POINTWISE®

Pointwise, mesh under control

Your Presenter

HPC methods for Engineering
CINECA, 17th-19th June 2015

PRicerca
Fluid Dynamics Specialist

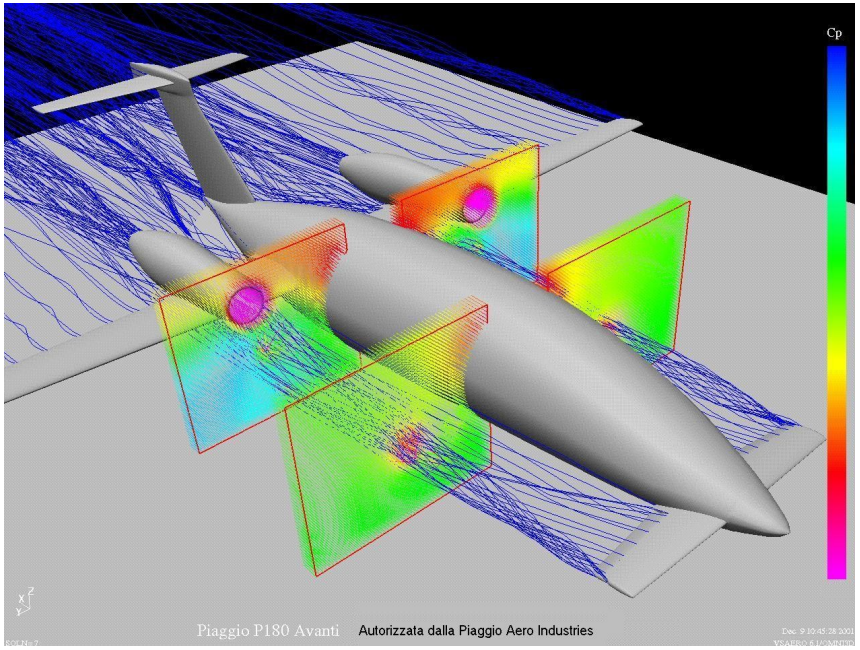
Your Presenter: **Porto Ricerca**

Our principal activity is in the CFD sector, mainly for external fluid-dynamics.

We provide:

- **Consulting**
- **Softwares**

CFD consulting: Aeronautics



Complete set of softwares

- panel code

- Euler code

- RANS

- 2D (Mses) and 3D

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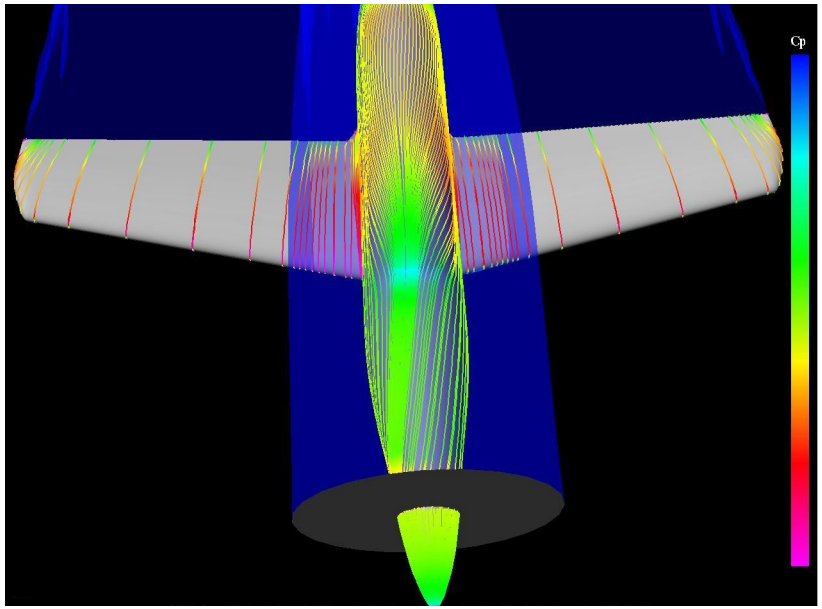
CFD consulting: Aeronautics

Additional Modules:

- flight dynamics integration

- ice collection efficiency

- rotor



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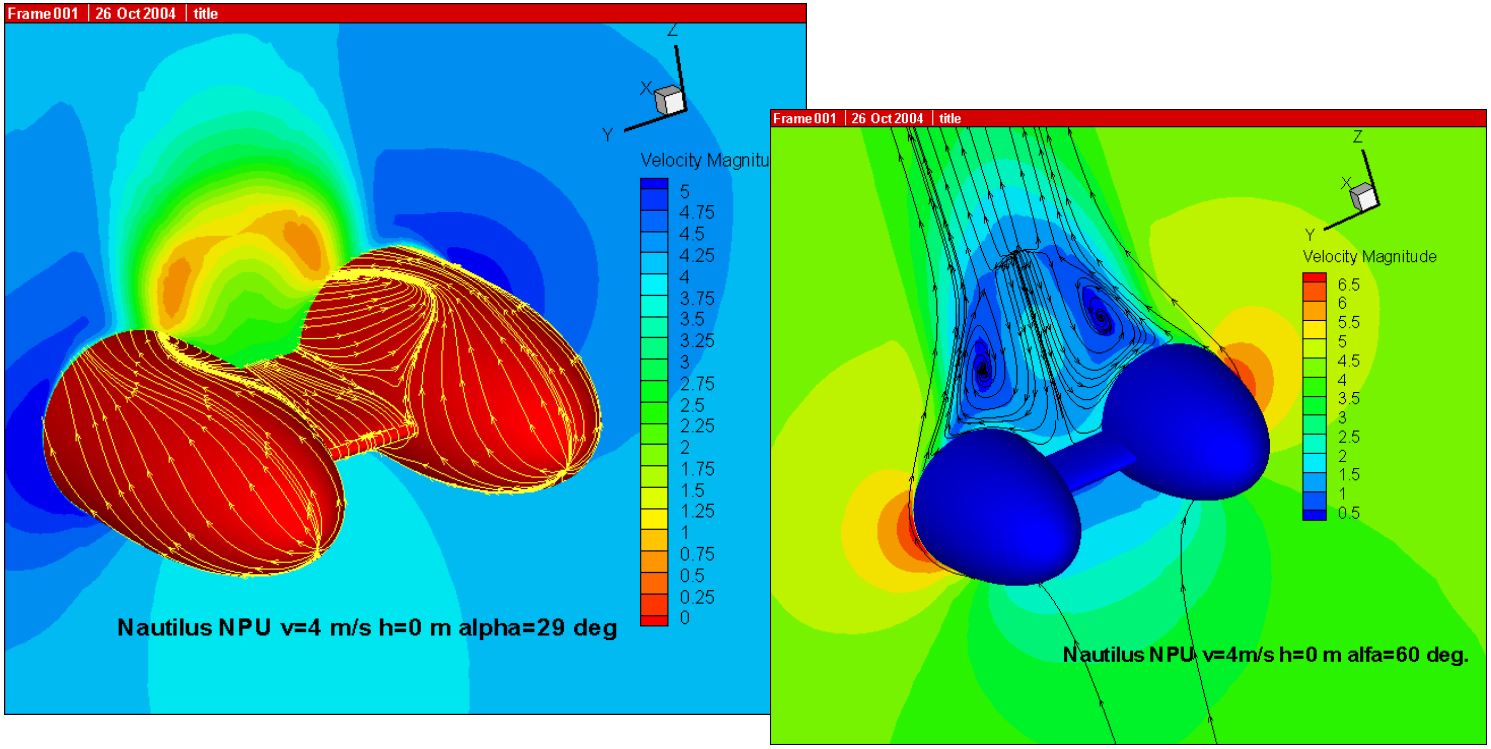
CFD consulting: Aeronautics



Collaborations with Universities

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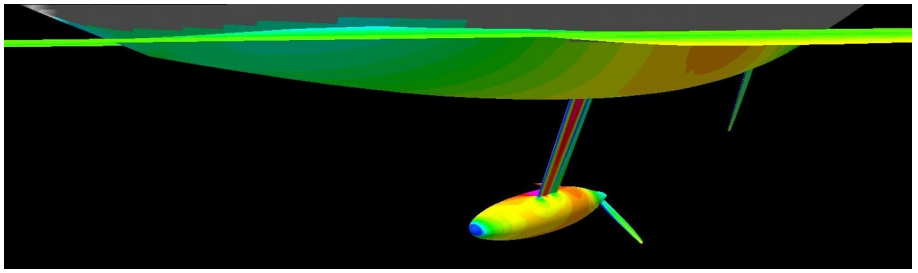
CFD consulting: Marine sector



- **Free Surface**
- **Un-steady analysis (sea-keeping)**

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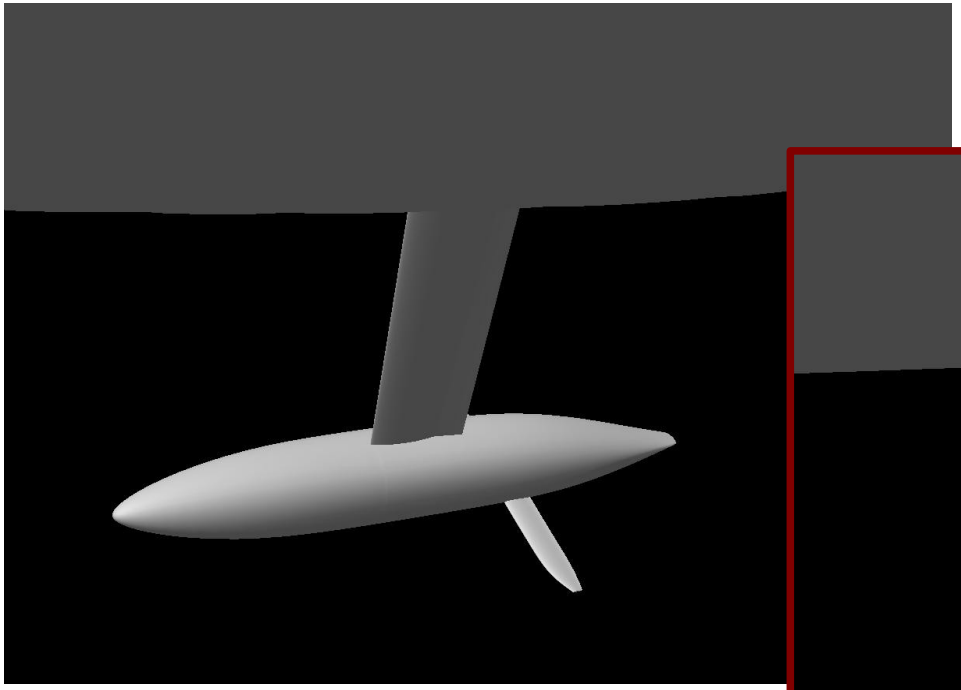
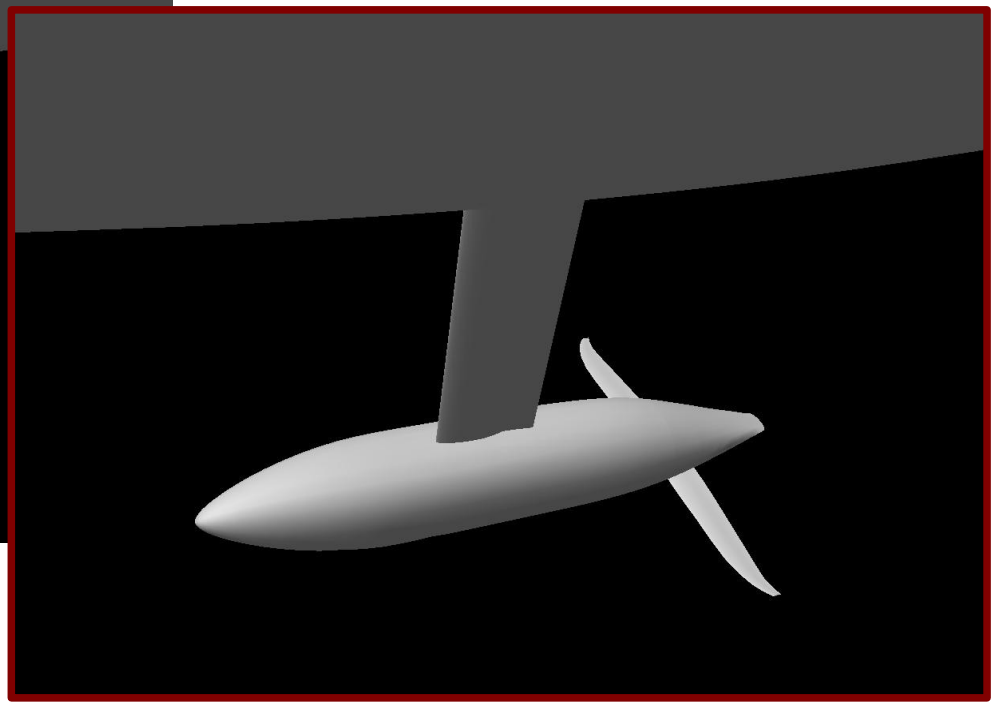
CFD consulting: Marine sector





