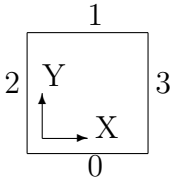
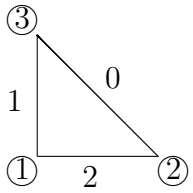
PFEM commands

PFEM2D discretize rectangle $startnodetag $x1 $y1 $hx $hy $angle $nx $ny $ndf -fix $constraintList -mass $massList -vel $velList -boundary $boundaryList

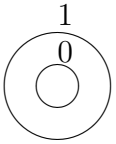
rectangle	discretize a rectangular area
$startnodetag	tag the first node
$x1 $y1	lower left corner of rectangle
$hx $hy	division length in local x and y direction
$angle	the angle between local and global x direction
$nx $ny	number of divisions in local x and y direction
$ndf	ndf for nodes created
$constraintList	a list for constraints: 1-fixed, 0-free
$massList	a list for mass
$velList	a list for velocity
$boundaryList	a list for including a boundary or not, 1-included, 0-not included
boundary order	
return value	the end node

PFEM2D discretize triangle $startnodetag $x1 $y1 $x2 $y2 $x3 $y3 $n1 $n2 $ndf -fix $constraintList -mass $massList -vel $velList -boundary $boundaryList -angleRange $angleList

triangle	discretize a triangular area
$startnodetag	tag the first node
$x1 $y1	first point of rectangle
$x2 $y2	second point of rectangle
$x3 $y3	third point of rectangle
$n1 $n2	number of divisions along triangle sides
$ndf	ndf for nodes created
$constraintList	a list for constraints: 1-fixed, 0-free
$massList	a list for mass
$velList	a list for velocity
$boundaryList	a list for including a boundary or not, 1-included, 0-not included
boundary order	
return value	the end node

PFEM2D discretize circle $startnodetag $xc $yc
$r1 $r2 $nc $nr $ndf -fix $constraintList
-mass $massList -vel $velList -boundary $boundaryList

circle	discretize a circular area
$startnodetag	tag the first node
$xc $yc	center of circle
$r1 $r2	inner and outer radius
$nc $nr	number of divisions along circle and radius direction
$ndf	ndf for nodes created
$constraintList	a list for constraints: 1-fixed, 0-free
$massList	a list for mass
$velList	a list for velocity
$boundaryList	a list for including a boundary or not, 1-included, 0-not included
$angleList	start and end angle of the circle in degrees, [0, 360]



boundary order	
return value	the end node

PFEM2D discretize line $startnodetag $x1 $y1
$h $angle $num $ndf -fix $constraintList
-mass $massList -vel $velList -boundary $boundaryList

line	discretize a line
$startnodetag	tag the first node
$x1 $y1	start point
$h	division length
$angle	the angle between the line and global x direction
$num	number of divisions
$ndf	ndf for nodes created
$constraintList	a list for constraints: 1-fixed, 0-free
$massList	a list for mass
$velList	a list for velocity
$boundaryList	a list for including a boundary or not, 1-included, 0-not included

boundary order	
return value	the end node

PFEM2D discretize PSLG $startnodetag $maxarea $ndf
-points $coordinateList -segments $pointList -vel $velList
-fix $constraintList -mass $massList -holes $pointList

PSLG	discretize a Planar Straight Line Graph
$startnodetag	tag the first node
$maxarea	maximum area for triangulation
$ndf	ndf for nodes created
$constraintList	a list for constraints: 1-fixed, 0-free
$massList	a list for mass
$velList	a list for velocity
return value	the end node

PFEM2D discretize particles $startnodetag $ndf
-points $coordinateList -vel $velList
-fix $constraintList -mass $massList

particles	create single particles
$startnodetag	tag the first node
$ndf	ndf for nodes created
$constraintList	a list for constraints: 1-fixed, 0-free
$massList	a list for mass
$velList	a list for velocity
return value	the end node

