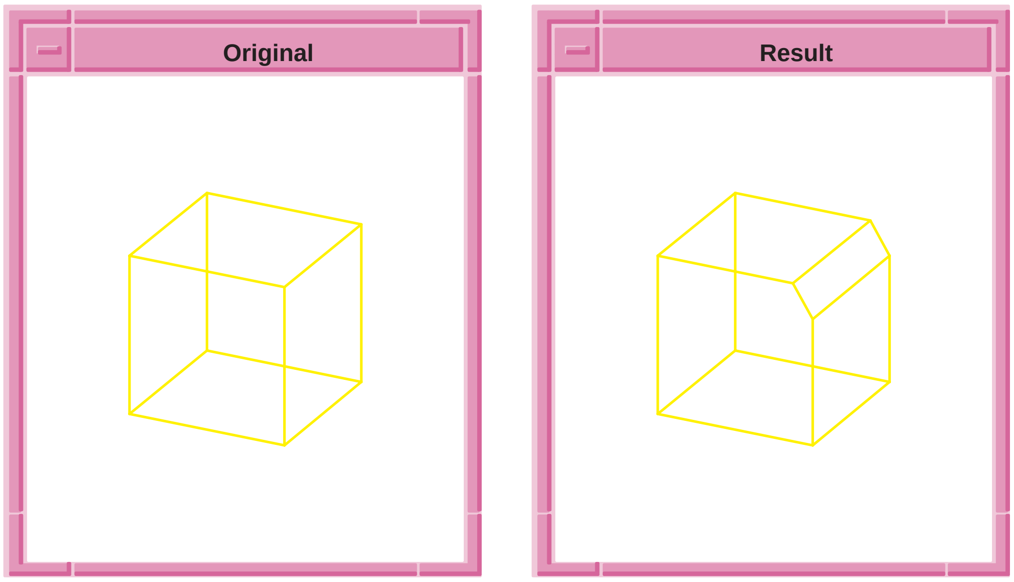


Figure 2-1. blend:chamfer

blend:chamfer–on–edge

Scheme Extension: Blending, Modifying Models

Action:	Attaches a chamfer blend attribute to each edge in the input list.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_del_entity, api_set_const_chamfers

Syntax:

```
(blend:chamfer-on-edge entity-list offset-left
    [offset-right=offset-left setback-start=0
    setback-end=setback-start] [acis-opts])
```

Arg Types:

entity–list	edge | (edge ...)
offset–left	real
offset–right	real
setback–start	real
setback–end	real
acis–opts	acis–options

Returns: (entity ...)

Errors: None

Description: This extension attaches a chamfer blend attribute to each edge in the input entity–list. The actual blending is not performed until blend:network is called. offset–left and offset–right represent the planar chamfer boundaries offset from the edge. The sense of the edge determines the left side and the right side. If only one offset value is provided, it applies to both offset–left and offset–right.

The optional setback–start and setback–end represent a distance from the vertex to the start of the blended edge. If only one setback value is provided, it is applied to both setback–start and setback–end.

This extension returns the input entity list.

entity–list is a list of input entities to which chamfer blend will be attached.

offset–left and offset–right represent the planar chamfer boundaries offset from the edge.

setback–start and setback–end represent a distance from the vertex to the start of the blended edge.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:chamfer-on-edge
; Create a solid block.
(define block1
    (solid:block (position -20 -20 -20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block's edges
(define list1 (entity:edges block1))
;; list1
; Pick two edges.
(define short-list (list (car list1)
    (car (cdr (cdr (cdr list1))))))
;; short-list
; OUTPUT Original
; Set the chamfer for the specified edges.
(define chamfer (blend:chamfer-on-edge
    short-list 5 5))
;; chamfer
; Complete the blend
(blend:fix (car short-list))
;; #t
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

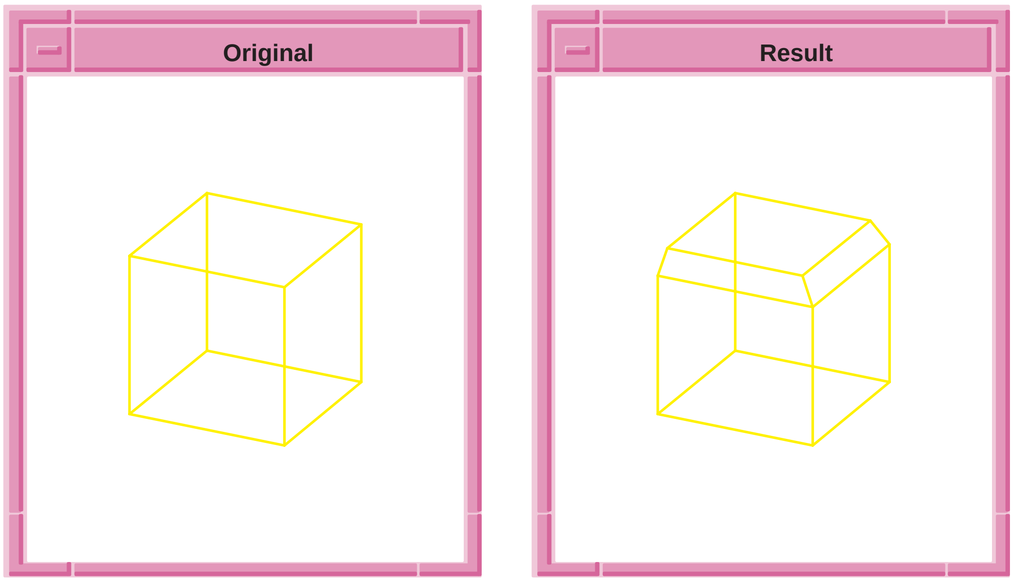


Figure 2-2. blend:chamfer–on–edge

blend:complete

Scheme Extension: Blending, Modifying Models

Action: Attaches a sheet to a blank body using wire. This is the third phase of blending.

Filename: blnd/blnd_scm/blndtest.cxx

APIs: api_complete_blends

Syntax: (**blend:complete** wire sheet body [acis-opts])

Arg Types:	sheet	body
	wire	body
	body	body
	acis–opts	acis–options

Returns: body

Errors: None

Description: This, the 3rd phase of blending, calls the boolean phase two to attach the sheet to the blank body, body, using wire.

The first phase of blending creates a blend sheet, which is the input argument sheet. The second phase of blending calls the boolean phase one to create an intersection boolean, which is the input argument wire.

sheet is a input blend sheet which is attached to the bland body.

wire is used to attach sheet to the blank body.

body is a blank body to which blend sheet is attached.

acis–opts are optional parameters that are specific to the component and general ACIS options such as the journal and version information.

Note blend:round *combines* blend:ss–sheet, blend:wire, *and* blend:complete.

Limitations: None

Example:

```
; blend:complete
; First stage of blending – create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 5 15 20)))
;; block1
; Get a list of the solid block’s edges.
(define edges (entity:edges block1))
;; edges
(define list1
    (list (car edges)
    (car (cdr (cdr (cdr edges))))))
;; list1
; OUTPUT Original
; Attach constant radius blend to 2 connected edges.
(define blend (blend:const-rad-on-edge list1 5))
;; blend
;First stage of Blending.
(define sheet1 (blend:make-sheet list1))
;; sheet1
; Second stage of Blending - create wire
;   intersection.
(define wire1 (blend:make-wire sheet1 block1))
;; wire1
; Third stage of Blending - attach sheet to blank
;   body.
(define blend-c (blend:complete wire1 sheet1 block1))
;; blend-c
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

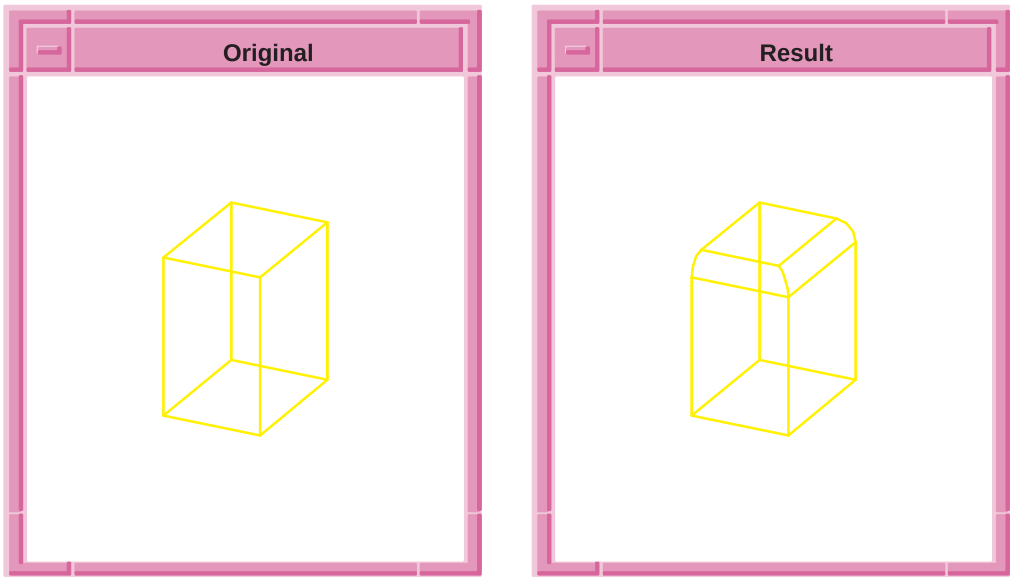


Figure 2-3. blend:complete

blend:const–rad–on–edge

Scheme Extension: Blending, Modifying Models

Action: Attaches a constant radius blend attribute to each edge in the input list.

Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_del_entity, api_set_const_rounds

Syntax:

```
(blend:const-rad-on-edge entity-list blend-radius
    [setback-start=0 setback-end=setback-start]
[acis-opts])
```

Arg Types:

entity–list	edge | (edge ...)
blend–radius	real
setback–start	real
setback–end	real
acis–opts	acis–options

Returns: (entity ...)

Errors: None

Description: This extension attaches a constant radius blend attribute to each edge in the input entity–list. The actual blending is not performed until blend:network is called. The optional setback–start and setback–end represent a distance from the vertex to the start of the blended edge. If only one setback value is provided, it is applied to both the setback–start and setback–end.

This extension returns the input entity list.

entity–list is a list of input entities.

blend–radius is a constant radius blend attribute.

setback–start and setback–end represent a distance from the vertex to the start of the blended edge.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:const-rad-on-edge
; Create a solid block.
(define block1
    (solid:block (position -20 -20 -20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block's edges.
(define list1 (entity:edges block1))
;; list1
(define short-list
    (list (car list1)
    (car (cdr (cdr (cdr list1))))))
;; short-list
; OUTPUT Original
; Set a constant radius blend.
(define blend (blend:const-rad-on-edge short-list 5))
;; blend
; Blend the network.
(blend:fix (car short-list))
;; #t
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

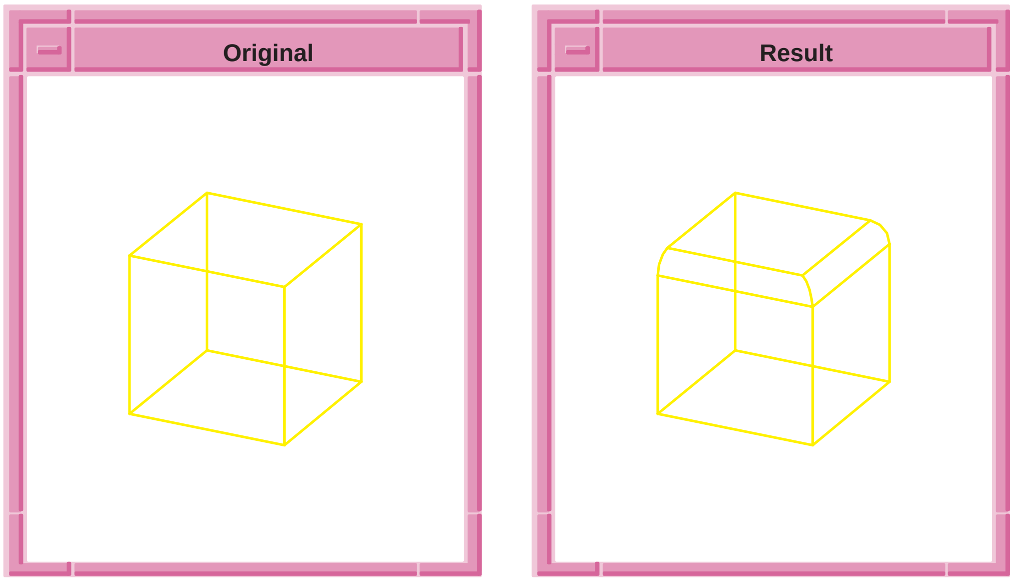


Figure 2-4. blend:const–rad–on–edge

blend:delete

Scheme Extension: Blending, Modifying Models

Action: Deletes a network of existing blend attributes on a given body.

Filename: blnd/blnd_scm/nblndscm.cxx

APIs: api_blend_graph, api_delete_blends

Syntax: `(**blend:delete** entity [”**single**”] [acis-opts])`

Arg Types:

entity	edge | vertex
“single”	entity
acis–opts	acis–options

Returns: string

Errors: None

Description: Deletes a network of existing blend attributes on a given body. If the keyword “single” is supplied, only the blend attributes on the picked entity are deleted.

entity is an input entity whose existing blend attributes will be deleted.

single is to delete only the blend attribute on the picked entity.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:delete
; reate solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 5 15 20)))
;; block1
; Get a list of the solid block’s edges.
(define list1 (entity:edges block1))
;; list1
; Define two specific edges in a list.
(define short–list
    (list (car list1)
    (car (cdr (cdr (cdr list1))))))
;; short–list
; Attach a constant radius blend to two edges.
(define blend (blend:const–rad–on–edge short–list 5))
;; blend
; (#[entity 3 1] #[entity 6 1])
; OUTPUT Original

; Delete the blend network you just created.
(blend:delete (entity 3 1) (entity 6 1))
;; 1
; Refresh the picture so you can see the result.
(view:refresh)
;; #[view 13042062]
; OUTPUT Result
```

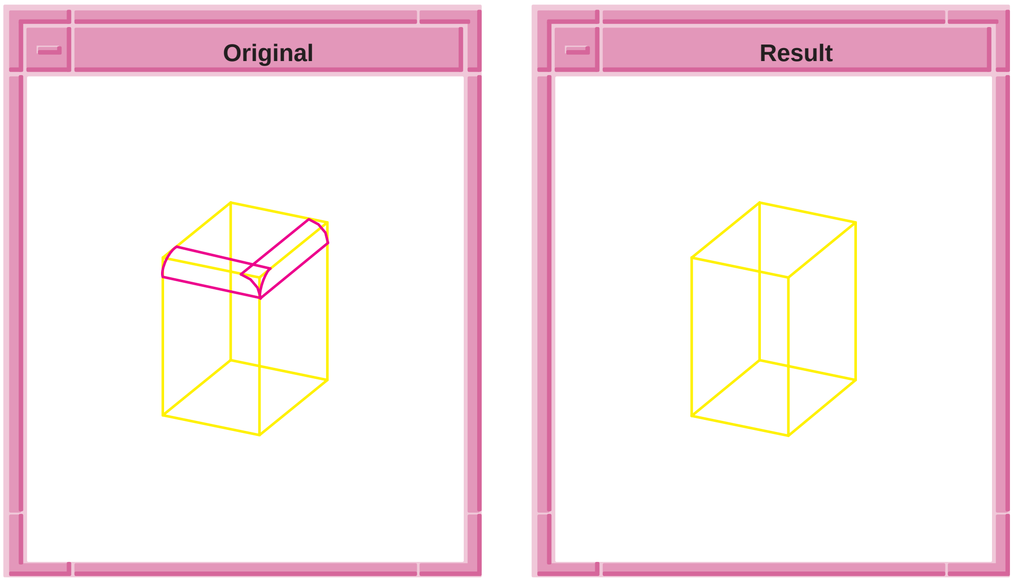


Figure 2-5. blend:delete

blend:edge–info

Scheme Extension:	Blending, Modifying Models
Action:	Gets a list of the edge blend type and internal data values.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	None
Syntax:	`(blend:edge-info edge)`
Arg Types:	edge edge
Returns:	((pair ...) | boolean)
Errors:	None
Description:	This extension tests the edges for blend attributes. It returns a list containing the blend type and internal data values. If no blend attributes exist, this extension returns #f. This command is called before the command blend:network, because blend:network deletes the edge entities to which the blend attributes are attached.

edge is an input edge which is tested for blend attributes.