Optimization

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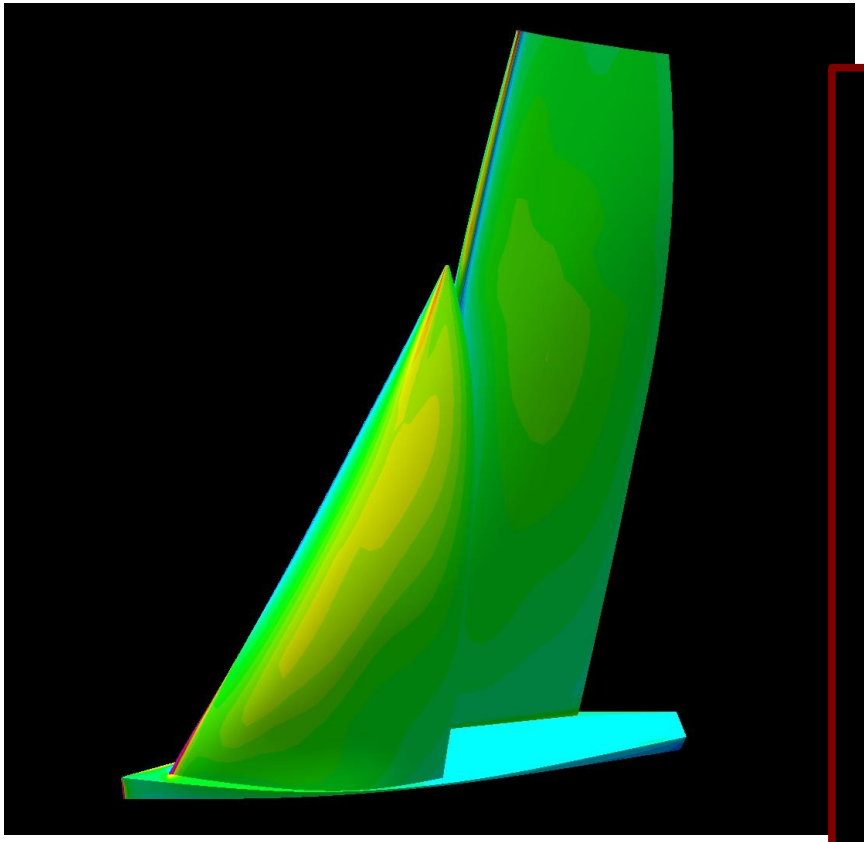
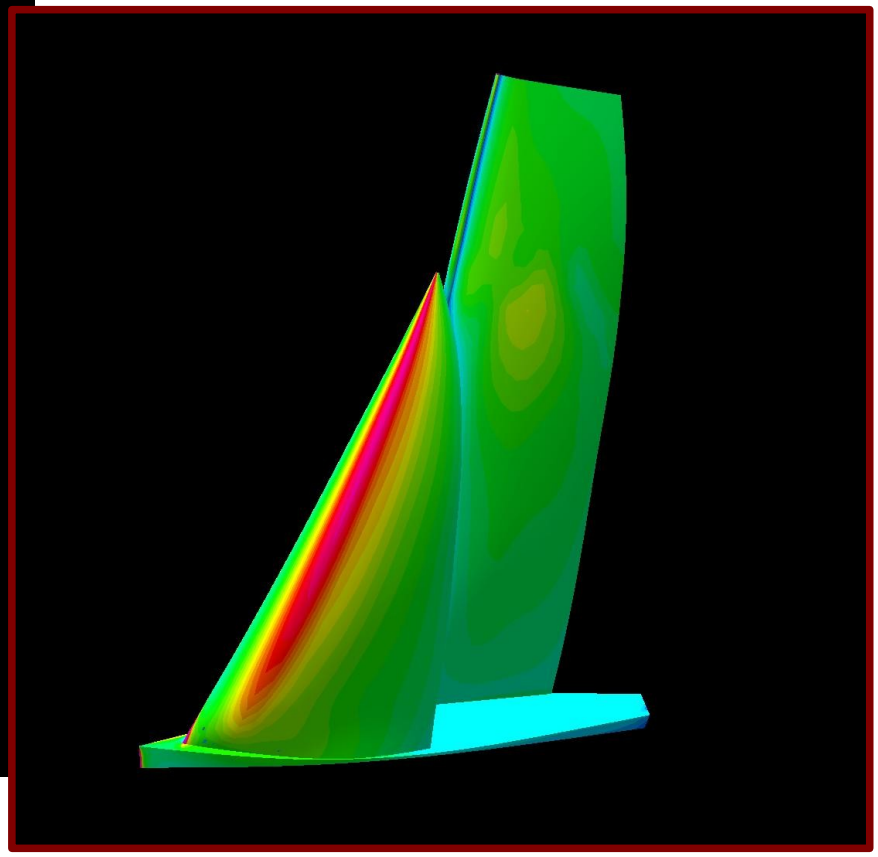
CFD consulting: Marine sector



Optimization



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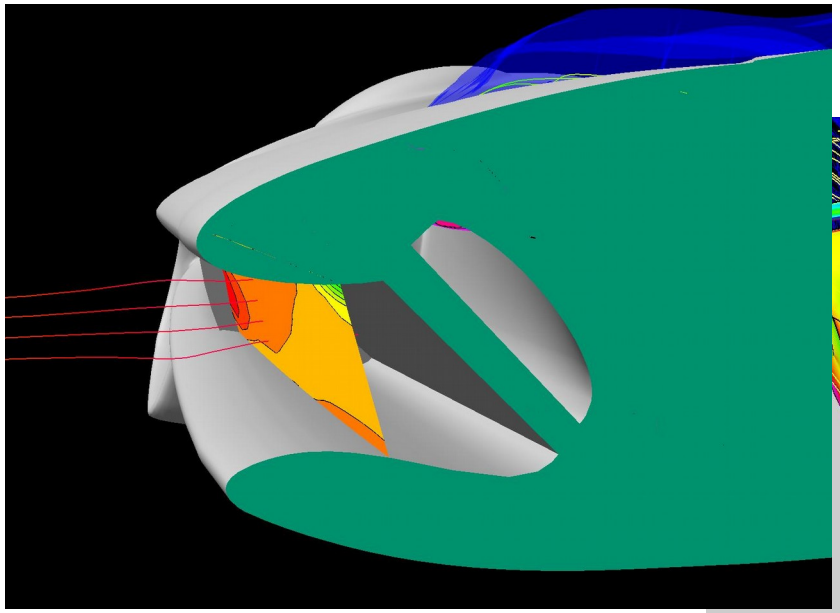
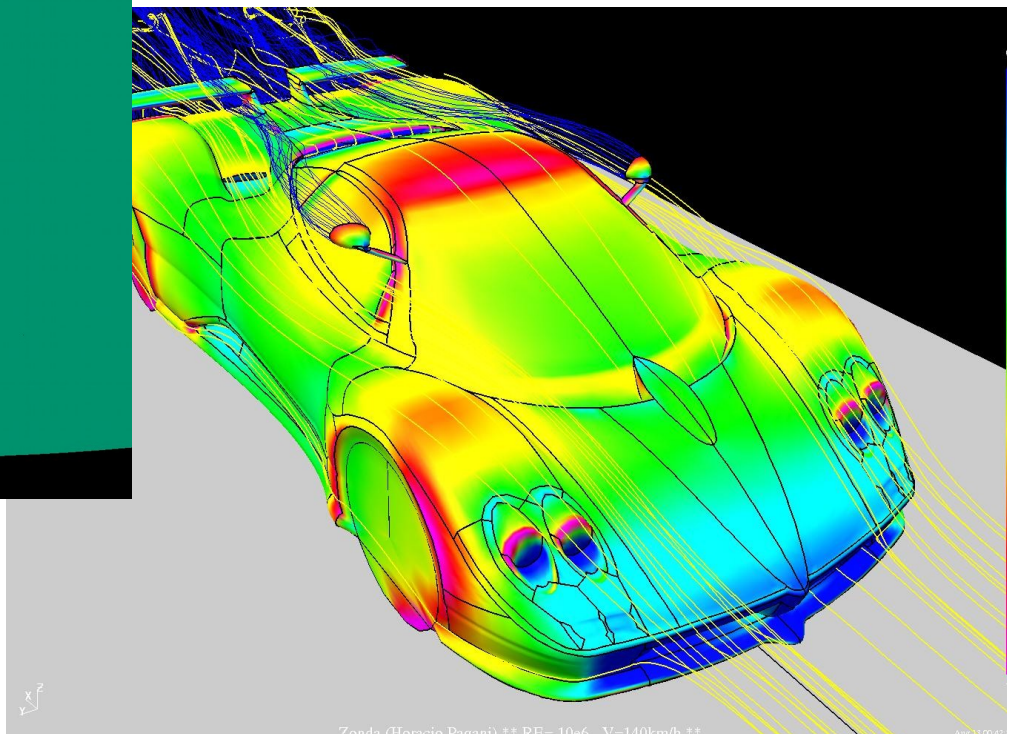
CFD consulting: Automotive