PFEM2D discretize frame $startnodetag $x $y $hcol $hbeam $ndf
$spanlist $hlist -fix $constraintList -colmass $massList
-beammass $massList -roofmass $massList -colvel $velList -beamvel $velList

frame	discretize a frame
$x	start x coordinate
$y	start y coordinate
$startnodetag	tag the first node
$spanlist	spans
$hlist	floor heights
$hcol	element size for column
$hbeam	element size for beam
$ndf	ndf for nodes created
-fix	fixity for base nodes
-colmass	mass for column nodes
-beammass	mass for beam nodes
-roofmass	mass for roof nodes
-colvel	initial velocity for column nodes
-colvel	initial velocity for beam nodes
return list	joint nodes from 1st column to nth column, for each column from 1st floor to nth floor. beam end nodes from 1st span to nth span, for each span from 1st floor to nth floor.

element PFEMElement2D $type $tag $nd1 $nd2 $nd3 $rho $mu $bx $by <$thk> <$kappa>

$type	element type (PressureGradient, Bubble, or Compressible)
$tag	element tag
$nd1 $nd2 $nd3	three nodes
$rho	fluid density
$mu	fluid viscosity
$bx $by	body forces
$thk	thickness of the element
$kappa	bulk modulus (for Bubble or Compressible)

PFEM2D doTriangulation $alpha -groups $groupList
-addgroups $addtinalGroupList
-PFEMElement2DBubble $parameterList(starteletag rho mu bx by <thk> <kappa>
-PFEMElement2DCompressible $parameterList(starteletag rho mu bx by <thk> <kappa>
-PFEMElement2D $parameterList(starteletag rho mu bx by <thk>
-Tri31 $parameterList (starteletag thk type matTag <pressure rho b1 b2>)

doTriangulation	triangulate the nodes given
$alpha	alpha value for identify boundary, >1, usually, 1.4 or 1.5 are good values
-groups	group tags
-addgroups	additional groups
-PFEMElement2D	PFEMElement2D elements are created
-PFEMElement2DBubble	PFEMElement2DBubble elements are created
-PFEMElement2DCompressible	PFEMElement2DCompressible elements are created
-Tri31	Tri31 elements are created
return value	the end element if -PFEMElement2D is set, otherwise, the list of triangu

PFEM2D save $filename <$maxelenodes>

save	save nodes and elements
$filename	filename for saving including path, extension .node and .element will be added
$maxelenodes	maximum number of nodes in each element

PFEM2D setBoundary $x1 $y1 $x2 $y2

setBoundary	set virtual boundary
$x1 $y1 $x2 $y2	bounding box of the boundary

PFEM2D removeOutBoundNode $grouplist

removeOutBoundNode	remove node that are out of the virtual boundary
grouplist	group tags

PFEM2D calculateForces -boundary $nodeList
-basenode $nd -dragdir $dirList -liftdir $dirList

calculateForces	calculate the drag and lift forces
-boundary	start and end nodes that form the boundary, can have multiple start-end nodes
-basenode	the base node for calculating overturning moment
-dragdir	the direction list of drag force
-liftdir	the direction list of lift force
return value	the forces

PFEM2D pc $groupList $startpressurenode

$groupList	group tags
$startpressurenode	start tag for the pressure node in Pressure_Constraint
return value	end pressure node tag

PFEM2D group $groupTag $nodelist -append -remove -series

$groupTag	group tag
$nodelist	a list of node tags
-append	append to current group tag
-remove	remove from current group tag
-series	treat the node list as a series of node tags, instead of end node tags

PFEM2D updateNode $type $tag $dof $val

$type	coord/disp/vel/accel
$tag	node tag
$dof	node dof
$val	value to update

PFEM2D identify $starteletag -mass $masslist -loads $loadlist

identify	to identify fluid/structure/interface/isolated nodes
$starteletag	start element tag for SingleNodeElement
-mass	mass for isolated nodes
$loads	loads for isolated nodes

system PFEM <-compressible>

analysis PFEM $dtmax $dtmin

$dtmax	maximum time step
$dtmin	minimum time step

test PFEM $tolv $tolp $tolrv $tolrp $tolvrel $tolprel $maxIter <$maxIncr $printFlag $normType>

$tolv $tolp	tolerance for velocity and pressure
$tolrv $tolrp	tolerance for residual
$tolvrel $tolprel	relative tolerance for velocity and pressure
$maxIter	maximum iterations
$maxIncr	maximum number allowing norms increasing
$printFlag	flag for printing message
$normType	method to calculate norm

nodePressure ndtag

sensNodePressure ndtag paramTag

integrator PFEMWithSensitivity