Limitations: None

Example:

```
; blend:edge-info
; Create a solid block.
(define block1
    (solid:block (position -20 -20 -20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block's edges.
(define list1 (entity:edges block1))
;; list1
; Set a constant radius blend.
(define blend (blend:round (car list1) 5))
;; blend
; (#[entity 3 1])
; List the edge blend type and value.
(blend:edge-info (car list1))
;; ("const radius" ("radius" . 5)
;; ("setback at start" . 0)
;; ("setback at end" . 0))
```

blend:enquire

Scheme Extension: Blending, Modifying Models

Action: Returns blend attribute details for a given network.

Filename: blnd/blnd_scm/nblndscm.cxx

APIs: api_smooth_edge_seq

Syntax: (**blend:enquire** edge)

Arg Types: edge	edge

Returns: edge | (edge ...)

Errors: None

Description: Returns blend attributes for a given network. If edge is part of a sequence, the sequence details are printed out.

edge is an input edge.

Limitations: None

Example:

```
; blend:enquire
; Create solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block’s edges.
(define list1 (entity:edges block1))
;; list1
; Set a constant radius blend.
(define blendround (blend:round (car list1) 5))
;; blendround
; (#[entity 3 1])
; Request details of edge
(blend:enquire (car list1))
; edge has face–face round
; radius 5
;; ()
```

blend:entities

Scheme Extension: Blending, Modifying Models

Action: Performs general blending commands.

Filename: blnd/blnd_scm/blndopts_scm.cxx

APIs: api_fix_blends, api_get_edges, api_get_faces, api_set_const_chamfers, api_set_var_blends, api_set_vblend, api_set_vblend_auto, api_set_vblend_autoblend, api_smooth_edge_seq, api_smooth_edges_to_curve

Syntax: `(`**`blend:entities`**` [entity–list] [option [data]]...)`

Arg Types:

entity–list	entity | (entity ...)
option	string
data	string

Returns: entity | entity ...

Errors: None

Description: entities argument defines the entities to be blended.

option argument can be defined as any of the following:

"chamfer" –	Attaches a chamfer blend attribute to a sequence of edges. A chamfer requires two values defined in the data argument.
"setback" –	Specifies the distance along an edge, back from the vertex, at which the blend stops. "Setback" requires a setback value defined in the data argument.
"fix" –	Repairs a blend network.
"autosetback"–	Calculates a best–fit setback for each end of the blended edge. Autosetback is applied to a vertex blend using the api_set_vblend_auto function.
"autoblend"–	Overrides autosetbacks with rolling ball vertex blends to produce an n–sided path vertex blend in preference to a rolling ball blend.
"round" –	This argument specifies that the edge is given a rounded blend of the specified radius. A radius must be defined in the data argument as a positive value and specifies the radius dimension in global body space.
"single" –	Specifies that fix should be applied only to the single edge or vertex picked, instead of to the whole set of edges and/or vertices forming the blendable network attached to that edge or vertex.
"bulge" –	Defines the fullness of the vertex blend. requires a value defined in the data argument.
"show" –	Highlights the entities that have blend attributes.

data provides the additional information required for some of the option arguments, e.g., radius for "round", two distance values for "chamfer", a value for "setback" and "bulge".

Limitations: None

Example:

```
; blend:entities
; Create solid block
(define b
    (solid:block
    (position –20 –20 –20)
    (position 20 20 20)))
;; b
; Illustrate vertex blend with round edges
(define ver–round (blend:entities
    (entity:vertices b) 1 ”setback” 4 ”fix”))
;; ver–round
```

```
(part:clear)
;; #t
(define b
    (solid:block
    (position –20 –20 –20)
    (position 20 20 20)))
;; b
; Illustrate vertex blend with chamfer edges
(define ver–chamfer (blend:entities
    (entity:vertices b) ”chamfer” 3
    ”setback” 4 ”fix”))
;; ver–chamfer

(part:clear)
;; #t
(define b
    (solid:block
    (position –20 –20 –20)
    (position 20 20 20)))
;; b
; Illustrate blend all edges as round
(define all–round (blend:entities b 3 ”fix”))
;; all–round

(part:clear)
;; #t
(define b
    (solid:block
    (position –20 –20 –20)
    (position 20 20 20)))
;; b
; Illustrate blend all edges as chamfer
(define all–chamfer (blend:entities b 3 ”fix”
    ”chamfer”))
;; all–chamfer
```

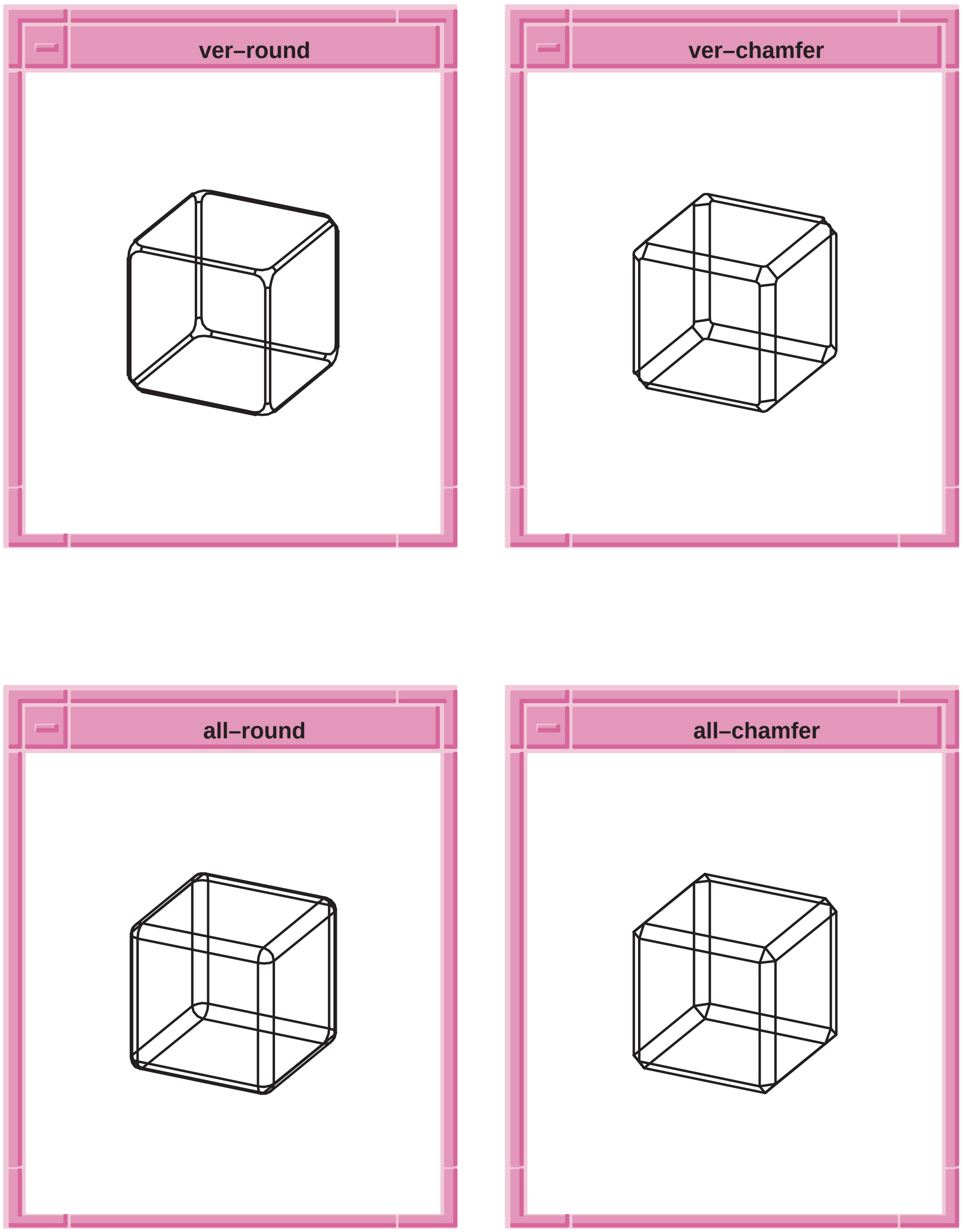


Figure 2-6. blend:entities

blend:fix

Scheme Extension: Blending, Modifying Models

Action:	Repairs a blend network.
Filename:	blnd/blnd_scm/nblndscm.cxx
APIs:	api_blend_graph, api_fix_blends
Syntax:	`(`**`blend:fix`**` edge [acis–opts])`

Arg Types:

edge	edge
acis–opts	acis–options

Returns: unspecified

Errors: None

Description: Fixes a blend network on a body. Place the attributes on the edges/vertices before initiating this command.

edge is an input edge for fixing blend network on a body.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:fix
; Fix a blend network on a body.
; create a solid block.
(define block (solid:block (position –25 –10 –30)
    (position 40 20 30)))
;; block
; Preview the selected blend prior to blending
(define preview (blend:round
    (list–ref (entity:edges block) 3) 5))
;; preview
; OUTPUT Original

; Apply the blend fix.
(blend:fix (list–ref (entity:edges block) 3))
;; #t
; OUTPUT Result
```

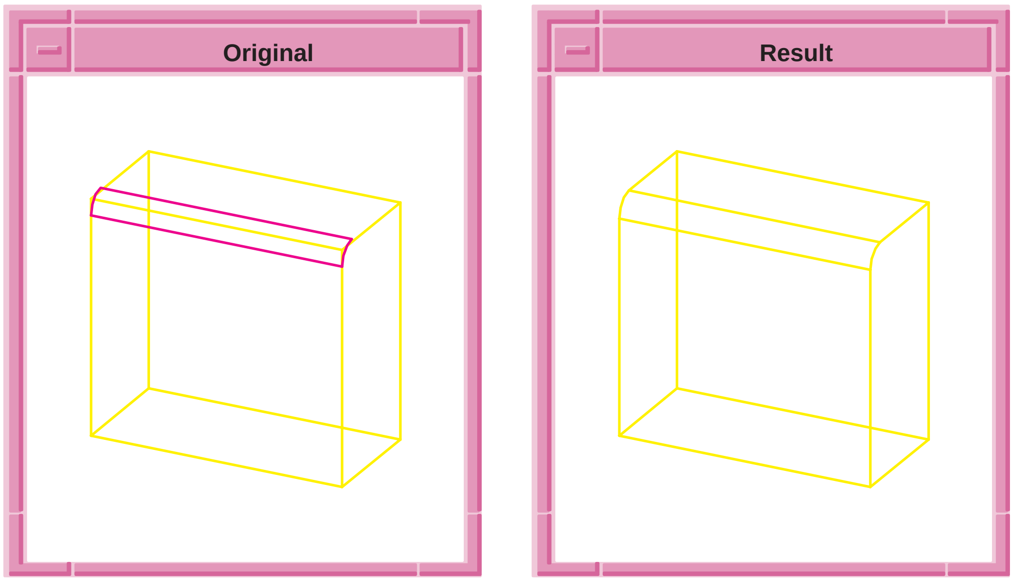


Figure 2-7. blend:fix

blend:get–network

Scheme Extension: Blending, Modifying Models

Action:	Gets a list of all edges and vertices that are in the same blend network as the given entity.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_blend_graph
Syntax:	`(blend:get-network entity [acis-opts])`
Arg Types:	entity — edge | vertex acis–opts — acis–options
Returns:	(entity ...) | (vertex ...)
Errors:	None
Description:	This extension returns a list of all edges and/or vertices that make up the blend network. It tests the specified entity for the types vertex or edge. It then looks for all other networked vertices and edges. This command is called before the command blend:network, because blend:network deletes the edge entities to which the blend attributes are attached.

To be part of a blend network, an edge or vertex must be owned by a solid body, have an attached blend attribute, and have one of the following be true.

– Meets an edge smoothly (tangent continuity) at either a blended or unblended vertex.
– Meets an edge or several edges at a blended vertex.
– Meets no more than one other blended EDGE at an unblended vertex, which is called a blend pair.

The returned list contains this network, including the given entity. The list is empty when the given entity has no blend attribute.

entity is the specified entity for the types vertex and edge, for testing.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:get–network
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block’s edges.
(define list1 (entity:edges block1))
;; list1
(define short–list
    (list (car list1)
    (car (cdr (cdr (cdr list1))))))
;; short–list
; short–list => (#[entity 3 1] #[entity 6 1])
; Attach a constant radius blend to two edges.
(define blendedge (blend:const–rad–on–edge
    short–list 5))
;; blendedge
; (#[entity 3 1] #[entity 6 1])
; Get a list of all the edges and vertices that
; are in the blend network for one of the solid
; block’s edges.
(define blendlist (blend:get–network (car list1)))
;; blendlist
; (#[entity 3 1] #[entity 6 1])
; Blend the network.
(define network (blend:network (car short–list)))
;; network
; #[entity 2 1]
```

blend:get–smooth–edges

Scheme Extension: Blending, Modifying Models

Action: Gets a list of all edges that smoothly connect to a given edge.

Filename: blnd/blnd_scm/blnd_scm.cxx

APIs: api_smooth_edge_seq

Syntax: (**blend:get–smooth–edges** entity [acis–opts])

Arg Types:

entity	edge
acis–opts	acis–options

Returns: (edge ...)

Errors: None

Description: This extension returns a list of edges that all join smoothly. Smoothly means that they have tangent continuity at the common vertices. The given entity must be of the type edge and be part of a solid body. If it does not join other edges smoothly, it returns a list containing only one argument.

entity is an input edge and a part of solid body.

acis–opts contains versioning and journaling parameters. Must be the last argument, if stated.

Limitations: None

Example:

```
; blend:get-smooth-edges
; Create a wire body from a list of edges.
(define wire1
    (wire-body (list (edge:linear (position 0 0 0)
    (position 20 0 0))
    (edge:circular (position 20 10 0) 10 -90 90)
    (edge:linear (position 20 20 0)
    (position 0 20 0))
    (edge:linear (position 0 20 0)
    (position 0 0 0)))))
;; wire1
; Sweep a wire along the wire body.
(define solid1 (solid:sweep-wire wire1 20))
;; solid1
; Get a list of the edges.
(define list1 (entity:edges solid1))
;; list1
```

```
; Set the highlighting to get the smooth edges.
(define edges1
    (car (cdr (cdr (cdr (cdr (cdr (cdr (cdr (cdr
    (cdr (cdr list1)))))))))))
;; edges1
(define highlight (entity:set-highlight
    (blend:get-smooth-edges edges1) #t))
;; highlight
; (#[entity 17 1] #[entity 14 1] #[entity 11 1])
; These edges all join together smoothly.
(define edges2 (car list1))
;; edges2
; Set the highlighting to get the smooth edges.
(define highlight2 (entity:set-highlight
    (blend:get-smooth-edges edges2) #t))
;; highlight2
; (#[entity 7 1])
```

blend:make–cross–curve

Scheme Extension:	Blending, Modifying Models
Action:	Creates a ”rib” curve, running from one base entity to the other, at a location along a blend determined by the v–parameter.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_make_blend_cross_curve
Syntax:	(**blend:make–cross–curve** edge real [acis–opts])

Arg Types:

edge	edge
real	real
acis–opts	acis–options

Returns: entity

Errors: None

Description: Gets an edge with an attached blend attribute and the value of a v–parameter along the blend. Given an edge with an attached blend attribute (currently, only ATTRIB_VAR_BLEND or ATTRIB_CONST_ROUND) and a v–parameter along the blend, this extension creates a ”rib” curve, running from one base entity to the other, at a location along the blend determined by the v–parameter. (The v–parameter runs along the blend, and the u–parameter runs from one base surface to the other.) The v–parameter of the blend is the same as that of its defining curve, which is generally the curve of the edge being blended.

Sometimes the blend cannot evaluate a cross curve at the given parameter, for example, if the blend radius is too big.

The returned entity is a ”rib” curve.

edge is an edge with an attached blend attribute and the value of a v–parameter along the blend.

real is the v–parameter – value of the parameter along the blend.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–opts.