Heat exchanger

External fluid-dynamics



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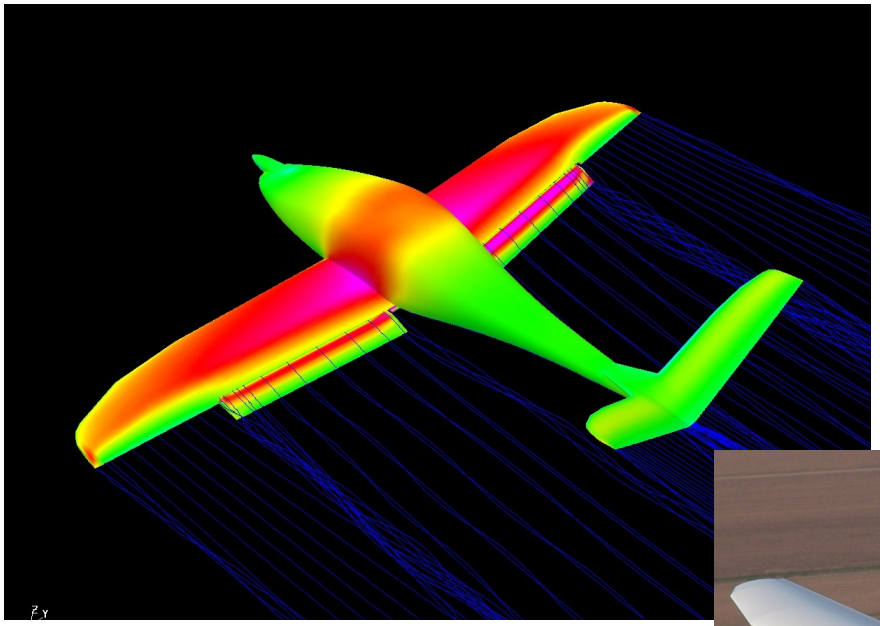
Complete Aircraft Design



Risen high performance ultralight aircraft

Complete design, construction and test

S.E.A. Risen

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Softwares

Analytical Methods

Pointwise

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Pointwise Intro and T-Rex

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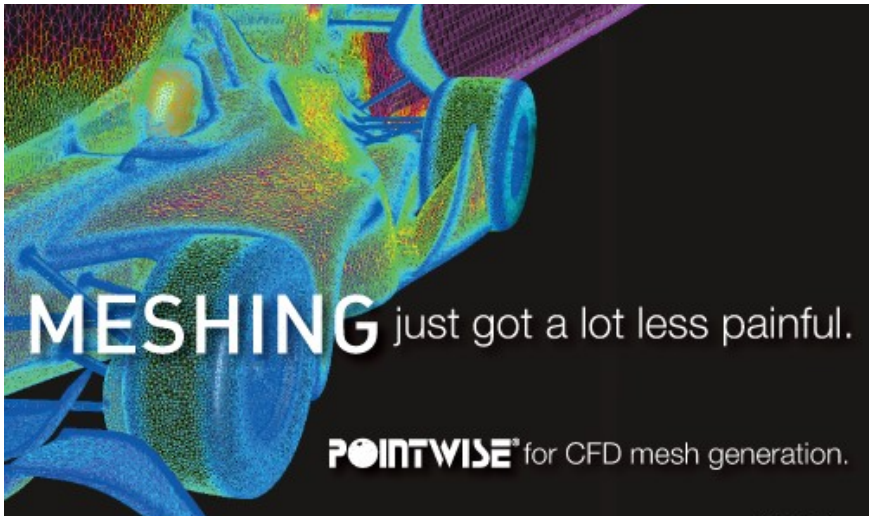
Pointwise Introduction



Mesh generation for computational fluid dynamics (CFD)

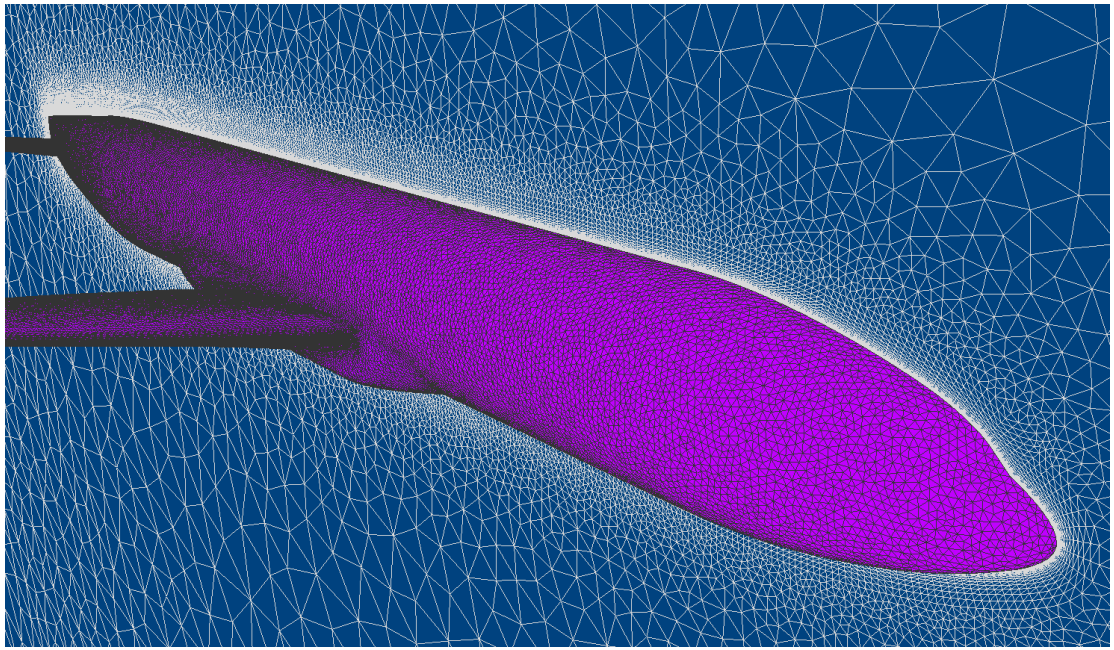
- Gridgen
- Pointwise

Quality
and
Flexibility

Quality

High levels of automation

Intimate levels of control (mesh metrics)



Quality

Hexahedral meshing

- elliptic PDE methods for smoothness, clustering and orthogonality control
- hyperbolic PDE and algebraic extrusion methods

Unstructured and hybrid meshing

- T-Rex (anisotropic tetrahedral extrusion) for extruding regular layers of high-quality tetrahedra
- classic hybrid meshing via extrusion
- mixed hex-tet meshes

Quality

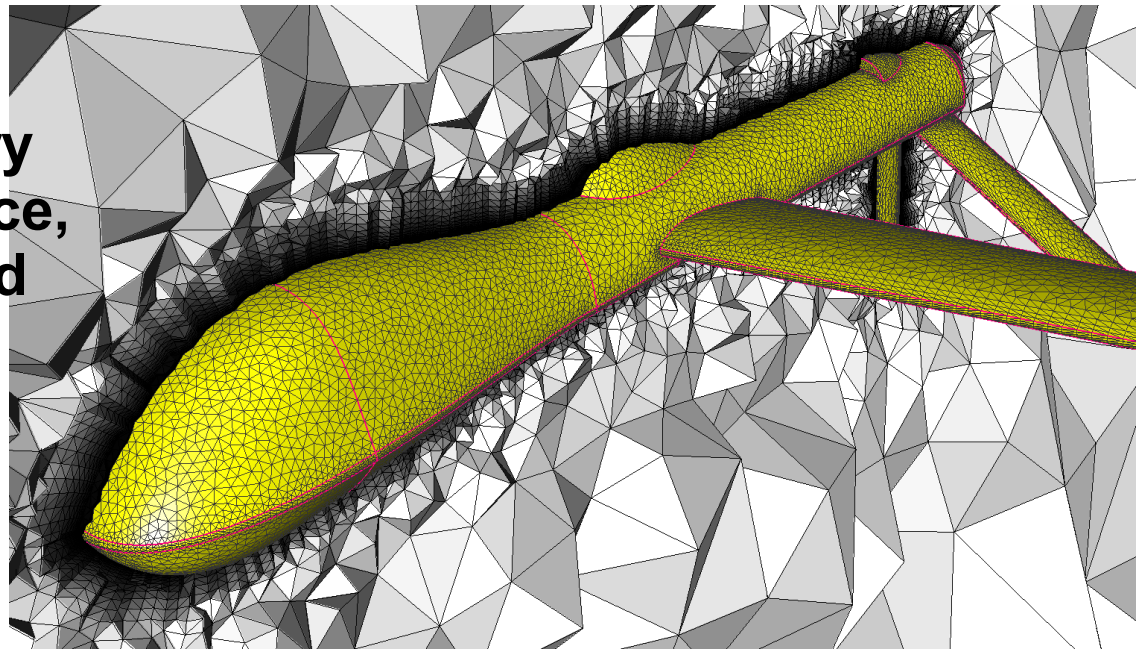
Jacobian	Length I Ratio	Equiarea Skewness
Volume	Length J Ratio	Equivolume Skewness
Component Volume	Length K Ratio	Centroid Skewness
Area	Aspect ratio	Wall Spacing
Length	Smoothness I	Wall Orthogonality
Length I	Smoothness J	Database associativity
Length J	Smoothness K	Boundary Proximity
Length K	Minimum Included Angle	Surface Procximity
Volume Ratio	Maximum Included Angle	
Area Ratio	Equiangle Skewness	

Available Metrics

Flexibility

Import CAD data from native and standard formats

Export grid and boundary conditions to open-source, commercial and standard CFD formats



CFD and CAE formats supported

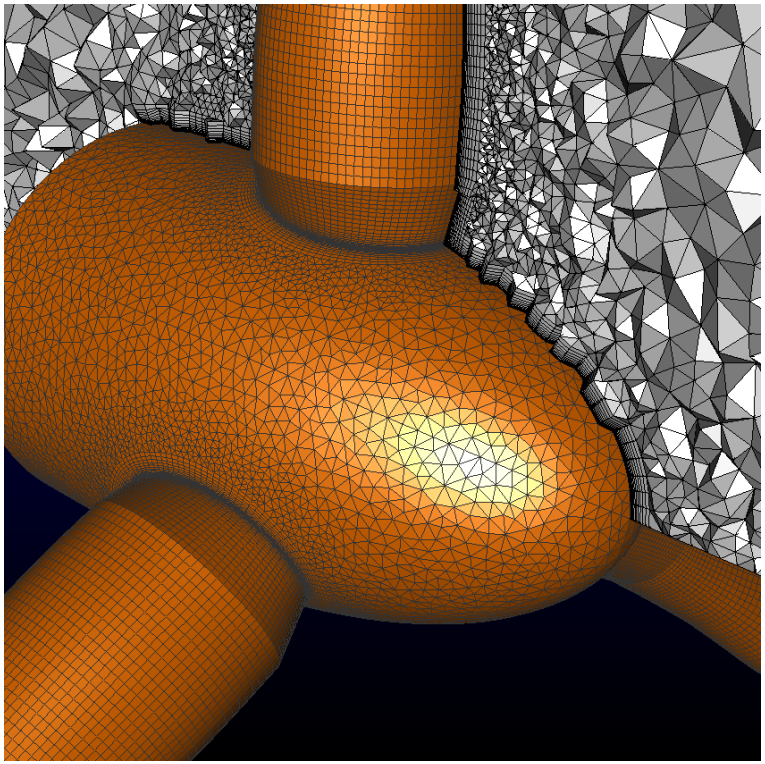
Flexibility

AcuSolve	Exodus II	**OpenFOAM**	TASCflow
ADPAC	FALCON	Overflow	TEAM
ANSYS CFX	FANS	PATRAN	Tecplot
ANSYS FLUENT	FDNS/UNIC	PHOENICS	TETREX
CFD++	FieldView	PLOT3D	UCD
CFDShip-Iowa	FrontFlow	SCRYU	UGRID
CFL3D	GASP	SCRYU/Tetra	VRML
CGNS	INCA	Splitflow	USM3D
CNSFV	INCA V2	STAR-CCM+	VSAERO
Cobalt	NASTRAN	STAR-CD	WIND
COMO	NCC	STL	WIND-US
CRUNCH	NPARC	TACOMA	XPATCH
DTNS			

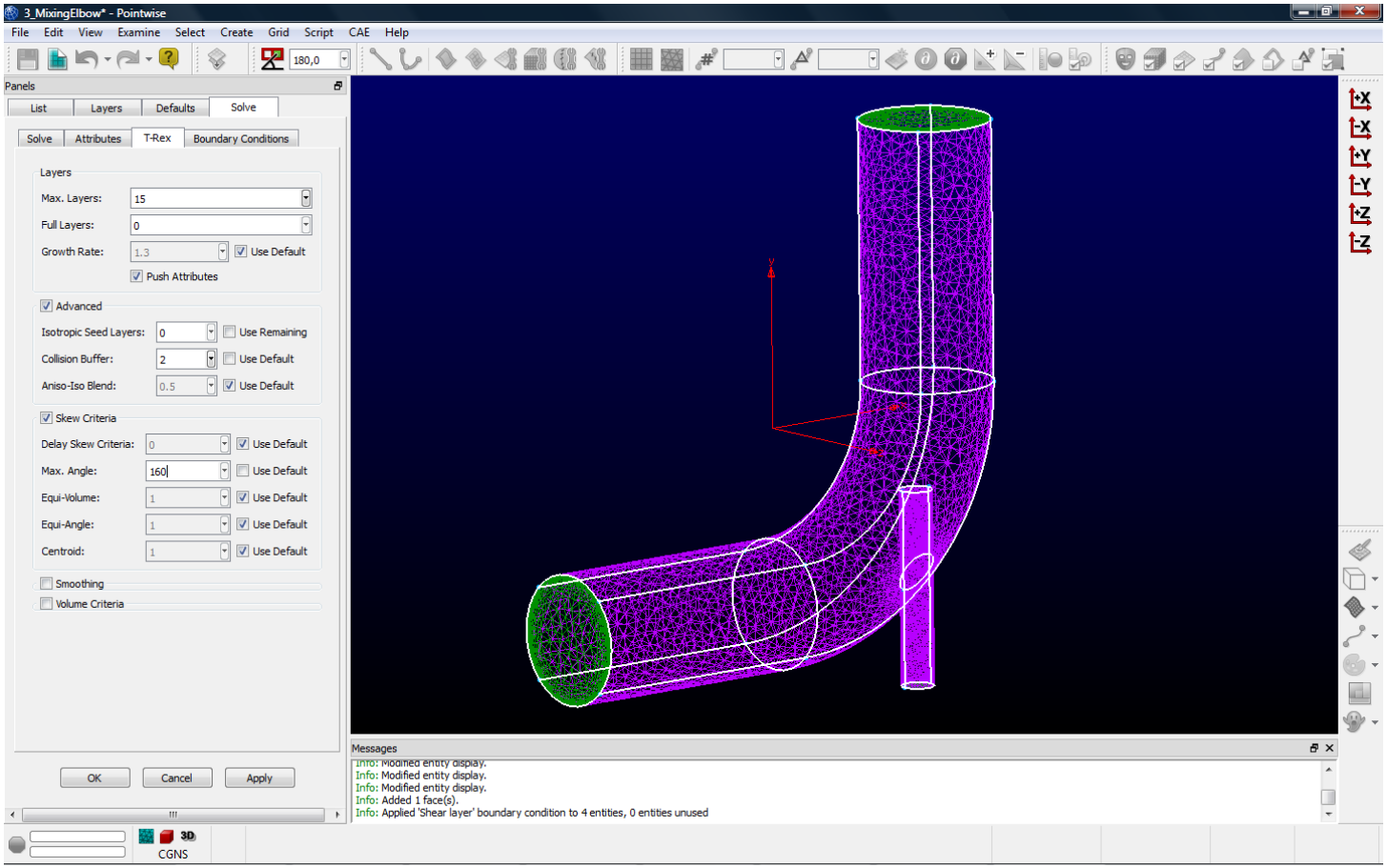
Glyph

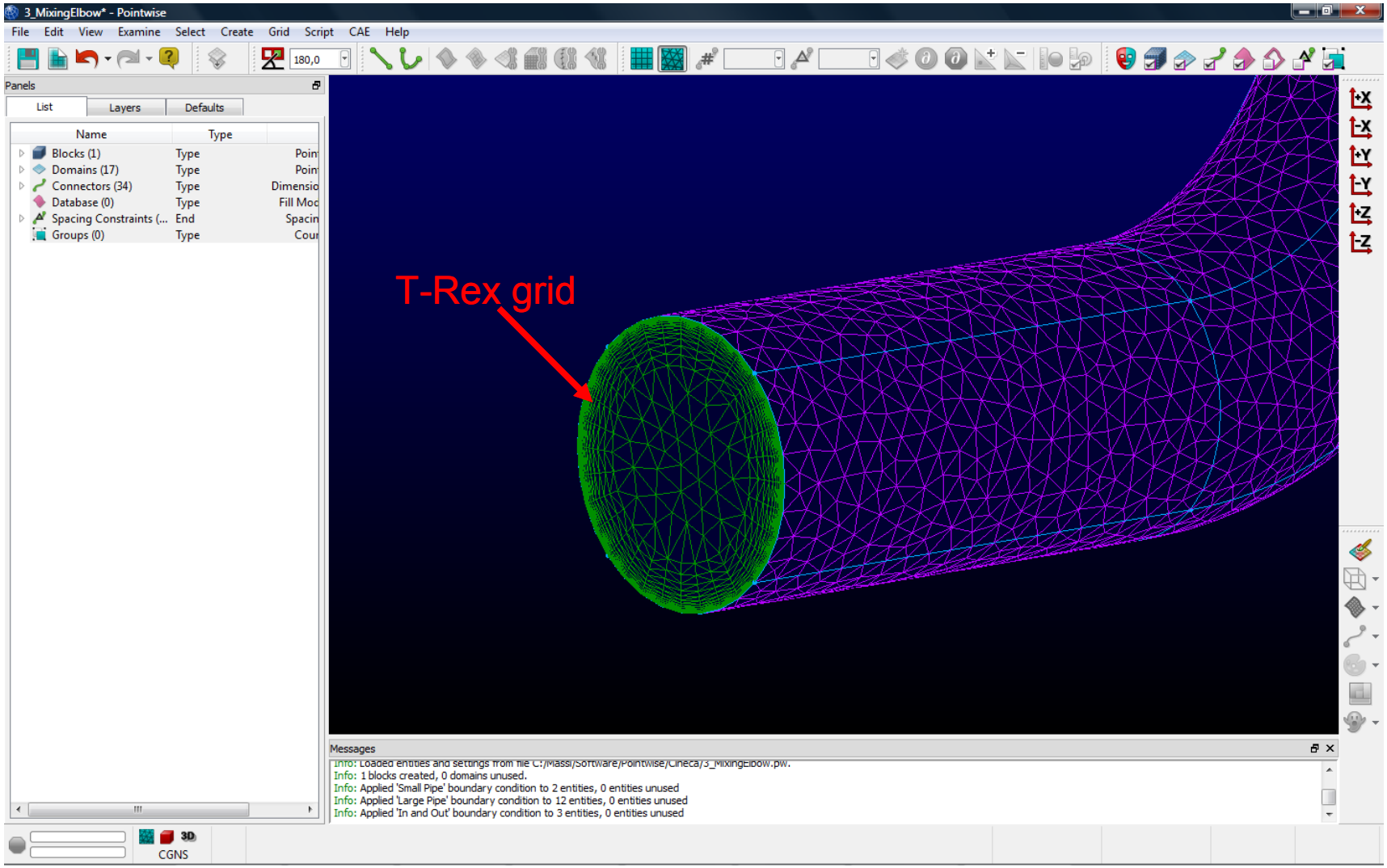
Tcl-based scripting language

Journaling and playback

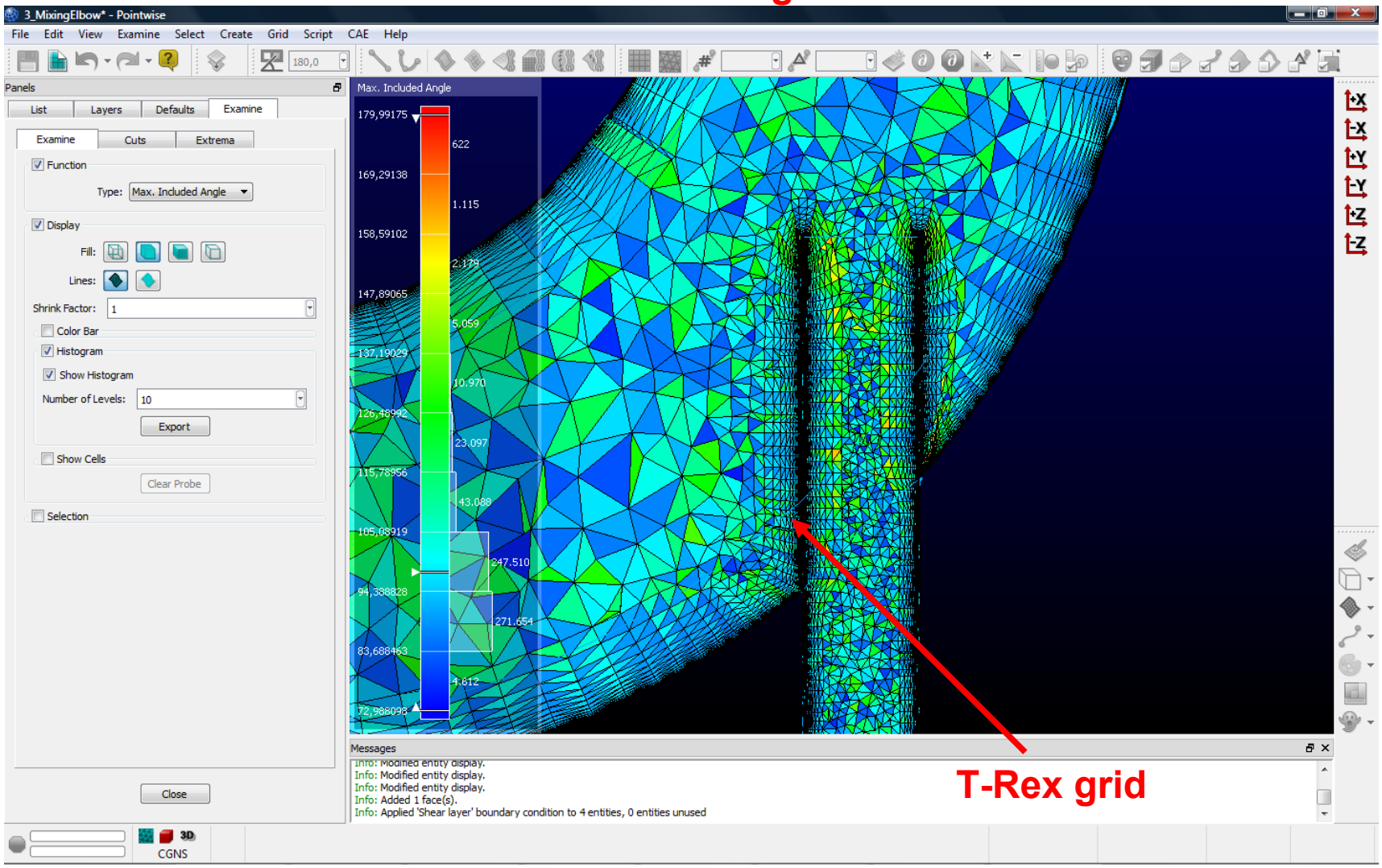


T-Rex: anisotropic tetrahedral extrusion




3_MixingElbow* - Pointwise
File Edit View Examine Select Create Grid Script CAE Help
Panels
List Layers Defaults
Name Type
Blocks (1) Type
Domains (17) Type
Connectors (34) Type
Database (0) Type
Spacing Constraints (... End
Groups (0) Type
T-Rex grid
Messages
Info: 1 blocks created, 0 domains unused.
Info: Applied 'Small Pipe' boundary condition to 2 entities, 0 entities unused
Info: Applied 'Large Pipe' boundary condition to 12 entities, 0 entities unused
Info: Applied 'In and Out' boundary condition to 3 entities, 0 entities unused
CGNS

Max Incl. Angle



Examine: Max Included Angle and Histogram

T-Rex

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Tutorial

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In every moment of mesh creation