Limitations: Currently, only ATTRIB_VAR_BLEND or ATTRIB_CONST_ROUND

Example:

```
; blend:make–cross–curve
; Set up views.
(part:clear)
;; #t
(define view (cond ((>= 0 (length (part:views)))
    (define dlv (view:dl 0 0 600 600)))))
;; view
(define iso (map iso (env:views)))
;; iso
; Define geometry to illustrate command.
; Define cylinder length H, radius r, wing span
; S, and surface curvature R.
(define H 30.0)
;; H
(define r 4.0)
;; r
(define S 40.0)
;; S
(define R 8.0)
;; R
; Create a cylinder and then a wing.
(define cyl (solid:cylinder (position (/ H –2) 0 0)
    (position (/ H 2) 0 0) r))
;; cyl
(define wing (solid:cylinder (position 0 0 0)
    (position 0 (– 0 S) 0) R))
;; wing
; Create a tool to cut the wing.
(define tool (solid:block (position (/ S –2) (* –2 S)
    (/ S –2)) (position (/ S 2) (* 2 S) (/ S 2))))
;; tool
; Slightly rotate and change the angle of the tool.
(define transform1 (entity:transform tool
    (transform:rotation (position 0 0 0)
    (gvector 1 0 0) –4)))
;; transform1
; Transform the tool.
(define transform2 (entity:transform tool
    (transform:translation
    (gvector 0 0 (+ (/ S –2) r)))))
;; transform2
(define subtract (solid:subtract wing tool))
;; subtract
; Round out the wing’s leading edge.
(option:set ”raysize” (/ R 4))
;; 1
(define lead_edge (pick:edge (ray (position (/ R –2)
    (/ S –2) R) (gvector 0 0 –1))))
;; lead_edge
; Attach the variable round blend attributes to edge.
; Blending preview visible in OpenGL only.
(define blend1 (blend:var–round lead_edge 1.0 0.25))
;; blend1
; Fix the blend network.
(define blend_fix (blend:fix lead_edge))
;; blend_fix
; Move wing into proper place.
(define move_wing (entity:transform wing
    (transform:translation
    (gvector 0 0 (– (* 0.75 r) R)))))
;; move_wing
; Unite the cylinder and the wing.
(define unite (solid:unite cyl wing))
;; unite
; Apply the transforms to the underlying geometry.
(define fix (entity:fix–transform cyl))
;; fix
; Apply the blend CONST_RADIUS attribute to all edges
; of the wing–cylinder intersection.
(option:set ”raysize” (/ r 2))
;; 2
; Select the edge(s) to be blended.
(define round_edge (pick:edge (ray (position 0 0 0)
    (gvector 0 –1 1))))
```

```
;; round_edge
; Find all the edges that join smoothly.
(define smooth-edges
    (blend:get-smooth-edges round_edge))
;; smooth-edges
; Attach a constant radius blend attribute to each
; edge in the list.
(define blend2
    (blend:const-rad-on-edge smooth-edges 4.5))
;; blend2
; Now, pick the front rounded edge.
(define currEdge (list-ref smooth-edges 1))
;; currEdge
; OUTPUT Original

; Create a cross curve.
(define cross-curve
    (blend:make-cross-curve currEdge 1.0))
;; cross-curve
; Create an edge from the curve.
(define new_edge (edge:from-curve cross-curve))
;; new_edge
; Render the image.
(render)
;; ()
; OUTPUT Rendered
```

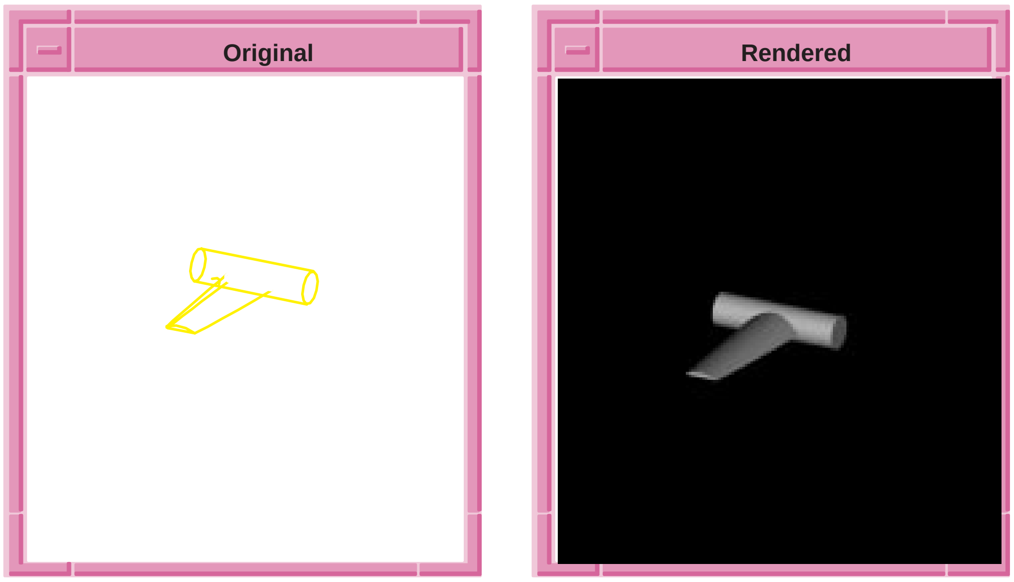


Figure 2-8. blend:make–cross–curve

blend:make–sheet

Scheme Extension:	Blending, Modifying Models
Action:	Executes the first phase of blending which creates a blend sheet.
Filename:	blnd/blnd_scm/blndtest.cxx
APIs:	api_make_blend_sheet
Syntax:	`(`**`blend:make-sheet`**` entity-list [acis-opts])`
Arg Types:	entity–list — entity | (entity ...)
	acis–opts — acis–options
Returns:	body
Errors:	None
Description:	The first phase of blending creates a blend sheet for a given list of edges, entity–list. Each edge has an implicit blend attribute.

The created blend sheet contains one or more faces for each blended entity. The blend body is the body that owns the blended entities. Attributes link the sheet to the blend body, thereby facilitating the next stage of blending. (In the next stage of blending, the sheet is combined with the blend body).

The sheet faces lie on new blend surfaces or on surfaces of the blend body where these are needed to cap blends at ends of blended edges.

Where two blend faces are made for blended edges meeting non–smoothly in an unblended vertex, the faces are trimmed to one another (i.e., are mitered) and the sheet faces are joined.

entity–list is a list of input entities to which blend sheet will be created.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Limitations: None

Example:

```
; blend:make–sheet
; First stage of blending.
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 5 15 20)))
;; block1
; Get a list of the solid block’s edges.
(define edges1 (entity:edges block1))
;; edges1
; Attach constant radius blend to 2 connected edges.
(define list1
    (list (car edges1)
    (car (cdr (cdr (cdr edges1))))))
;; list1
; OUTPUT Original

; Attach constant radius blend to 2 connected edges.
(define attach (blend:const–rad–on–edge list1 5))
;; attach
; (#[entity 3 1] #[entity 6 1])
(define sheet1
    (blend:make–sheet
    (blend:get–network (car list1))))
;; sheet1
; OUTPUT Result
```

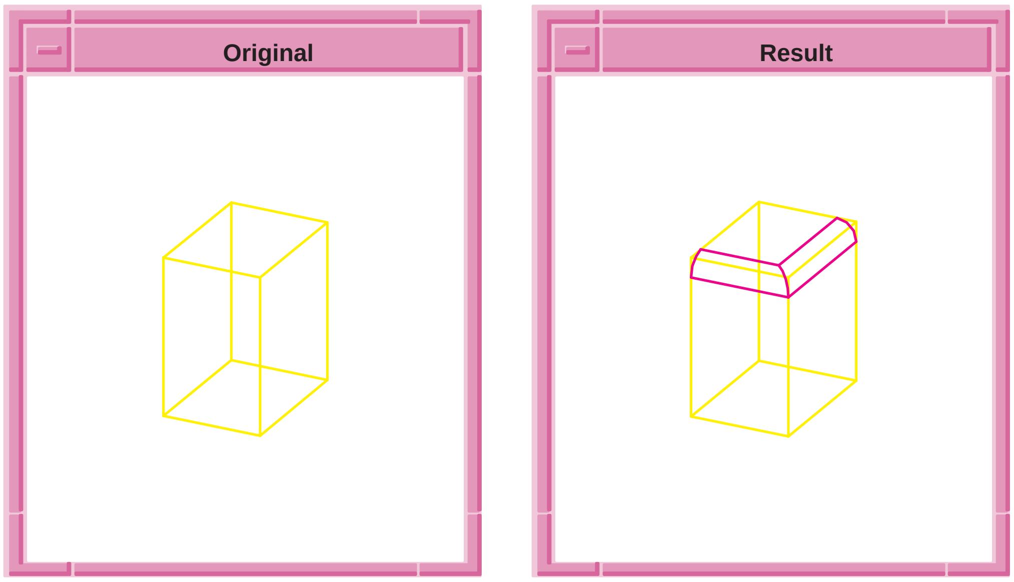


Figure 2-9. blend:make–sheet

blend:make–ss–sheet

Scheme Extension: Blending, Modifying Models

Action:	Executes the first phase of blending which creates a blend sheet.
Filename:	blnd/blnd_scm/blndtest.cxx
APIs:	api_concl_blend_ss, api_do_one_blend_ss, api_init_blend_ss
Syntax:	`(`**`blend:make–ss–sheet`**` entity–list)`
Arg Types:	entity–list entity | (entity ...)
Returns:	body
Errors:	None
Description:	Refer to action.
	entity–list is a list of input entities for creating a blend sheet.
Limitations:	None

Example:

```
; blend:make–ss–sheet
; First stage of blending one edge at a time.
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 5 15 20)))
;; block1
; Get a list of the solid block's edges.
(define edges1 (entity:edges block1))
;; edges1
; Attach constant radius blend to 2 connected edges.
(define list1
    (list (car edges1)
    (car (cdr (cdr (cdr edges1))))))
;; list1
; Attach constant radius blend to 2 connected edges.
(define attach (blend:const–rad–on–edge list1 5))
;; attach
; (#[entity 3 1] #[entity 6 1])
; OUTPUT Original

(define sheet1
    (blend:make–ss–sheet (car list1)))
;; sheet1
; OUTPUT Result
```

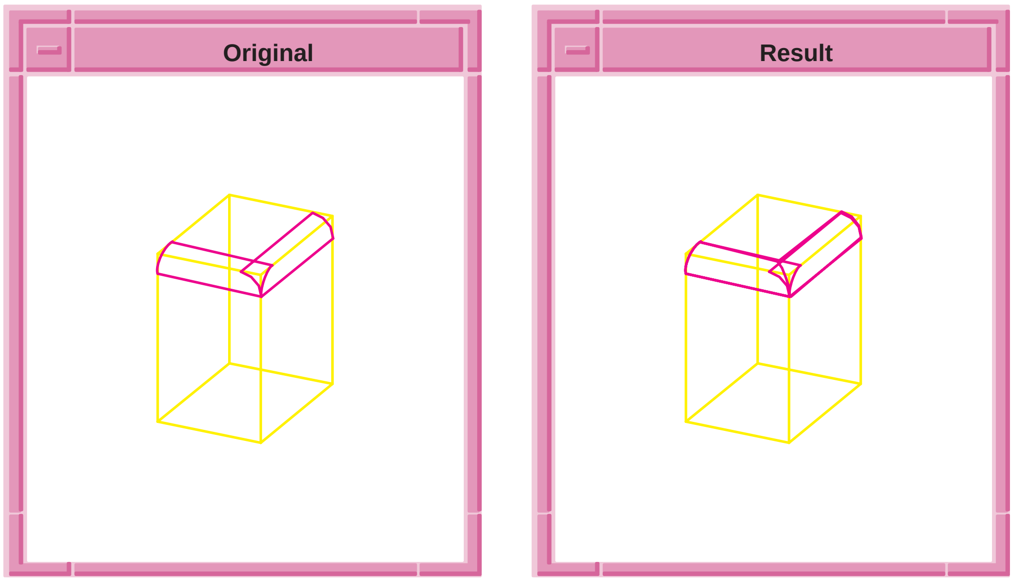


Figure 2-10. blend:make–ss–sheet

blend:make–wire

Scheme Extension: Blending, Modifying Models

Action:	Executes the second phase of blending which creates a wire intersection.
Filename:	blnd/blnd_scm/blndtest.cxx
APIs:	api_make_blend_wire
Syntax:	`(`**`blend:make-wire`**` sheet body [acis-opts])`

Arg Types:

sheet	body
body	body
acis–opts	acis–options

Returns:	body
Errors:	None
Description:	The first phase of blending creates a blend sheet, which is the input argument sheet. This second phase of blending calls the boolean phase one to create an intersection boolean.

This extension creates a wire body that represents the intersection of the blend sheet with the body being blended.

sheet is an input blend sheet.

body is a wire body that represents the intersection of the blend sheet with the body being blended.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–opts.

Limitations: None

Example:

```
; blend:make-wire
; First stage of blending.
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 5 15 20)))
;; block1
; Get a list of the solid block’s edges.
(define edges1 (entity:edges block1))
;; edges1
; Attach constant radius blend to 2 connected edges.
(define list1
    (list (car edges1)
    (car (cdr (cdr (cdr edges1))))))
;; list1
(define attach (blend:const–rad–on–edge list1 5))
;; attach
; (#[entity 3 1] #[entity 6 1])
(define sheet1
    (blend:make–sheet (car list1)))
;; sheet1
; Second stage of blending.
(define wire1 (blend:make–wire sheet1 block1))
;; wire1
```

blend:network

Scheme Extension: Blending, Modifying Models

Action: Creates blends on a list of edges and vertices that make up a single blend network.

Filename:	blnd/blnd_scm/blnd_scm.cxx	
APIs:	api_fix_blends	
Syntax:	(**blend:network** entity-list [acis-opts])	
Arg Types:	entity–list	edge | vertex
	acis–opts	acis–options
Returns:	body	
Errors:	None	

Description: Accepts a list of edges or vertices owned by a solid body. The entity–list needs to have blending attributes already be attached. If the entity–list argument is indeed a list, its members must be from a single solid body and must form a blend network. The extension completes the blend and returns the owning body.

entity–list is a list of edges or vertices owned by a solid body.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:network
; Create a solid block.
(define block1
    (solid:block (position -20 -20 -20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block's edges.
(define list1 (entity:edges block1))
;; list1
; Define two specific edges in a list.
(define short-list
    (list (car list1)
    (car (cdr (cdr (cdr list1))))))
;; short-list
; (#[entity 3 1] #[entity 6 1])
; OUTPUT Original

; Attach a constant radius blend to two edges.
(define blend (blend:const-rad-on-edge short-list 5))
;; blend
; Blend the edges and vertices.
(define network (blend:network short-list))
;; network
; OUTPUT Result
```

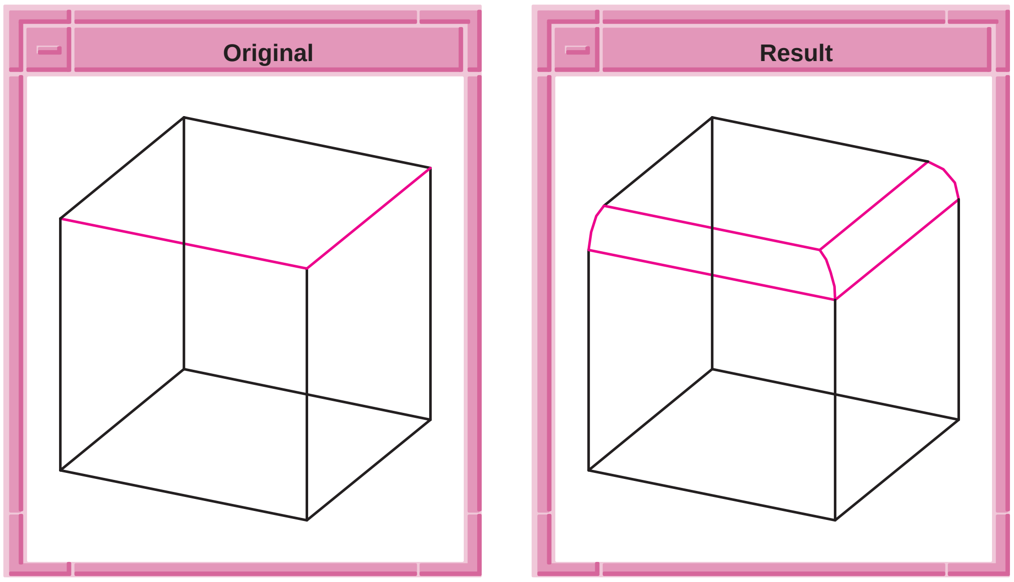


Figure 2-11. blend:network

blend:on–vertex

Scheme Extension: Blending, Modifying Models

Action:	Attaches vertex blend attributes to each vertex in the input list.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	None

Syntax:

```
(blend:on–vertex entity–list [setback=–1 [bulge=1]] |
    [flag [bulge]])
```

Arg Types:

entity–list	vertex | (vertex ...)
setback	real
bulge	real
flag	boolean

Returns: vertex | vertex ...

Errors: None

Description: This extension attaches vertex blend attributes to each vertex in the input entity–list. The optional setback argument is a distance from the vertex to the start of the blended edge. setback changes the setback value on any blended edge leading into the vertex. The default value indicates the edge setback is not changed.

If the logical flag is set to #t then auto–setback is performed. Setbacks are computed and applied to each edge of the vertex. Setback values depend on the geometry of the body local to the blended vertex and on the sizes of blends already assigned to edges ending in the vertex.

entity–list is a list of input entities.

setback argument is a distance from the vertex to the start of the blended edge.

bulge controls the fullness of the vertex blend. It must range from 0 to 2. The default value is suitable for most blends.

flag is set to #t then auto–setback is performed.

This extension returns the input list.

Limitations: None

Example:

```
; blend:on–vertex
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 20 20 20)))
;; block1
; Get a list of the solid block’s edges.
(define list1 (entity:edges block1))
;; list1
; Create a short list of edges.
(define short–list
    (list (car list1)
    (car (cdr (cdr (cdr list1))))
    (car (cdr (cdr (cdr (cdr (cdr (cdr (cdr (cdr
    (cdr list1)))))))))))))
;; short–list
; Get a list of the solid block’s vertices.
(define vert1 (entity:vertices block1))
;; vert1
; OUTPUT Original
; Set a constant radius blend for the given edges.
(define radblend (blend:const-rad-on-edge
    short-list 5))
;; radblend
; (#[entity 3 1] #[entity 6 1] #[entity 12 1])
; Set the vertex blend for one of the vertices.
(define blend (blend:on-vertex (car vert1) 10))
;; blend
; Blend the network of edges and vertices.
(define network (blend:network (car list1)))
;; network
; OUTPUT Result
```

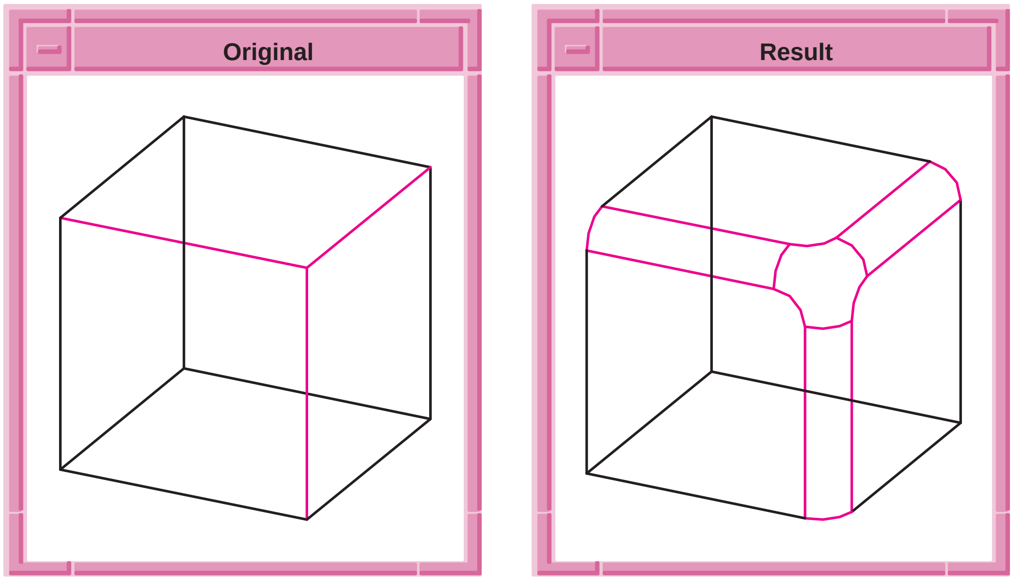


Figure 2-12. blend:on–vertex

blend:preview

Scheme Extension:	Blending, Modifying Models
Action:	Shows a blend network by calculating a quick approximation of the sheet body.
Filename:	blnd/blnd_scm/nblndscm.cxx
APIs:	api_blend_graph

Syntax: (**blend:preview** edge)

Arg Types: edge edge

Returns: unspecified

Errors: None

Description: The sheet body is not a valid ACIS body and is deleted after it is drawn out.

edge is an input edge or vertex. Scheme shows approximately the future blend faces associated with the blending sequence which includes the given edge or vertex

Limitations: Currently only available for DI (not available in GI).

Example:

```
; blend:preview
; Create a solid block.
(define block1 (solid:block (position –20 –20 –20)
    (position 20 20 20)))
;; block1
; Create a blend sheet.
(blend:round (list–ref
    (entity:edges block1) 9) 10 ”fix”)
;; #t
; Get the list of edges.
(define edges (entity:edges block1))
;; edges
(define ewire (list–ref edges 12))
;; ewire
; Attach const round blend attribute to edge.
(define attach (blend:round ewire 7))
;; attach
; (#[entity 6 1] #[entity 17 1] #[entity 19 1])
; OUTPUT Original

; Do a temporary display of blend network.
(blend:preview ewire)
;; ()
; OUTPUT Preview

; Repair blend network.
(blend:fix ewire)
;; #t
; OUTPUT Result
```

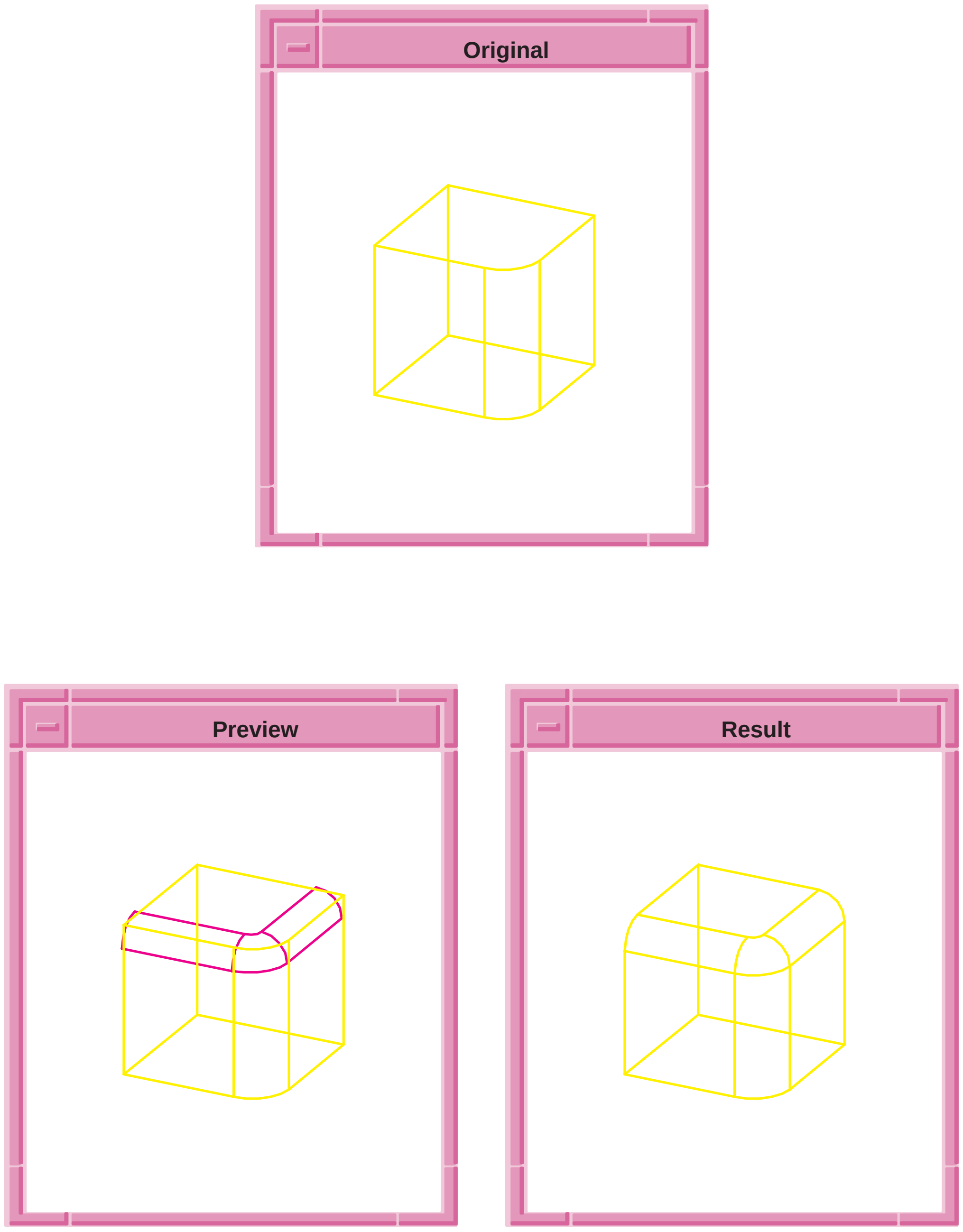


Figure 2-13. blend:preview

blend:remove–from–edge

Scheme Extension: Blending, Modifying Models

Action:	Removes blend attributes, if any, from the input edge.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	None
Syntax:	`(`**`blend:remove–from–edge`**` edge)`
Arg Types:	edge — edge
Returns:	boolean
Errors:	None
Description:	This extension removes any blend attributes from the input edge. This extension returns #t if blend attributes exist and are removed; otherwise, it returns #f. edge is an input edge from which blend attributes are removed.
Limitations:	None

Example:

```
; blend:remove–from–edge
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 20 20 20)))
;; block1
; Create a list of edges.
(define list1 (entity:edges block1))
;; list1
; Set a constant blend radius for the block.
(blend:const–rad–on–edge list1 5)
;; (#[entity 3 1] #[entity 4 1] #[entity 5 1]
;; #[entity 6 1] #[entity 7 1] #[entity 8 1]
;; #[entity 9 1] #[entity 10 1] #[entity 11 1]
;; #[entity 12 1] #[entity 13 1] #[entity 14 1])
; Get blend information on the first edge.
(blend:edge–info (entity 3 1))
;; ("const radius" ("radius" . 5)
;; ("setback at start" . 0)
;; ("setback at end" . 0))
; Remove the blend attributes from the edge.
(blend:remove–from–edge (entity 3 1))
;; #t
; Verify that the blend has been removed.
(blend:edge–info (entity 3 1))
;; #f
```

blend:remove–from–vertex

Scheme Extension: Blending, Modifying Models

Action: Removes blend attributes, if any, from the input vertex.

Filename: blnd/blnd_scm/blnd_scm.cxx

APIs: None

Syntax: (**blend:remove–from–vertex** vertex)

Arg Types: vertex	vertex

Returns: boolean

Errors: None

Description: This extension removes any blend attributes from the input vertex. It returns #t if the blend attributes exist and are removed; otherwise, it returns #f.

vertex is an input vertex from which blend attributes are removed.

Limitations: None

Example:

```
; blend:remove-from-vertex
; Create a solid block.
(define block1
    (solid:block (position -20 -20 -20)
    (position 20 20 20)))
;; block1
; Create a vertex list.
(define list1 (entity:vertices block1))
;; list1
; Attach vertex blend attributes to a list.
(blend:on-vertex list1)
;; (#[entity 3 1] #[entity 4 1] #[entity 5 1]
;; #[entity 6 1] #[entity 7 1] #[entity 8 1]
;; #[entity 9 1] #[entity 10 1])
; Get blend information on the first vertex.
(blend:vertex-info (entity 3 1))
;; ("vertex" ("bulge" . 1))
; Remove the vertex blend attributes from
; the first edge.
(blend:remove-from-vertex (entity 3 1))
;; #t
; Verify that the blend has been removed.
(blend:vertex-info (entity 3 1))
;; #f
```

blend:round

Scheme Extension: Blending, Modifying Models

Action: Attaches const round blend attribute to an edge.

Filename: blnd/blnd_scm/nblndscm.cxx

APIs: api_blend_graph, api_fix_blends, api_set_const_rounds, api_smooth_edge_seq

Syntax: (**blend:round** edge blend-radius [**"fix"** | **"single"**])

Arg Types:

edge	edge
blend–radius	real
"fix"	string
"single"	string

Returns: unspecified

Errors: None

Description: Attaches const round blend attribute on a single edge. Default action is to place attributes on the smoothly connected edges to the given edge. The last argument, if given as fix, completes the blend. If given as single, the attribute is placed on the picked edge only.

Note blend:round *combines* blend:ss–sheet, blend:wire*, and* blend:complete.

edge is an input single edge on which blend attribute is attached.

blend–radius is radius applied for blending.

fix completes the blend.

single places the attribute on the picked edge only.

Limitations: Works on a single edge at a time.

Example:

```
; blend:round
; Create a solid block.
(define block1 (solid:block (position –20 –20 –20)
    (position 20 20 20)))
;; block1
; OUTPUT Original

; Attach const round blend attribute to edge.
(define blend (blend:round (list–ref
    (entity:edges block1) 0) 2 ”fix”))
;; blend
; OUTPUT Result
```

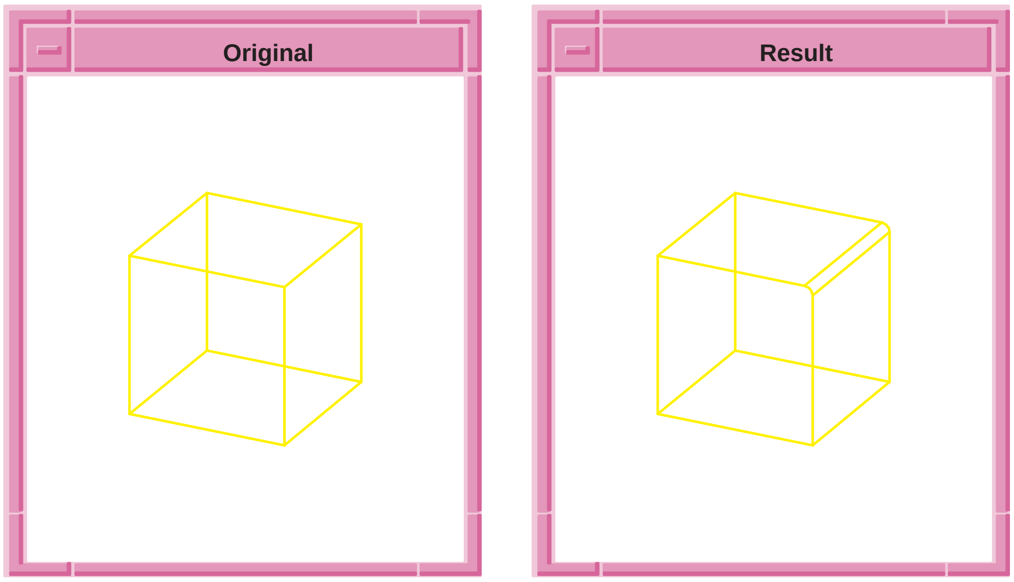


Figure 2-14. blend:round

blend:set–prop

Scheme Extension: Blending, Modifying Models

Action:	Adds additional information to an existing attribute on a blend edge.
Filename:	blnd/blnd_scm/nblndscm.cxx
APIs:	None
Syntax:	`(blend:set-prop edge {prop-name value})`

Arg Types:

edge	edge
prop–name	string
value	real | boolean

Returns: unspecified

Errors: None

Description: Adds additional information to an existing attribute on a blend edge. The information is specified as a string–value pair. The number of arguments can be variable and in any order but must be in pairs. Arguments can be start_setback, end_setback, start_stop_angle, end_stop_angle, or prefer_edge. The prefer_edge argument takes #t or #f. All other arguments take a value of type real.

edge is an input blend edge to which additional information is added.

prop–name is one of the several parameters which control the shape of the stopped blend

value is a value of the property.

Limitations: Arguments must be provided in pairs.

Example:

```
; blend:set–prop
; Create a block
(define block1 (solid:block
    (position –20 –20 –20) (position 30 30 30)))
;; block1
(blend:round (list–ref
    (entity:edges block1) 9) 7 ”fix”)
;; #t
(define entity1 (entity:edges block1))
;; entity1
(define edge1 (list–ref entity1 12))
;; edge1
(define blendround (blend:round edge1 7))
;; blendround
; (#[entity 6 1] #[entity 17 1] #[entity 19 1])
(blend:fix edge1)
;; #t
; OUTPUT Original