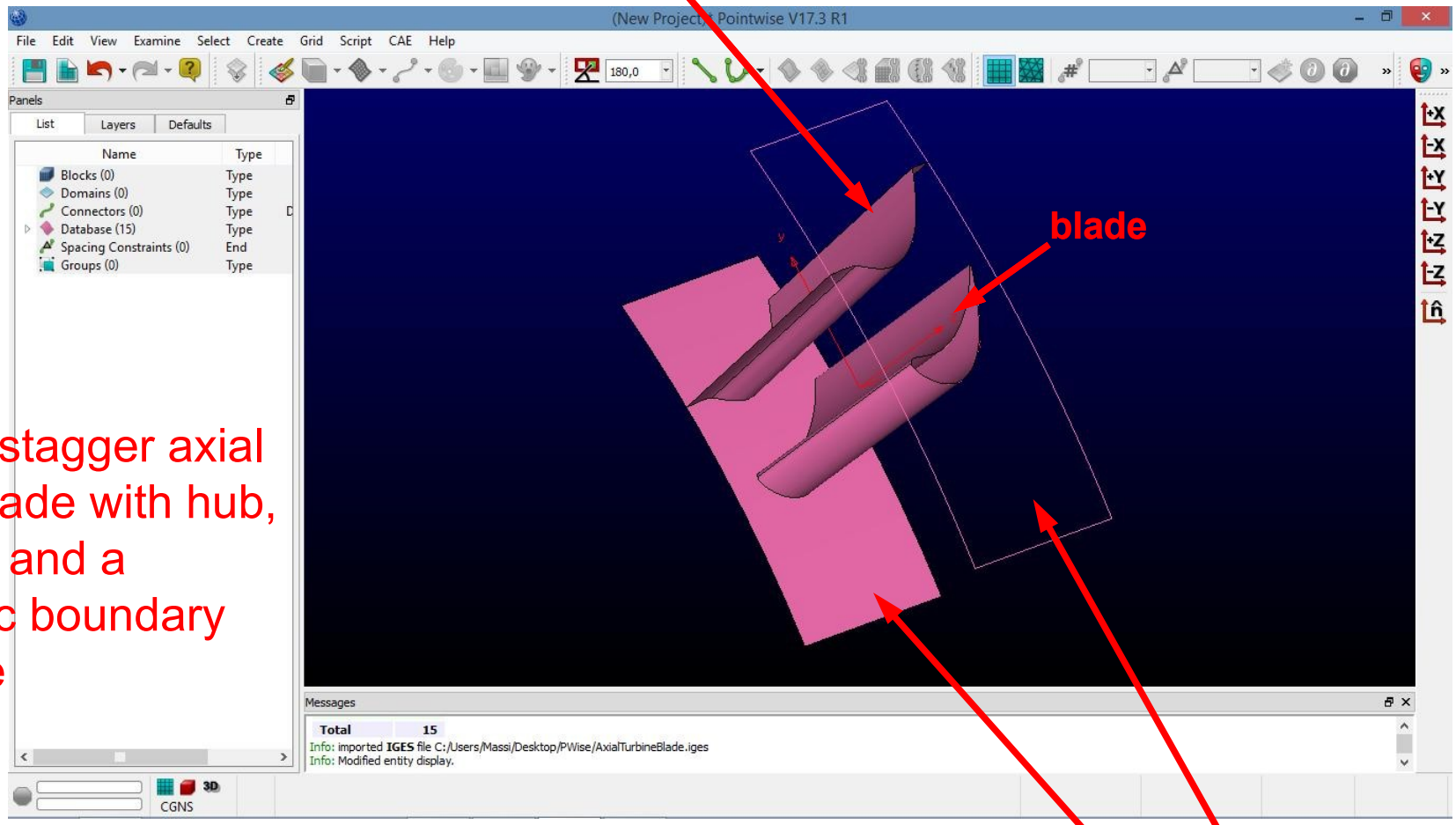
-Modify entities

-Modify entities dimensions and spacing constraints

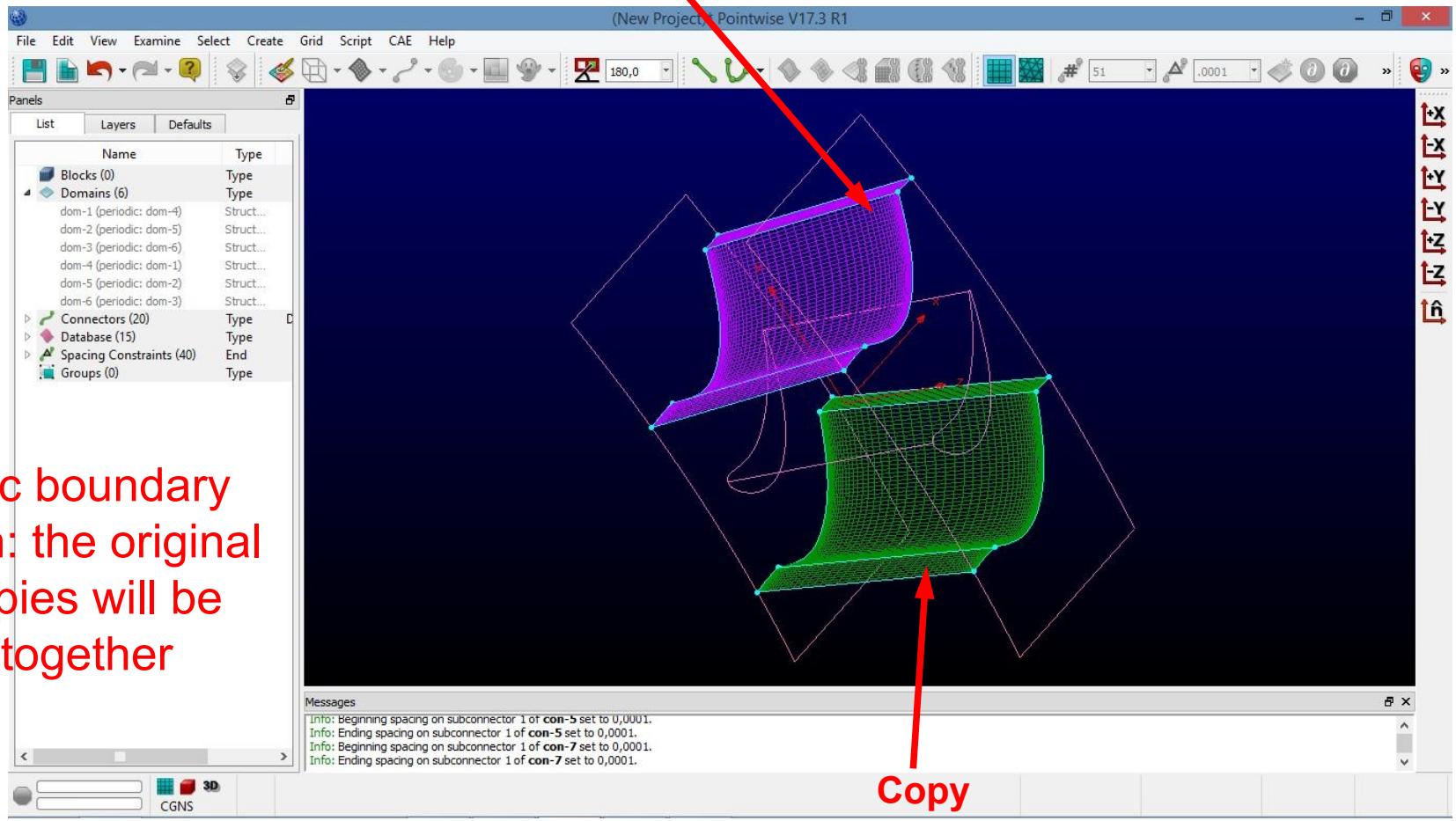
-Check grid quality

Tutorial: Axial rotor blade structured grid

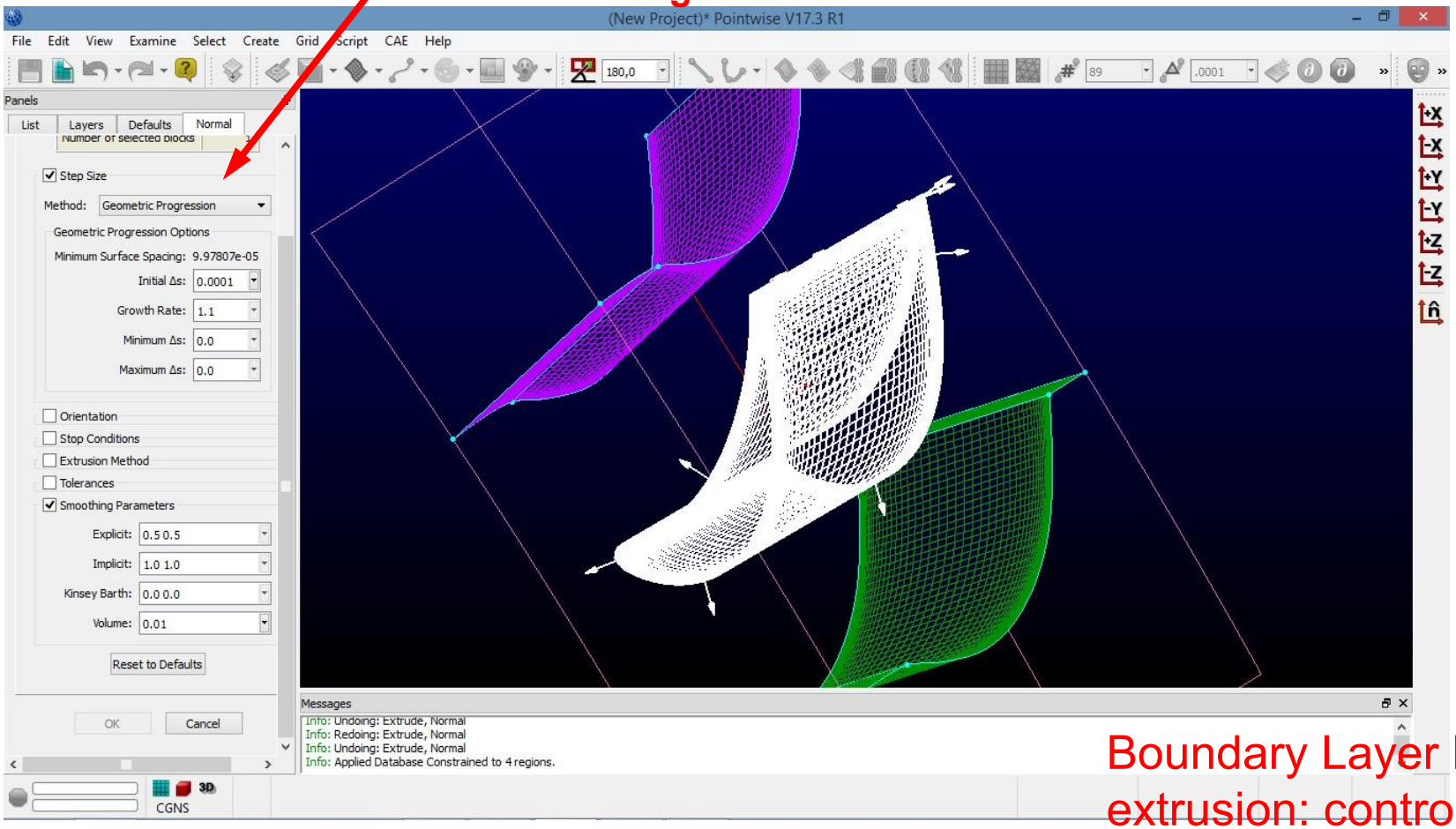
periodic boundary surface



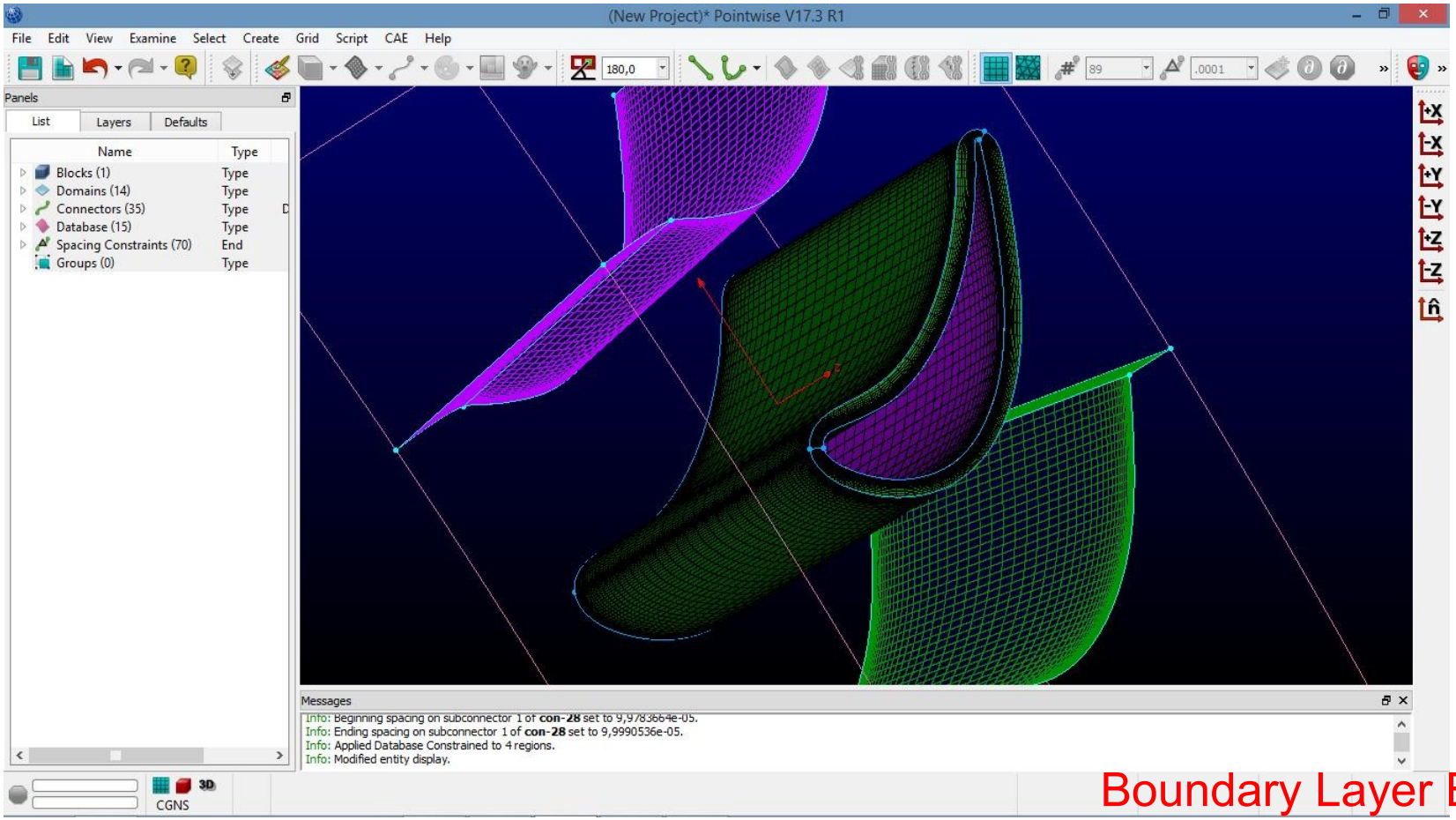