(roll)
;; –1
(blend:set–prop
    edge1 ”start_setback” 7 ”start_stop_angle” 45 )
;; ()
(blend:fix edge1)
;; #t
; OUTPUT Result
```

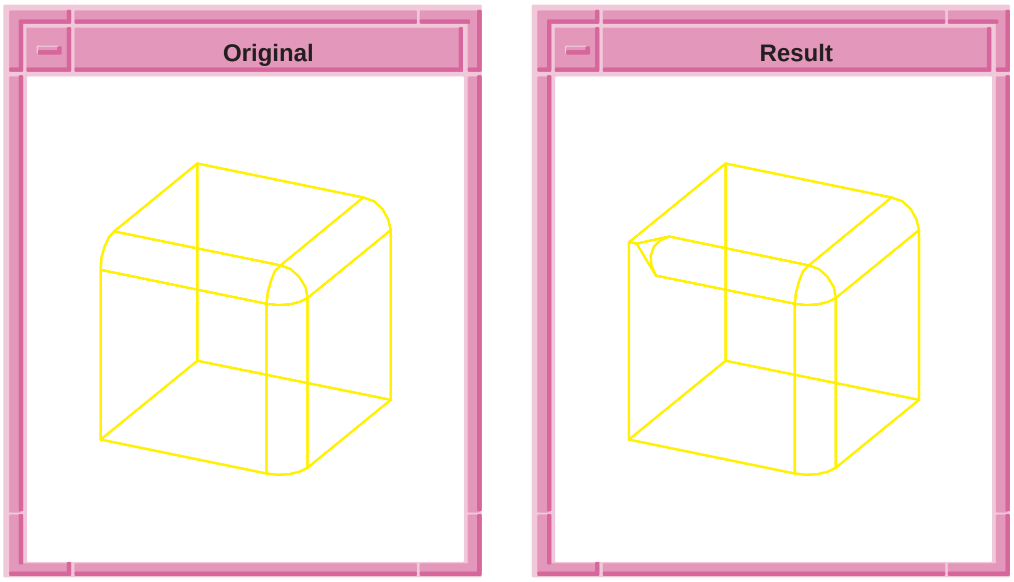


Figure 2-15. blend:set–prop

blend:sheet

Scheme Extension:	Blending, Modifying Models
Action:	Executes the first phase of blending which creates a blend sheet.
Filename:	blnd/blnd_scm/nblndscm.cxx
APIs:	api_blend_graph, api_make_blend_sheet
Syntax:	`(`**`blend:sheet`**` edge [acis-opts])`

Arg Types:

edge	edge
acis–opts	acis–options

Returns: body

Errors: None

Description: Builds the sheet body for a given blend network. This, the first stage of blending, produces the blend geometry.

The created blend sheet contains one or more faces for each blended entity. The blend body is the body that owns the blended entities. Attributes link the sheet to the blend body, thereby facilitating the next stage of blending. (In the next stage of blending, the sheet is combined with the blend body).

The sheet faces lie on new blend surfaces or on surfaces of the blend body where these are needed to cap blends at ends of blended edges.

Where two blend faces are made for blended edges meeting non–smoothly in an unblended vertex, the faces are trimmed to one another (i.e., are mitered) and the sheet faces are joined.

edge is an input blend edge.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Limitations: None

Example:

```
; blend:sheet
; First stage of blending.
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 5 15 20)))
;; block1
; Get a list of the solid block’s edges.
(define edges1 (entity:edges block1))
;; edges1
; Attach constant radius blend to 2 connected edges.
(define list1
    (list (car edges1)
    (car (cdr (cdr (cdr edges1))))))
;; list1
; OUTPUT Original

; Attach constant radius blend to 2 connected edges.
(define attach (blend:const–rad–on–edge list1 5))
;; attach
; (#[entity 3 1] #[entity 6 1])
(define sheet1
    (blend:sheet (car list1)))
;; sheet1
; OUTPUT Result
```

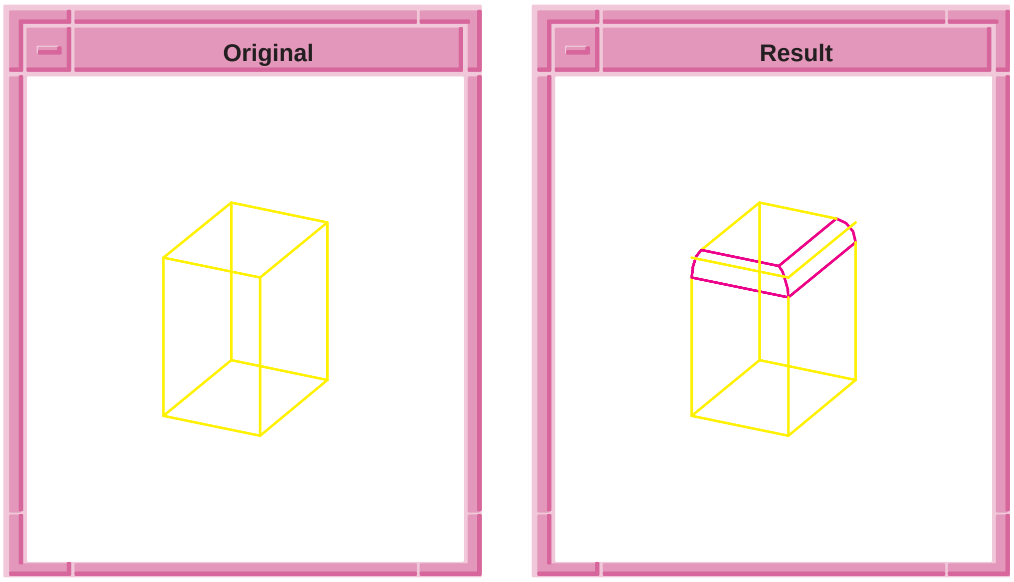


Figure 2-16. blend:sheet

blend:smooth–edges–to–curve

Scheme Extension:	Blending, Modifying Models
Action:	Constructs a curve entity corresponding to a list of edges typically returned by blend:get–smooth–edges.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_smooth_edges_to_curve
Syntax:	`(blend:smooth-edges-to-curve edge-list [acis-opts])`
Arg Types:	edge–list — edge | (edge ...) acis–opts — acis–options
Returns:	(entity...)
Errors:	None
Description:	This Scheme extension makes a single curve that approximates the given list of smoothly–connected edges. The input edge list is typically created by the API api_smooth_edge_seq (see the Scheme command blend:get–smooth–edges). The list need not be sorted at input.

This Scheme extension can be used in blending to find a defining curve for a variable–radius blend sequence, which parameterizes the blend surface and calibrates the radius function.

This Scheme extension returns an entity list containing one curve and two edges (the curve and the edges corresponding to the start and end of the curve).

edge–list is a given list of smoothly–connected edges.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Limitations: None

Example:

```
; blend:smooth–edges–to–curve
; Create the geometry to illustrate extention.
; Create a solid block and cylinder and unite them.
(define block (solid:block
    (position –20 –20 –20) (position 20 20 20)))
;; block
(define cylinder (solid:cylinder
    (position 20 0 –20) (position 20 0 20) 20))
;; cylinder
(define my–part (solid:unite block cylinder))
;; my–part
; Get a list of all entities.
(define my–entity–list (part:entities))
;; my–entity–list
; Get the first entity as my–body.
(define my–body (car my–entity–list))
;; my–body
; Get the body transform.
(define my–transf (body:get–transform my–part))
;; my–transf
; Pick an edge on the body and show it in red.
(define def–edge ( pick:edge (ray
    (position 10 –20 100) (gvector 0 0 –1))))
;; def–edge
(define red (entity:set–color def–edge RED))
;; red
; Get all edges that are smooth to the selected edge.
(define smooth–edges
    (blend:get–smooth–edges def–edge))
```

```
;; smooth-edges
; Display them in blue.
(define blue (entity:set-color smooth-edges BLUE))
;; blue
; Construct a curve approximating the smooth edges.
(define smooth
    (blend:smooth-edges-to-curve smooth-edges))
;; smooth
; Get the calibration curve.
(define smooth-curve (car smooth))
;; smooth-curve
; Define a position list.
(define position-list (list (position -20 -20 -20)
    (position 20 -20 20) (position 20 20 20)
    (position -20 20 20)))
;; position-list
; Define a radii list.
(define radii-list (list 8 5 5 8))
;; radii-list
; Build the v-radius object.
(if my-transf
    (define v-radius (abl:pos-rad position-list
    radii-list smooth-curve my-transf))
    (define v-radius (abl:pos-rad position-list
    radii-list smooth-curve)))
;; v-radius
; Complete the blend.
(define blend1 (abl:edge-blend def-edge v-radius))
;; blend1
(define blend2 (blend:network
    (blend:get-network def-edge)))
;; blend2
```

blend:ss–sheet

Scheme Extension: Blending, Modifying Models

Action: Calculates the blend sheet one segment at a time.

Filename: blnd/blnd_scm/nblndscm.cxx

APIs: api_blend_graph, api_concl_blend_ss, api_do_one_blend_ss, api_init_blend_ss

Syntax: (**blend:ss–sheet** edge [acis–opts])

Arg Types:	edge	edge
	acis–opts	acis–options

Returns: body

Errors: None

Description: Calculates the sheet body for a blend network one segment at a time. The partially built sheet body is re–drawn after each segment calculation in order to provide a graphical display of the creation of the blend.

Note blend:round *combines* blend:ss–sheet, blend:wire*, and* blend:complete.

edge is an input edge.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:ss-sheet
; Create a solid block.
(define block1 (solid:block (position 0 0 0)
    (position 10 10 10)))
;; block1
; Attach const round blend attribute to edge.
(define attach (blend:round (list-ref
    (entity:edges block1) 9) 3))
;; attach
; (#[entity 12 1])
; Calculate the sheet body for a blend network.
(define sheet1 (blend:ss-sheet (list-ref
    (entity:edges block1) 9)))
;; sheet1
; Create the blend wire.
(define wire1 (blend:wire (list-ref
    (entity:edges block1) 9) sheet1))
;; wire1
; blend edges w, s, and b.
(define complete
    (blend:complete wire1 sheet1 block1))
;; complete
; #[entity 2 1]
; Attach const round blend attribute to edge.
(define roundblend (blend:round (list-ref
    (entity:edges block1) 12) 2))
;; roundblend
; (#[entity 6 1] #[entity 19 1] #[entity 21 1])
; Calculate the sheet body for a blend network.
(define sheet2 (blend:ss-sheet (list-ref
    (entity:edges block1) 12)))
;; sheet2
; Create the blend wire.
(define wire2 (blend:wire (list-ref
    (entity:edges block1) 12) sheet2))
;; wire2
; blend edges w, s, and b.
(define complete
    (blend:complete wire2 sheet2 block1))
;; complete
; #[entity 2 1]
```

blend:var–rad–on–edge

Scheme Extension: Blending, Modifying Models

Action:	Attaches a variable radius blend attribute to each edge in the input list.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_del_entity, api_set_var_blends, api_smooth_edges_to_curve

Syntax:

```
(blend:var–rad–on–edge entity–list radius–start
    radius–end [setback–start=0
    setback–end=setback–start] [acis–opts])
```

Arg Types:

entity–list	edge **|** (edge ...)
radius–start	real
radius–end	real
setback–start	real
setback–end	real
acis–opts	acis–options

Returns: entity **|** entity ...

Errors: None

Description: This extension attaches a variable radius blend attribute to each EDGE in the input entity–list. The optional setback–start and setback–end represent a distance from the vertex to the start of the blended edge. If only one setback value is provided, it is applied to both setback–start and setback–end.

This extension returns the input entity list.

entity–list is a list of input edge entities to which radius blend attribute is attached.

radius–start and radius–end are the radius blend value at the start of edge and end of edge.

setback–start and setback–end represent a distance from the vertex to the start of the blended edge.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:var-rad-on-edge
; Create a solid block.
(define block1
    (solid:block (position -20 -20 -20)
    (position 30 30 30)))
;; block1
; Create an edge list.
(define list1 (entity:edges block1))
;; list1
; OUTPUT Original

; Set the variable radius blend for an edge.
(define blend
    (blend:var-rad-on-edge (car list1) 5 8))
;; blend
; #[entity 3 1]
; Set the variable radius blend for another edge.
(define blendvar (blend:var-rad-on-edge
    (car (cdr (cdr (cdr list1)))) 3 2))
;; blendvar
; #[entity 6 1]
; Blend the network of edges.
(blend:fix (car list1))
;; #t
; OUTPUT Result
```

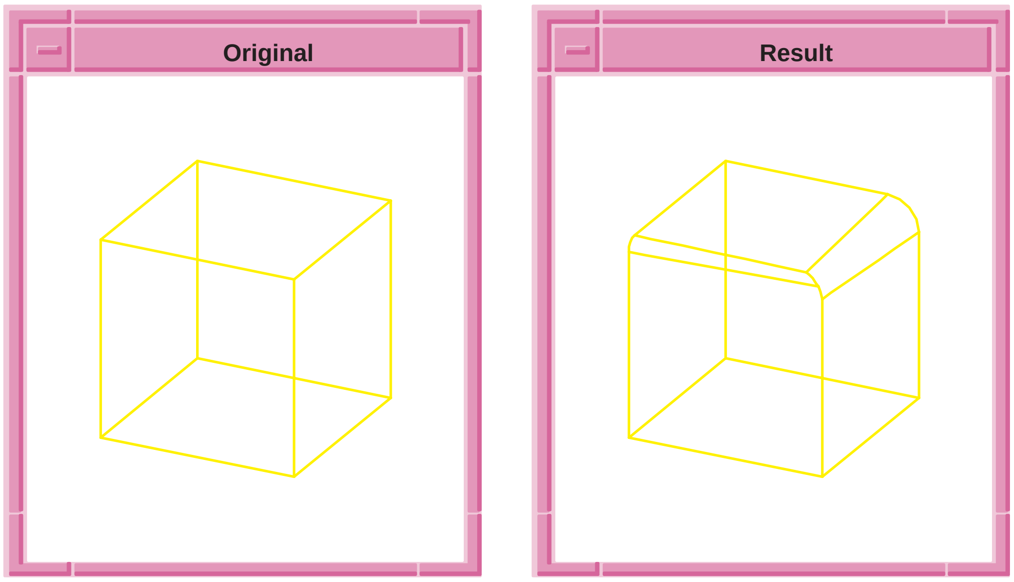


Figure 2-17. blend:var–rad–on–edge

blend:var–round

Scheme Extension: Blending, Modifying Models

Action:	Attaches variable round blend attributes to a sequence of edges.
Filename:	blnd/blnd_scm/nblndscm.cxx
APIs:	api_blend_graph, api_fix_blends, api_set_var_blends, api_smooth_edge_seq, api_smooth_edges_to_curve

Syntax:

```
(blend:var-round edge start-radius end-radius
    ["fix" | "single"])
```

Arg Types:

edge	edge
start–radius	real
end–radius	real
”fix”	string
”single”	string

Returns: unspecified

Errors: None

Description: Attaches variable round blend attributes on a sequence of edges. The default attaches the attributes on the smoothly connected edges to the given edge. The last argument, if defined as “fix”, completes the blend for the sequence. If given as “single”, the attribute is placed only on the picked edge (not the sequence). The arguments “fix” and “single” may be also input as “f” or “s”.

edge is an input edge to which variable round blend attributes are attached.

start–radius and end–radius are the radius blend value at the start of edge and end of edge.

fix completes the blend for the sequence.

single places the attribute only on the picked edge.

Limitations: None

Example:

```
; blend:var–round
; Create a block
(define block1 (solid:block
    (position –20 –20 –20) (position 30 20 30)))
;; block1
(blend:round (list–ref
    (entity:edges block1) 9) 8 ”fix”)
;; #t
; OUTPUT Original

(define edge1 (entity:edges block1))
;; edge1
(define edge2 (list–ref edge1 12))
;; edge2
(blend:var–round edge2 4 8 ”fix”)
;; #t
; OUTPUT Result
```

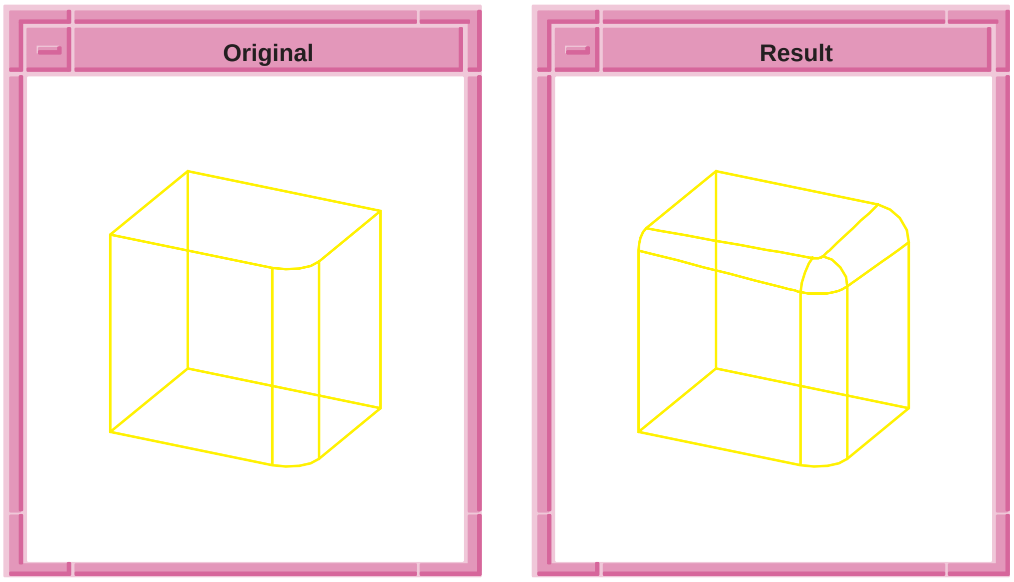


Figure 2-18. blend:var–round

blend:vertex

Scheme Extension:	Blending, Modifying Models
Action:	Attaches blend attribute on a vertex.
Filename:	blnd/blnd_scm/nblndscm.cxx
APIs:	api_set_vblend, api_set_vblend_auto, api_set_vblend_autoblend
Syntax:	`(`**`blend:vertex`**` vertex {prop–name value} [type] [acis–opts])`

Arg Types:

vertex	vertex
prop–name	string
value	real
type	string
acis–opts	acis–options

Returns: unspecified

Errors: None

Description: Attaches a vertex blend attribute on a vertex. Optional properties of the vertex blend such as bulge and setback can be specified next. The final keyword forces the type of vertex blend to be made. The values can be vblend, autosetback, or autoblend.

vertex is a vertex to which blend attribute is attached.

prop–name is the optional properties of the vertex blend such as bulge and setback.

value is the property name value.

type is a type of the vertex blend to be made.

acis–opts contains journaling and versioning information.

Limitations: None

Example:

```
; blend:vertex
; Create a solid block.
(define block1 (solid:block (position –15 –10 –15)
    (position 20 25 20)))
;; block1
; Attach blend attribute to edge 0
(define blend (blend:round (list–ref
    (entity:edges block1) 0) 5))
;; blend
; (#[entity 3 1])
; Attach blend attribute to edge 3
(define blend2 (blend:round (list–ref
    (entity:edges block1) 3) 7))
;; blend2
; (#[entity 6 1])
; Attach blend attribute to edge 9
(define blendround (blend:round (list–ref
    (entity:edges block1) 9) 9))
;; blendround
; (#[entity 12 1])
; OUTPUT Original

; Attach blend attribute to vertex 0
(define vertex (blend:vertex
    (list–ref (entity:vertices block1) 0)))
;; vertex
; #[entity 15 1]
; Execute blend on vertex and edges
(blend:fix (list–ref (entity:vertices block1) 0))
;; #t
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

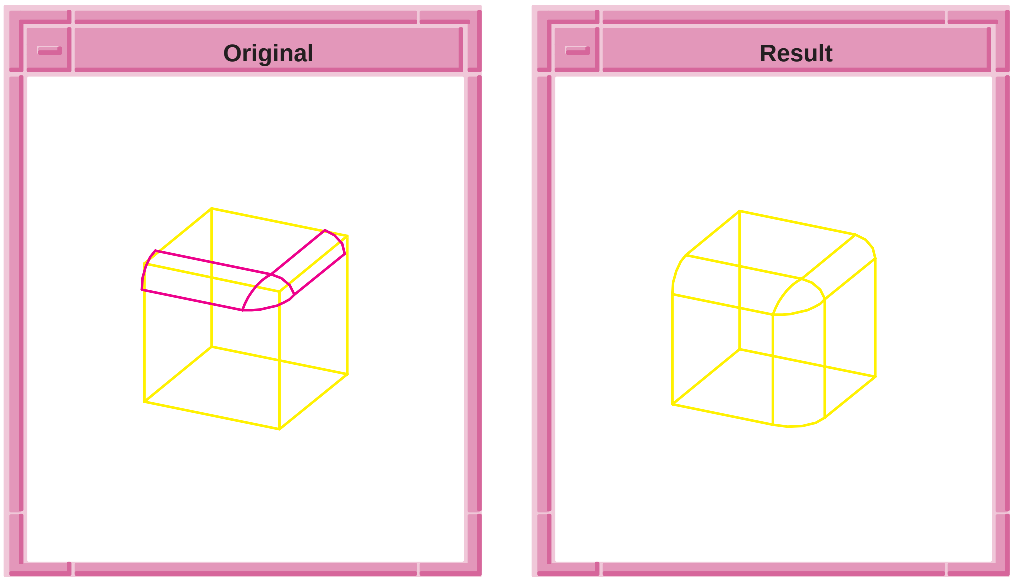


Figure 2-19. blend:vertex – example 1

```
; Example 2
; Blend Vertex using setback.
(part:clear)
;; #t
(define block1 (solid:block (position -20 -20 -20)
    (position 15 25 25)))
;; block1
; Attach blend attribute to edge 0.
(define edge0 (blend:round (list-ref
    (entity:edges block1) 0) 12))
;; edge0
; (#[entity 24 1])
; Attach blend attribute to edge 3
(define edge3 (blend:round (list-ref
    (entity:edges block1) 3) 8))
;; edge3
; (#[entity 27 1])
; Attach blend attribute to edge 9
(define edge9 (blend:round (list-ref
    (entity:edges block1) 9) 4))
;; edge9
; (#[entity 33 1])
; OUTPUT Original
; Attach blend attribute for setback on vertex 0
(define setback (blend:vertex (list-ref
    (entity:vertices block1) 0) ”setback” 6))
;; setback
; #[entity 36 1]
; Execute blend on vertex and edges.
(blend:fix (list-ref (entity:vertices block1) 0))
;; #t
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

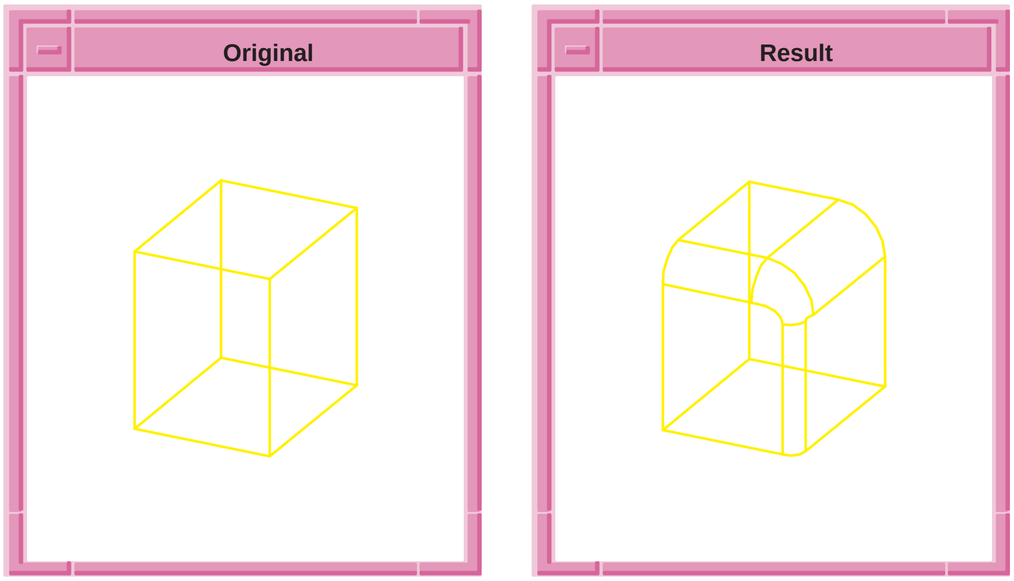


Figure 2-20. blend:vertex – example 2

```
; Example 3
; Blend Vertex using vblend.
(part:clear)
;; #t
(define block1 (solid:block (position –25 –20 –25)
    (position 35 30 20)))
;; block1
; Attach blend attribute to edge 0.
(define edge0 (blend:round (list–ref
    (entity:edges block1) 0) 15))
;; edge0
; (#[entity 45 1])
; Attach blend attribute to edge 3.
(define edge3 (blend:round (list–ref
    (entity:edges block1) 3) 10))
;; edge3
; (#[entity 48 1])
; Attach blend attribute to edge 9.
(define blend (blend:round (list–ref
    (entity:edges block1) 9) 15))
;; blend
; (#[entity 54 1])
; OUTPUT Original

; Attach blend attribute for vblend on vertex 0
(define vertex0 (blend:vertex (list–ref
    (entity:vertices block1) 0) ”vblend”))
;; vertex0
; #[entity 57 1]
; Execute blend on vertex and edges.
(blend:fix (list–ref (entity:vertices block1) 0))
;; #t
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

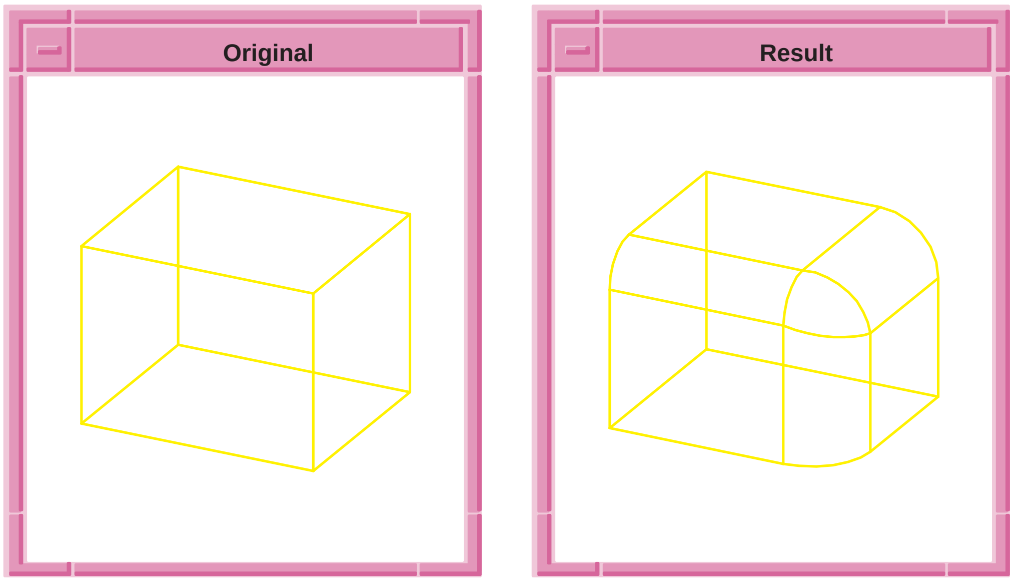


Figure 2-21. blend:vertex – example 3

```
; Example 4
; Blend Vertex using autosetback.
(part:clear)
;; #t
(define block1 (solid:block (position -25 -20 -25)
    (position 35 30 20)))
;; block1
; Attach blend attribute to edge 0.
(define edge0 (blend:round (list-ref
    (entity:edges block1) 0) 15))
;; edge0
; (#[entity 66 1])
; Attach blend attribute to edge 3.
(define edge3 (blend:round (list-ref
    (entity:edges block1) 3) 10))
;; edge3
; (#[entity 69 1])
; Attach blend attribute to edge 9.
(define attach9 (blend:round (list-ref
    (entity:edges block1) 9) 15))
;; attach9
; (#[entity 75 1])
; OUTPUT Original
; Attach blend attribute for autosetback on vertex 0
(define setback0 (blend:vertex (list-ref
    (entity:vertices block1) 0) ”autosetback”))
;; setback0
; #[entity 78 1]
; Execute blend on vertex and edges.
(blend:fix (list-ref (entity:vertices block1) 0))
;; #t
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

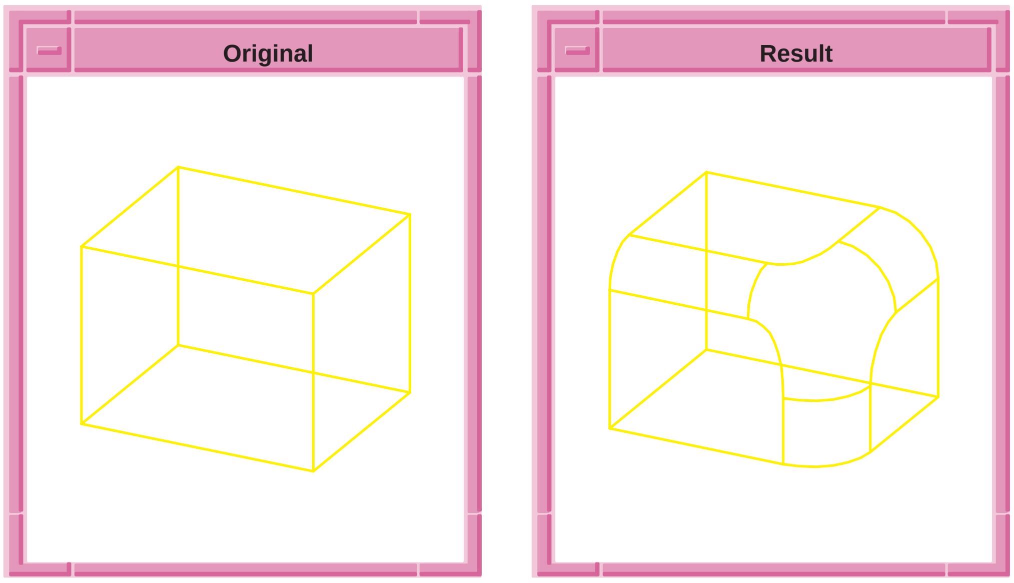


Figure 2-22.   blend:vertex – example 4

```
; Example 5
; Blend Vertex using autoblend.
(part:clear)
;; #t
(define block1 (solid:block (position –25 –20 –25)
    (position 35 30 20)))
;; block1
; Attach blend attribute to edge 0.
(define attach0 (blend:round (list–ref
    (entity:edges block1) 0) 15))
;; attach0
; (#[entity 87 1])
; Attach blend attribute to edge 3.
(define edge3 (blend:round (list–ref
    (entity:edges block1) 3) 10))
;; edge3
; (#[entity 90 1])
; Attach blend attribute to edge 9.
(define edge9 (blend:round (list–ref
    (entity:edges block1) 9) 15))
;; edge9
; (#[entity 96 1])
; OUTPUT Original

; Attach blend attribute for autoblend on vertex 0
(define autoblend0 (blend:vertex (list–ref
    (entity:vertices block1) 0) ”autoblend”))
;; autoblend0
; #[entity 99 1]
; Execute blend on vertex and edges.
(blend:fix (list–ref (entity:vertices block1) 0))
;; #t
(view:refresh)
;; #[view 1079201720]
; OUTPUT Result
```

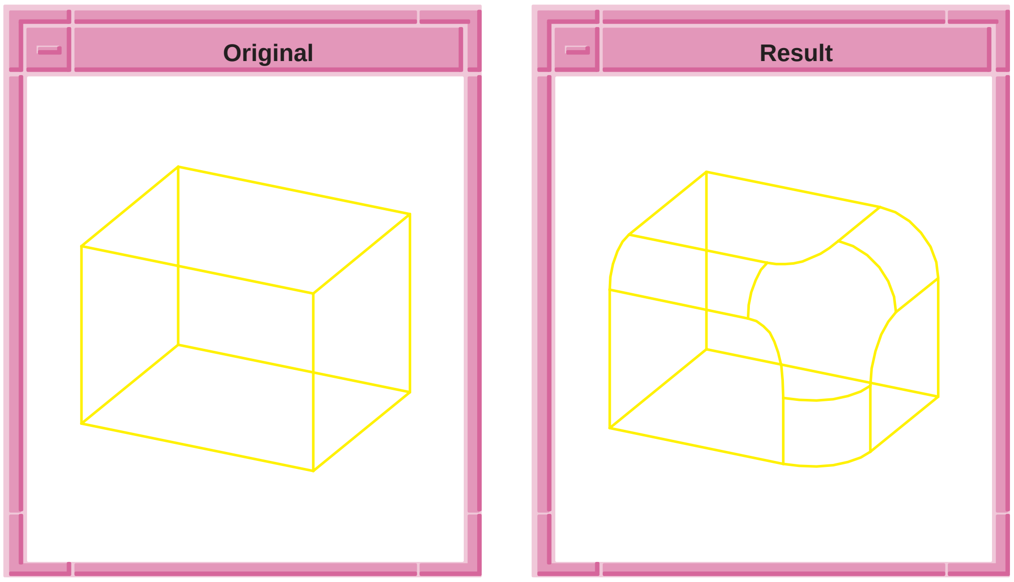


Figure 2-23. blend:vertex – example 5

blend:vertex–info

Scheme Extension: Blending, Modifying Models

Action:	Gets a list of the vertex blend type and internal data values.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	None
Syntax:	`(blend:vertex-info vertex)`
Arg Types:	vertex vertex
Returns:	(string . real) | boolean
Errors:	None
Description:	This extension tests the specified vertex for blend attributes. It returns a list containing the blend type and internal data values. If no blend attributes exist, this extension returns #f. vertex is an input vertex which will be tested for blend attributes.
Limitations:	None

Example:

```
; blend:vertex-info
; Create a solid block.
(define block1
    (solid:block (position -20 -20 -20)
    (position 20 20 20)))
;; block1
; Create a vertex list.
(define list1 (entity:vertices block1))
;; list1
; Attach vertex blend attributes to a list.
(blend:on-vertex list1)
;; (#[entity 3 1] #[entity 4 1] #[entity 5 1]
;; #[entity 6 1] #[entity 7 1] #[entity 8 1]
;; #[entity 9 1] #[entity 10 1])
(blend:vertex-info (car list1))
;; ("vertex" ("bulge" . 1))
```

blend:wire

Scheme Extension: Blending, Modifying Models

Action: Creates the blend wire (second stage of blending).

Filename: blnd/blnd_scm/nblndscm.cxx

APIs: api_make_blend_wire

Syntax: (**blend:wire** edge sheet [acis–opts])

Arg Types:

edge	edge
sheet	body
acis–opts	acis–options

Returns: wire–body

Errors: None

Description: Creates the blend wire, imprints the sheet body with the blank body, and returns the imprint as a wire body. This is the second stage of blending (blend:sheet is the first stage).

The first phase of blending (blend:sheet) creates a blend sheet. The third phase of blending (blend:complete), calls the boolean phase two to attach the sheet to the blank body using wire.

edge is an input edge.

sheet is a blending sheet.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Note blend:round *combines* blend:ss–sheet, blend:wire, *and* blend:complete.

Limitations: None

Example:

```
; blend:wire
; Create a solid block.
(define block1
    (solid:block (position –20 –20 –20)
    (position 5 15 20)))
;; block1
; Get a list of the solid block’s edges.
(define edges1 (entity:edges block1))
;; edges1
; Attach constant radius blend to 2 connected edges.
(define list1
    (list (car edges1)
    (car (cdr (cdr (cdr edges1))))))
;; list1
; OUTPUT Original

; Attach const round blend attribute to edge.
(define attach (blend:round (car edges1) 5))
;; attach
; (#[entity 3 1])
; Create the blend sheet – first stage of blending.
(define sheet1 (blend:sheet (car list1)))
;; sheet1
; Second stage of blending – create the blend wire.
(define wire1 (blend:wire sheet1 block1))
;; wire1
; OUTPUT Result
```

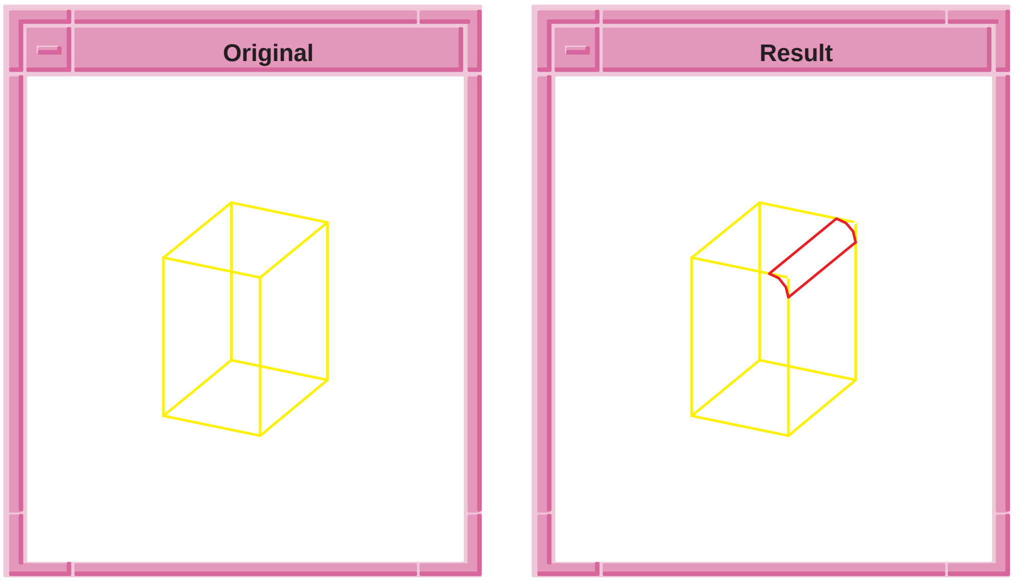


Figure 2-24. blend:wire

solid:blend–edges

Scheme Extension: Blending, Modifying Models

Action: Creates a cylindrical blend on a list of edges.

Filename: blnd/blnd_scm/blnd_scm.cxx

APIs: api_blend_edges

Syntax: `(solid:blend-edges entity-list radius [acis-opts])`

Arg Types:	entity–list	entity | (entity ...)
	radius	real
	acis–opts	acis–options

Returns: (entity ...)

Errors: None

Description: entity–list specifies a solid EDGE entity or a list of solid EDGE entities to be blended.

radius specifies the length between the faces adjoining the edges.

This extension returns a list of entity owners of all the edges affected by the blend. In the case where all the edges in the entity–list belong to a single solid, this extension returns only one element (the solid).

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Limitations: None

Example:

```
; solid:blend–edges
; Create a solid block.
(define block1
    (solid:block (position –25 –25 –25)
    (position 25 25 25)))
;; block1
; Get a list of the solid block’s edges.
(define edges1 (entity:edges block1))
;; edges1
; OUTPUT Original

; Blend two of the edges.
(define blend (solid:blend–edges (list (car edges1)
    (car (cdr (cdr edges1)))) 8))
;; blend
; OUTPUT Result
```

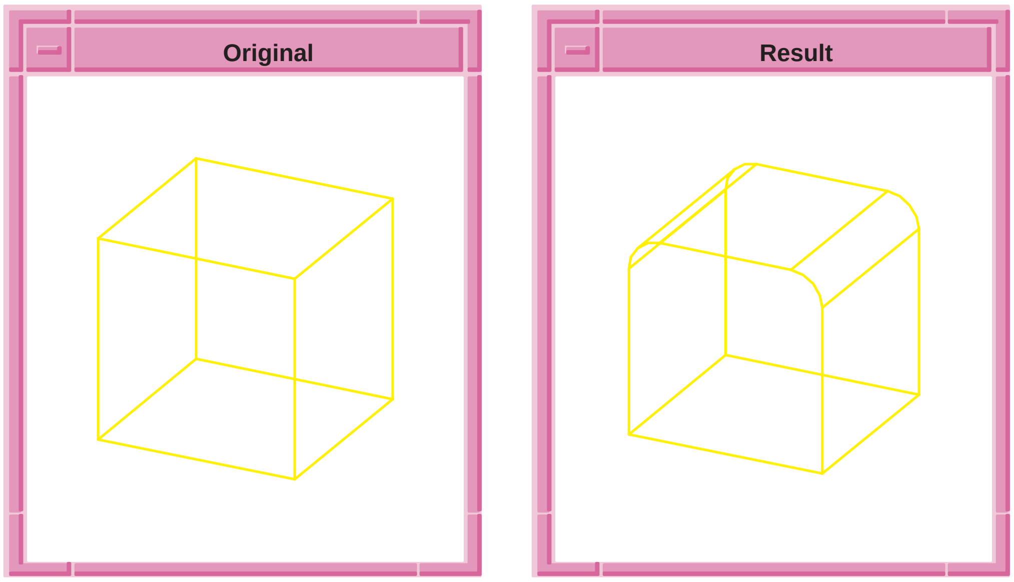


Figure 2-25. solid:blend–edges

solid:chamfer–edges

Scheme Extension:	Blending, Modifying Models
Action:	Creates a chamfer blend on a list of edges.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_chamfer_edges

Syntax:

```
(solid:chamfer-edges entity-list
    left-offset-distance [right-offset-distance]
    [acis-opts])
```

Arg Types:

entity–list	entity | (entity ...)
left–offset–distance	real
right–offset–distance	real
acis–opts	acis–options

Returns: (entity ...)

Errors: None

Description: This extension chamfers edges using an offset distance from the edge along the faces adjoining the edge. A list of edges may be specified which creates a series of chamfers between the faces adjoining the edges.

entity–list specifies a solid edge entity or list of solid edge entities to be chamfered.

left–offset–distance specifies the amount to be taken off the edge on the left face. If right–offset–distance is not specified, it is assumed equal to left–offset–distance. The sense of offsets is determined by the direction of the edge.

This extension returns a list of entity owners of all the edges in the entity–list. If all the edges in the entity–list belong to a single solid, this extension returns only one element (the solid).

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Limitations: None

Example:

```
; solid:chamfer–edges
; Create geometry to illustrate this command.
(define block1
    (solid:block (position –25 –25 –25)
    (position 25 25 25)))
;; block1
; Get a list of the solid block’s edges.
(define edges1 (entity:edges block1))
;; edges1
; OUTPUT Original

; Chamfer two of the solid block’s edges.
(define chamfer–example (solid:chamfer–edges
    (list (car (cdr edges1))
    (car (cdr (cdr (cdr edges1))))) 10 5))
;; chamfer–example
; OUTPUT Result
```

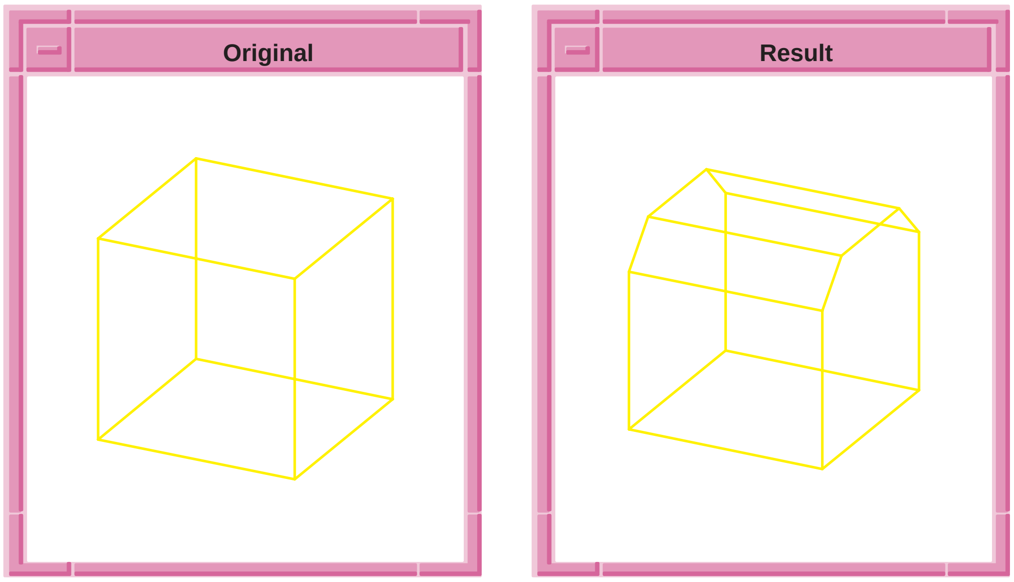


Figure 2-26. solid:chamfer–edges

solid:chamfer–vertex

Scheme Extension: Blending, Modifying Models

Action: Creates a planar chamfer on a vertex of a solid body.

Filename: blnd/blnd_scm/blnd_scm.cxx

APIs: api_chamfer_vertex

Syntax:

```
(solid:chamfer-vertex vertex offset1
    {[[edge1] [{offsets edges}]*
    [distancestraight=#t]] | [chamfernormal]}
    [acis-opts])
```

Arg Types:

vertex	vertex
offset1	real
edge1	edge
offsets	real
edges	edge
distancestraight	boolean
chamfernormal	gvector
acis–opts	acis–options

Returns: body

Errors: None

Description: Creates a planar chamfer on a vertex of a solid body.

There are two distinct implementations of this command. One is when offsets are the distance along the edge(s) and additional edge and offset pairs are specifically defined (chamferNormal is not defined). In the second implementation, the chamfer plane is constructed to be perpendicular to the chamferNormal vector and the position of the plane is determined by offsetting from the vertex along the chamferNormal. In this case, chamferNormal must be specified and no edges or offsets (besides offset1) are defined.

If there are more than 3 edges touching the vertex and not all of the edge pointers (edge1 or edges), are specified in the argument list, all offsets are assumed equal offset1. This applies even if the offsets/edges pairs are defined correctly. The three “best” edges are selected according to the following algorithm: points are placed on all edges at offset1 from the vertex and then three such edges are selected. The selected edges all have the same convexity (at the points location) and these points make the triangle with the largest perimeter.

When the vertex is the apex of a cone, and chamferNormal is not specified, vertex and offset1 are the only arguments needed. offset1 must be defined as the radius of the sphere with the center at the vertex (which intersects the cone in order to obtain the intersection curve). This curve is used to find the location of the chamfer plane, which passes through the curve.

offset1 can be defined as a negative value to create a concave chamfer (when material is added to form a chamfer face). Conversely, a positive offset1 value provides no information about the chamfering type. For example, a positive offset1 can be used for removing material from convex vertices and adding material to concave ones. Therefore, ACIS must detect the chamfering type. When the vertex does not have adjacent edges, which is only possible with cones and vortex tori, ACIS analyzes the face sense. For vertices with adjacent edge(s), convexity of the edge(s) is used to predict the chamfering type. If such a prediction is impossible (e.g., a vertex with mixed–convexity edges) and offset1 is positive, convex chamfer is assumed.

If chamferNormal is specified, offset1 represents the offset of the chamfer plane from the vertex along the normal. This implementation of (solid:chamfer–vertex) allows for tilted chamfers on vertices with zero or one adjacent edge. If chamferNormal is not defined, offset1 represents the offset along the first edge or the radius of an intersection sphere. Additionally, offset along any edge cannot exceed the length of that edge and a vertex with 3 edges of mixed convexity may not chamfer successfully.

This extension returns a solid body which owns the chamfered vertex.

solid:chamfer–vertices may serve as a alternative command choice for chamfering multiple vertices with equal offsets.

vertex is an input vertex.

offset1 is a distance from the vertex.

distanceStraight is TRUE (default), offsets define the distance along the straight line between the vertex and the point on the edge. When distanceStraight is FALSE, offsets define the distance along the edge. The chamfer plane is positioned to pass through all these points. distanceStraight has no effect if the edges are straight. As many arguments as necessary may be supplied, however; distanceStraight always marks the end of the argument list.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Limitations: If chamferNormal is not defined offset along any edge cannot exceed the length of that edge and a vertex with 3 edges of mixed convexity may not always chamfer successfully. When chamferNormal is specified and offset1 is positive, ACIS may fail to detect a concave vertex with edges of mixed convexity. In this case, use a negative offset1 value to explicitly specify a concave vertex. When any offset is so large that the chamfer plane should intersect the faces not containing the vertex, chamfering is not performed and a ”chamfer case not implemented” error message is returned.

Example:

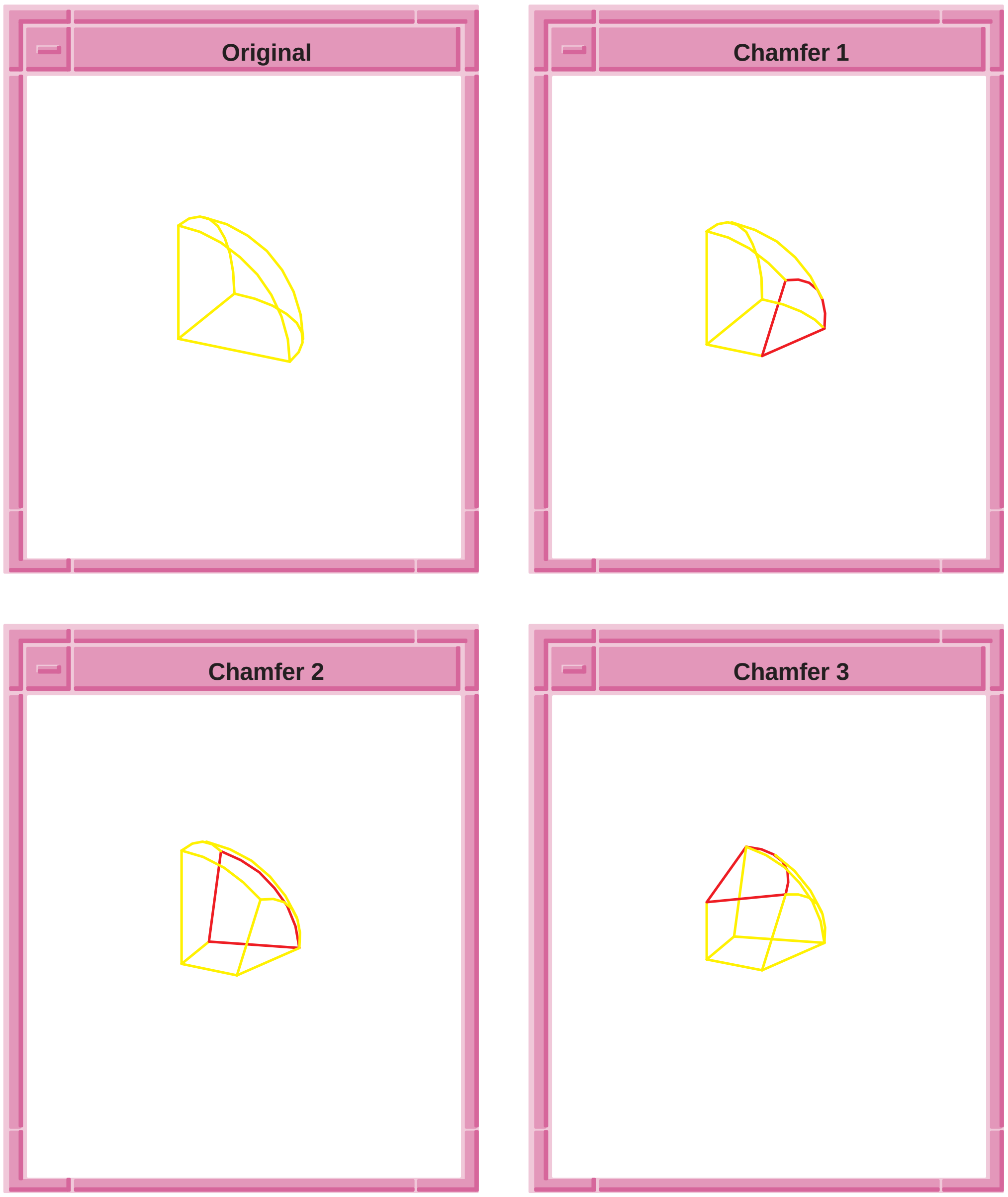
```
; solid:chamfer-vertex
; Create geometry to illustrate this command.
(define R 30)
;; R
(define origin (position 0 0 0))
;; origin
(define sphere (solid:sphere origin R))
;; sphere
(define block (solid:block origin (position R R R)))
;; block
(define intersect (solid:intersect sphere block))
;; intersect
; OUTPUT Original