A high stagger axial rotor blade with hub, shroud and a periodic boundary surface



Periodic boundary domain: the original and copies will be slaved together



Boundary Layer Block extrusion: control of extrusion features



Boundary Layer Block extrusion

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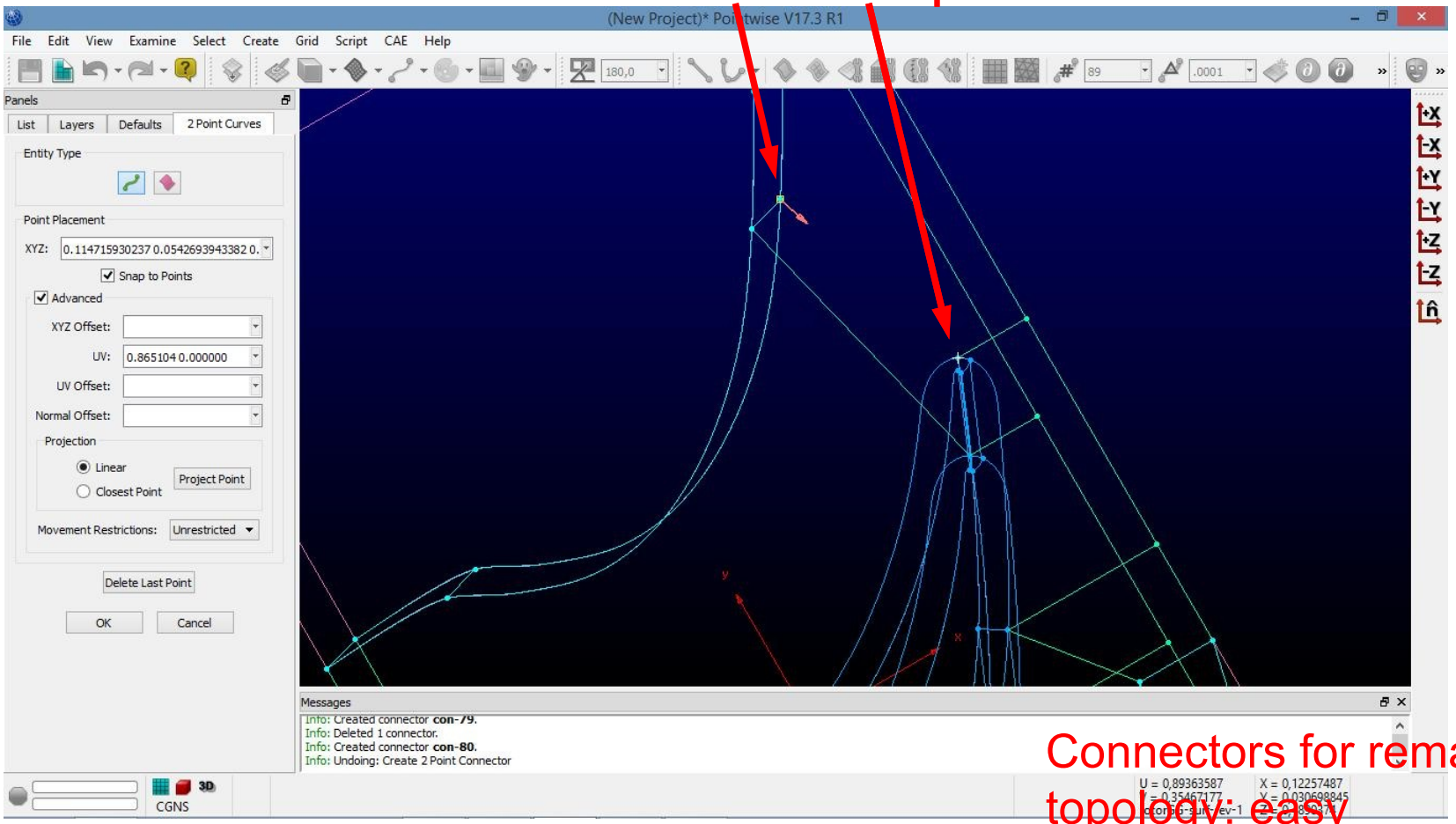
Boundary Layer Block Extrusion

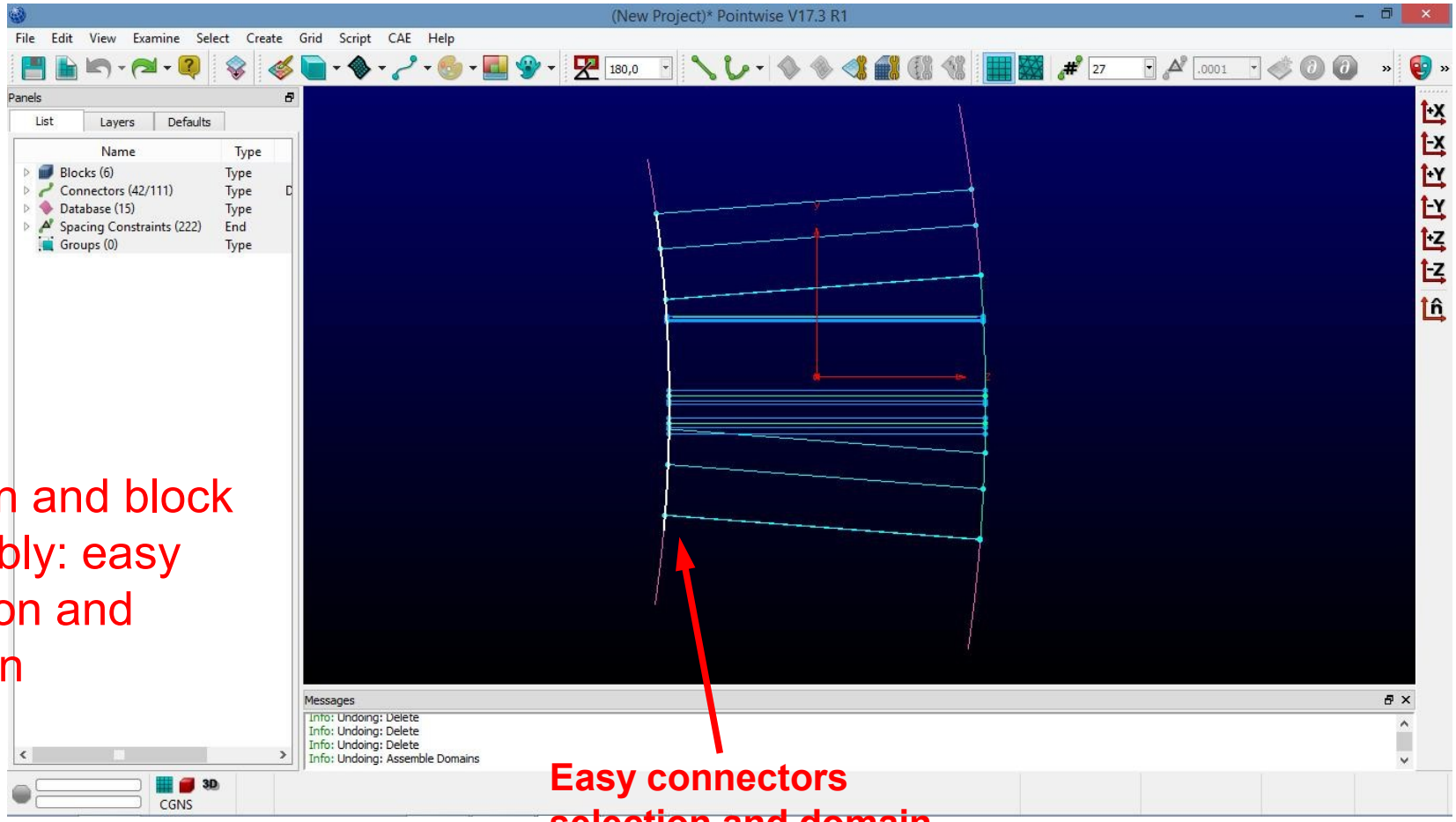
Mesh under control

Initial and final point

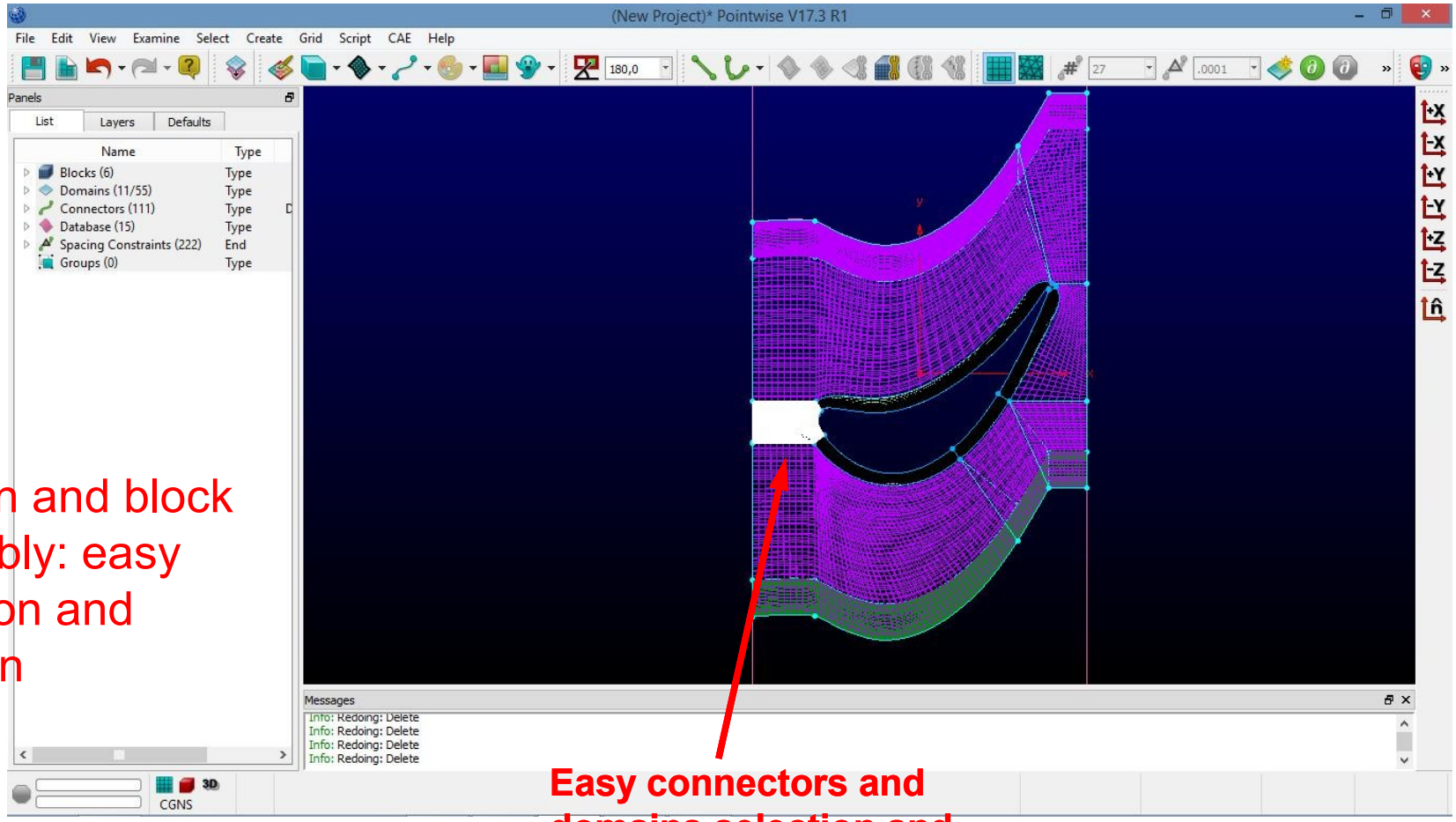


Connectors for remaining topology: easy connectors creation

Domain and block assembly: easy selection and creation

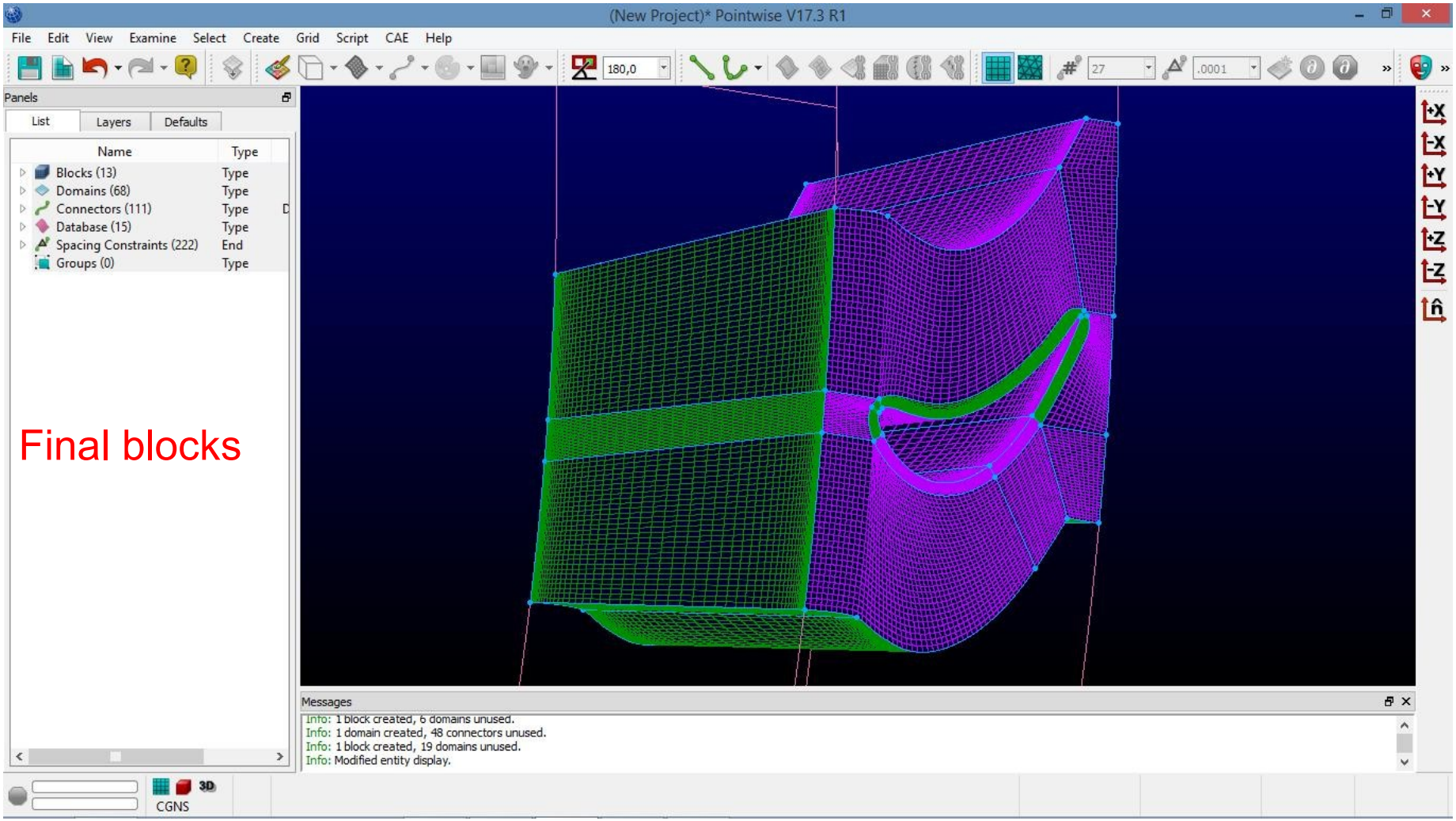


Easy connectors selection and domain creation



Domain and block assembly: easy selection and creation