(define R/2 (/ R 2))
;; R/2
(define RPi/4 (* (/ PI 4) R))
;; RPi/4
(define vertex (pick:vertex (ray (position R 0 0)
    (gvector 1 0 0))))
;; vertex
(define edge1 (pick:edge
    (ray (position (/ R 2) 0 0) (gvector 0 0 -1))))
;; edge1
(define edge2 (pick:edge
    (ray (position (/ R 2) 0 (/ R 4))
    (gvector 1 0 0))))
;; edge2
(define edge3 (pick:edge (ray
    (position (/ R 2) (/ R 2) 0) (gvector 1 0 0))))
;; edge3
(define chamfer1 (solid:chamfer-vertex
    vertex R/2 edge1 RPi/4 edge2 RPi/4 edge3 #f))
;; chamfer1
; OUTPUT Chamfer 1
```

```
(define vertex2 (pick:vertex
    (ray (position 0 R 0) (gvector 0 1 0))))
;; vertex2
(define edge1 (pick:edge
    (ray (position 0 (/ R 2) 0) (gvector 0 0 –1))))
;; edge1
(define edge2 (pick:edge (ray
    (position 0 (/ R 2) (/ R 4)) (gvector 0 1 0))))
;; edge2
(define edge3 (pick:edge (ray
    (position (/ R 4) (/ R 2) 0) (gvector 0 1 0))))
;; edge3
(define chamfer2 (solid:chamfer–vertex
    vertex2 R/2 edge1 RPi/4 edge2 RPi/4 edge3 #f))
;; chamfer2
; OUTPUT chamfer 2

(define vertex3 (pick:vertex (ray
    (position 0 0 R) (gvector 0 0 1))))
;; vertex3
(define edge1 (pick:edge (ray (position 0 0 (/ R 2))
    (gvector –1 0 0))))
;; edge1
(define edge2 (pick:edge (ray
    (position 0 (/ R 4) (/ R 2)) (gvector 0 0 1))))
;; edge2
(define edge3 (pick:edge (ray
    (position (/ R 4) 0 (/ R 2)) (gvector 0 0 1))))
;; edge3
(define chamfer3 (solid:chamfer–vertex
    vertex3 R/2 edge1 RPi/4 edge2 RPi/4 edge3 #f))
;; chamfer3
; OUTPUT chamfer 3

(define vertex4 (pick:vertex (ray
    (position 0 0 0) (gvector –1 –1 –1))))
;; vertex4
(define chamfer4
    (solid:chamfer–vertex vertex4 R/2))
;; chamfer4
; OUTPUT Chamfer 4: model has been slightly tilted
; to display fourth chamfer result edges.
```


Original
Chamfer 1
Chamfer 2
Chamfer 3

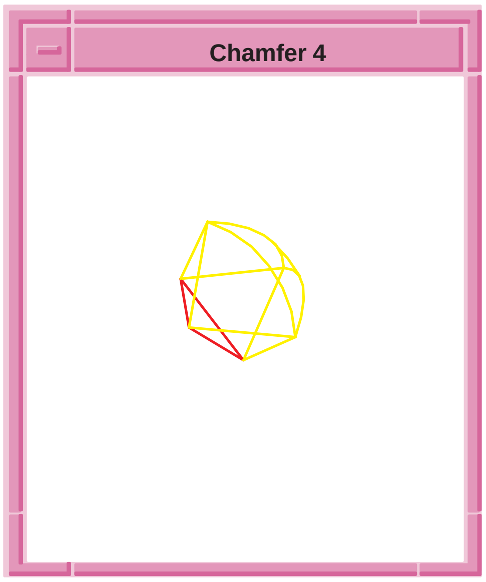


Figure 2-27. solid:chamfer–vertex

solid:chamfer–vertices

Scheme Extension: Blending, Modifying Models

Action:	Creates planar chamfers on a list of vertices.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_chamfer_vertices

Syntax:

```
(solid:chamfer-vertices entity-list offset
    [distancestraight=#t] [acis-opts])
```

Arg Types:

entity–list	entity | (entity ...)
offset	real
distancestraight	boolean
acis–opts	acis–options

Returns: (entity ...)

Errors: None

Description: entity–list specifies a solid vertex entity or a list of solid vertex entities to be chamfered. offset specifies the chamfer offset to be applied to all edges (if any) of all vertices.

If there are any edges touching a vertex and distanceStraight is TRUE, offsets define the distance along the straight line between the vertex and the point on the edge. When distanceStraight is FALSE, offsets define the distance along the edge. The chamfer plane is positioned to pass through all these points. distanceStraight does not care if the edges are straight.

This extension returns a list of the owners of all the vertices affected by the chamfering. If all the vertices in the entity–list belong to a single solid, this extension returns only one element (the solid).

entity–list specifies a solid vertex entity or a list of solid vertex entities to be chamfered.

offset specifies the chamfer offset to be applied to all edges (if any) of all vertices.

distanceStraight is TRUE, offsets define the distance along the straight line between the vertex and the point on the edge. When distanceStraight is FALSE, offsets define the distance along the edge.

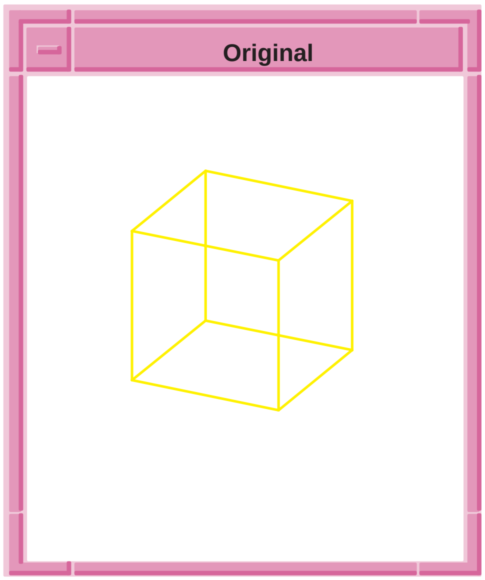
acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

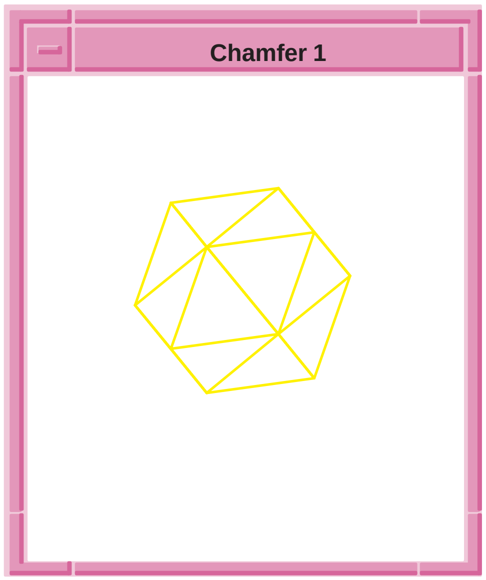
Limitations: Offset cannot exceed the length of the associated edge. Vertices with 3 edges of mixed convexity may not chamfer successfully (then, a message ”chamfer case not implemented” is generated). In this case, solid:chamfer–vertex might be a better choice.

Example:

```
; solid:chamfer-vertices
; Create geometry to illustrate this command.
(define H 10)
;; H
(define _H (- 0 H))
;; _H
(define block1 (solid:block (position _H _H _H)
    (position H H H)))
;; block1
; Get a list of the vertices.
(define vertices1 (entity:vertices block1))
;; vertices1
; OUTPUT Original

; Planar chamfer the vertices of block1.
(define block2 (solid:chamfer-vertices vertices1 H))
;; block2
; OUTPUT Chamfer 1
; Get the list of resulting vertices.
(define vertices2 (entity:vertices block2))
;; vertices2
; Planar chamfer the new list of vertices.
(define chamfer2
    (solid:chamfer-vertices vertices2 (/ H 2)))
;; chamfer2
; OUTPUT Result
```





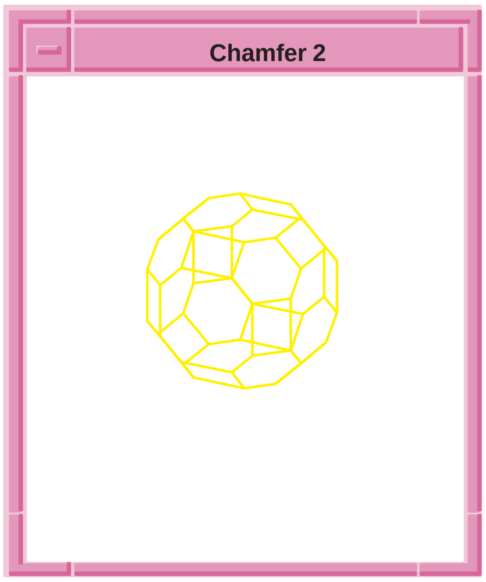


Figure 2-28. solid:chamfer–vertices

solid:flat–on–face

Scheme Extension:	Blending, Modifying Models
Action:	Creates a flat on a given face or faces.
Filename:	blnd/blnd_scm/blnd_scm.cxx
APIs:	api_make_flat_on_faces

Syntax:

```
(solid:flat-on-face point offset
    {face-list | body | normal
    [{face-list | body}]} [acis-opts])
```

Arg Types:

point	position
offset	real
face–list	face | (face...)
body	body
normal	gvector
acis–opts	acis–options

Returns: body

Errors: Error messages are generated when a slant flat is placed at the (concave) center of a vortex torus, erroneous situation of too large offset and/or tilt is not caught, or a bad body is created.

Description: point specifies a position in space, which may lie on the face(s) to be modified. If face–list is not defined, point must specify a position which lies on the face(s). If face–list is defined, point can specify a position which may not belong to any face.

offset specifies whether the flat is to be accomplished by deleting material (negative offset) from a convex face or by adding material to a concave face (positive offset). offset may be positive or negative and determines the offset of a chamfer plane along its normal. normal may be given as the third argument. If normal is not specified in the third argument, it defaults as an outward normal of the face(s) being chamfered at the position nearest to point (first argument). Note this sign convention is different from the one used in (solid:chamfer–vertex).

normal, if not specified, face–list or body must be the third parameter to define which faces are to be chamfered. If body is given, the point must lie on one or more faces (a point lying on multiple faces belongs to the intersection of these faces) of the body. The underlying API function, api_make_flat_on_face, then constructs a list of faces to be chamfered. Finally, normal is computed by averaging each of the corresponding outward normals of each face in face–list.

If the intersection of the chamfer plane with the face(s) given by face–list produces multiple intersection curves (like in the example below), the curve closest to the projection of the point (first argument) to the chamfer plane, is used.

This extension returns the owner (solid) of all the faces affected by this operation.

acis–opts contains optional parameters that are specific to the component and general ACIS options such as the journal and version information. The option argument (must be the last argument) is a class derived from acis–options.

Limitations: Making maximum possible flat at the the center of a vortex torus, when the chamfer plane just touches the torus, (i.e., completely filling the toroid indentation is not possible). Instead, use solid:chamfer–vertex with the central vertices of the vortex torus.

Example:

```
; solid:flat–on–face
; Create geometry to illustrate command.
; Define the height. Must be greater than two.
(define h 3)
;; h
(define _Pi/2 (/ PI –2))
;; _Pi/2
(define Pi*7/2 (* PI 3.5))
;; Pi*7/2
; Define height. Must be greater than two.
(define h 3)
;; h
; Create solid block using the positions defined
; above.
(define block (solid:block
    (position _Pi/2 _Pi/2 (– 0 h))
    (position Pi*7/2 Pi*7/2 h)))
;; block
; Define a list of entities and the law to warp them.
(define law (law:warp block ”vec
    (x,y,z+sin (x) +sin (y)) ”))
;; law
; Define another block using the same positions as
; above
(define t (solid:block
    (position _Pi/2 _Pi/2 (– –3 h))
    (position Pi*7/2 Pi*7/2 0)))
;; t
(define subtract (solid:subtract block t))
;; subtract
; OUTPUT Original
```

```
(define fof1 (solid:flat-on-face
    (position (* PI 2.5) (* PI 2.5)
    (+ h 2)) -1.95 block))
;; fof1
(define fof2 (solid:flat-on-face
    (position (* PI 0.5) (* PI 0.5) (+ h 2)) -0.25
    (gvector -0.5 -0.5 1) block))
;; fof2
(define top_face (pick:face (ray
    (position 0 0 (/ (- h 2)2)) (gvector 0 0 1))))
;; top_face
(define fof3 (solid:flat-on-face
    (position (* PI 1.5) (* PI 1.5) 1) 1.0
    (gvector 0.2 0.3 1) top_face))
;; fof3
(define fof4 (solid:flat-on-face
    (position (* PI 0.5) _Pi/2 h) -0.3
    (gvector 0.3 -2 1) block))
;; fof4
; Rotate entity for better view of flats.
(define rotate (entity:rotate fof4 1 1 1 45))
;; rotate
; OUTPUT Rotated Result
```

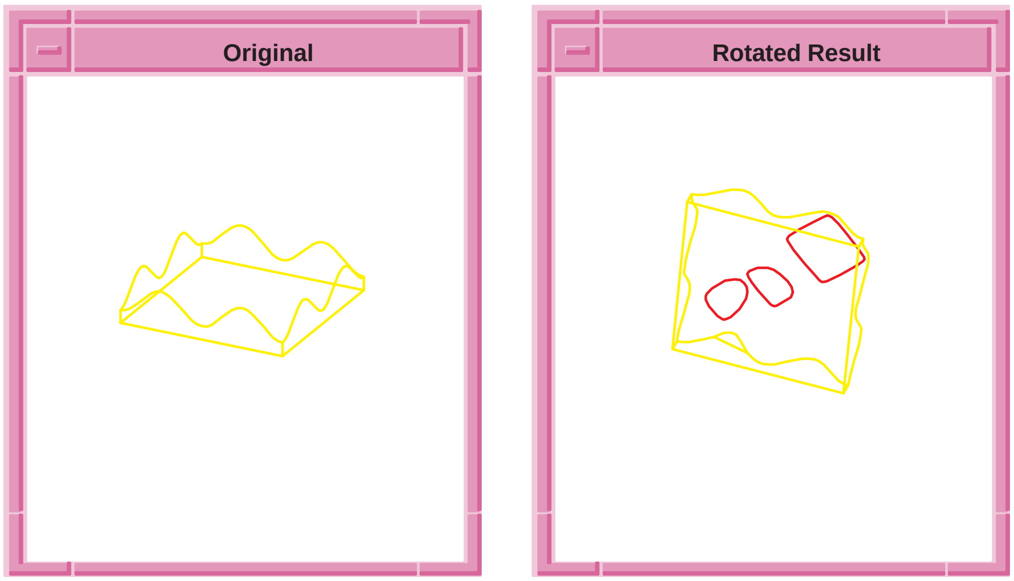


Figure 2-29. solid:flat–on–face