Easy connectors and domains selection and block creation



Domain and Block assembly

Mesh under control

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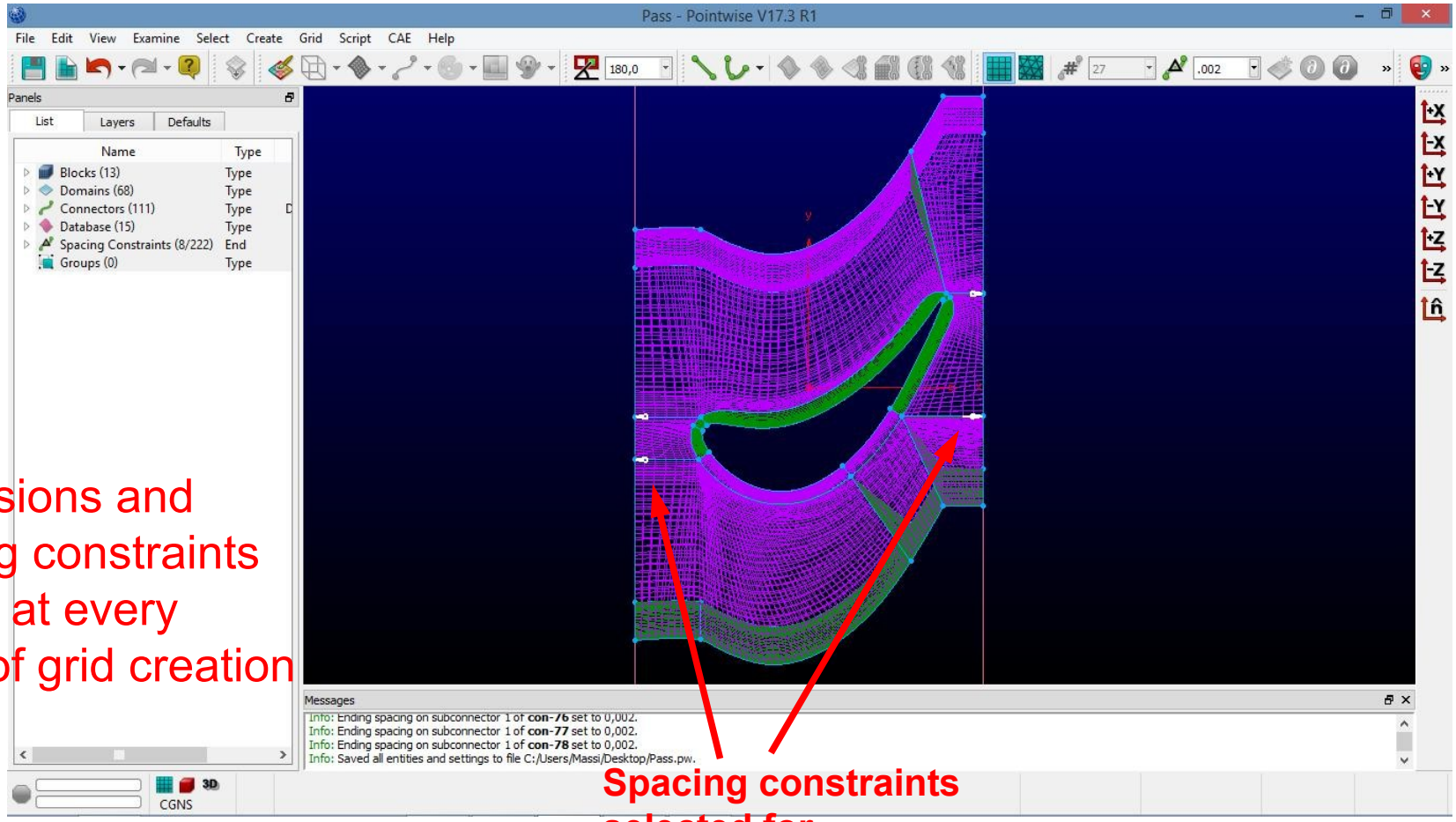
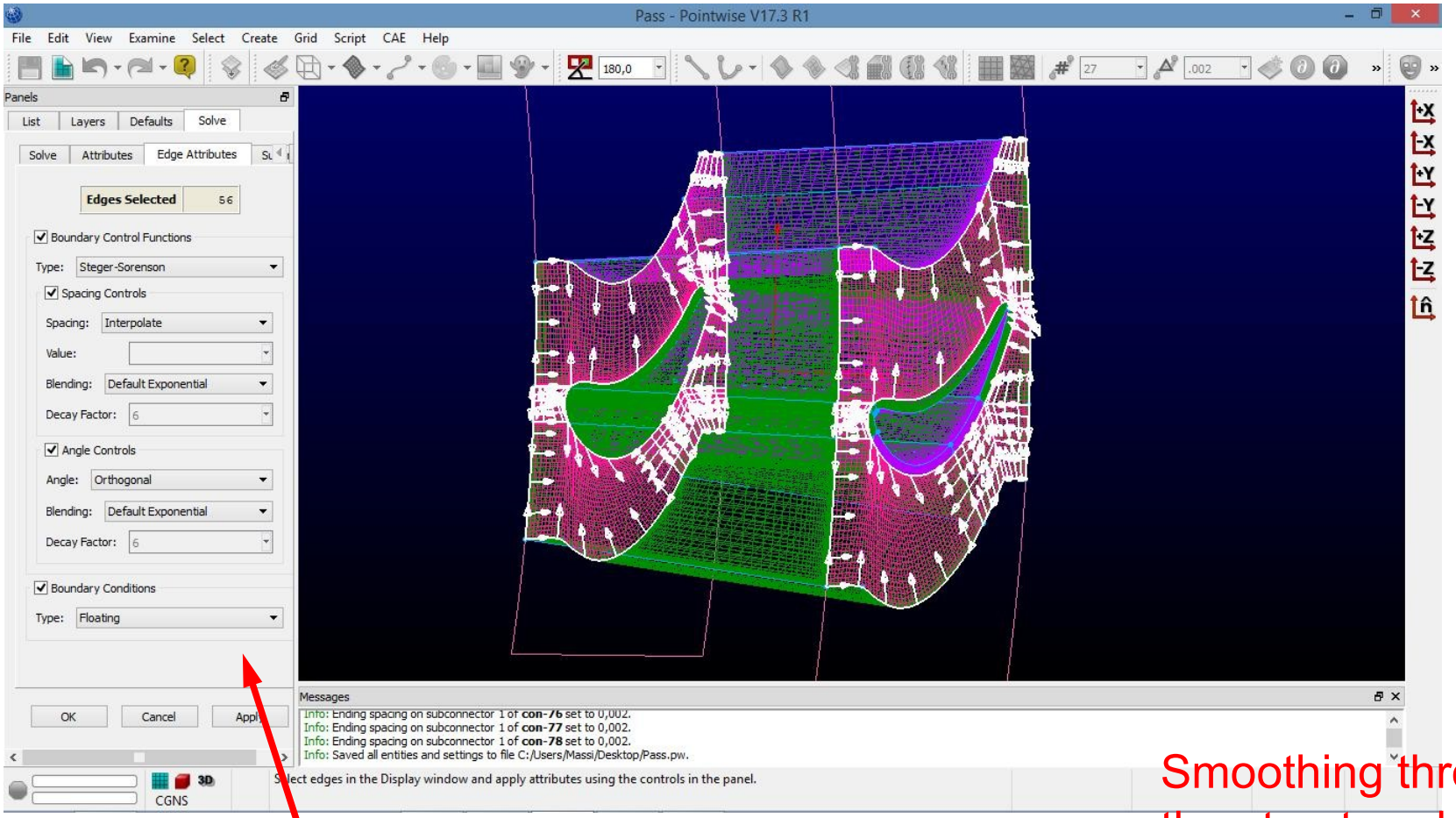
Dimensions and spacing constraints control at every stage of grid creation

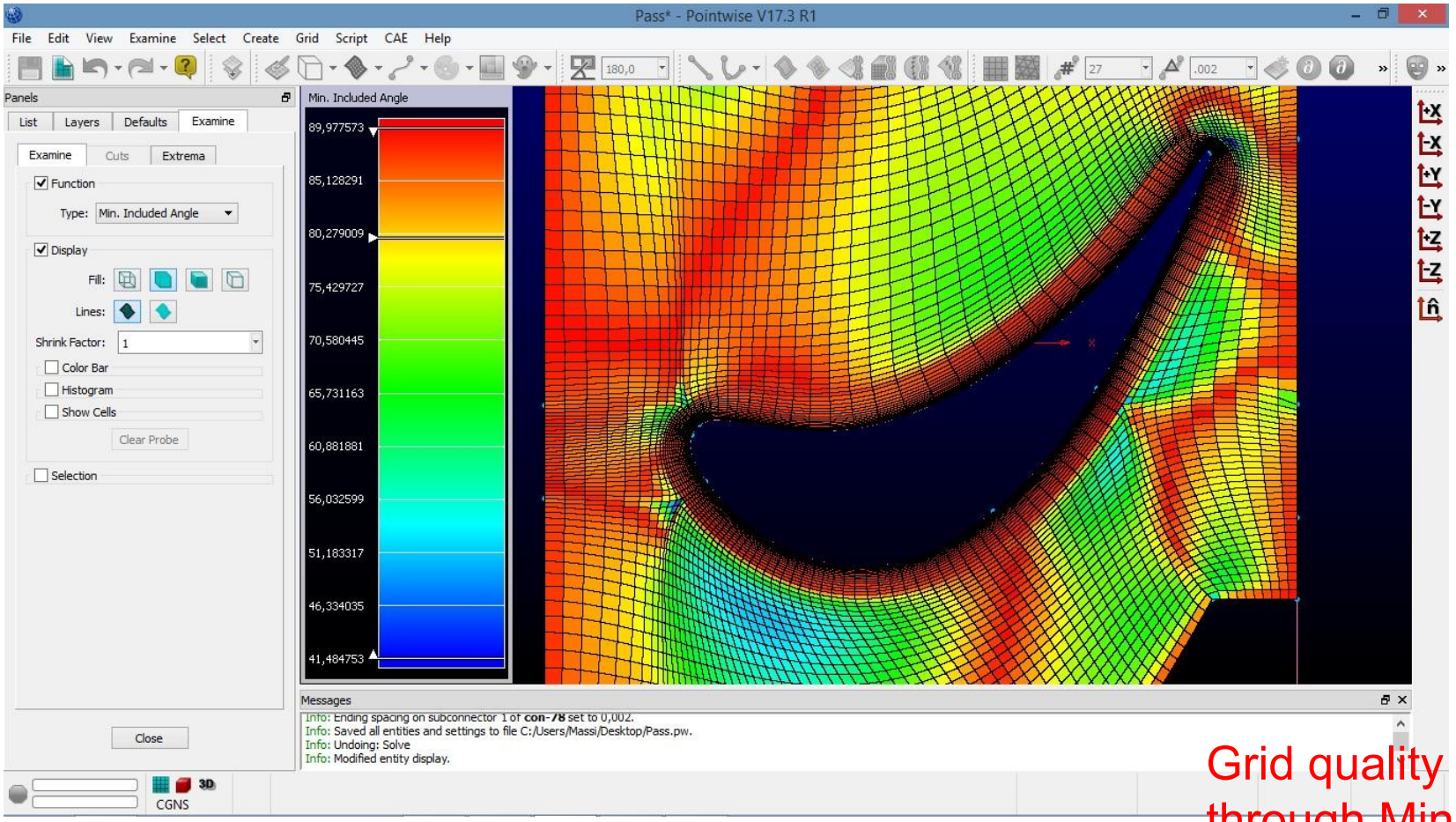


Spacing constraints selected for modification

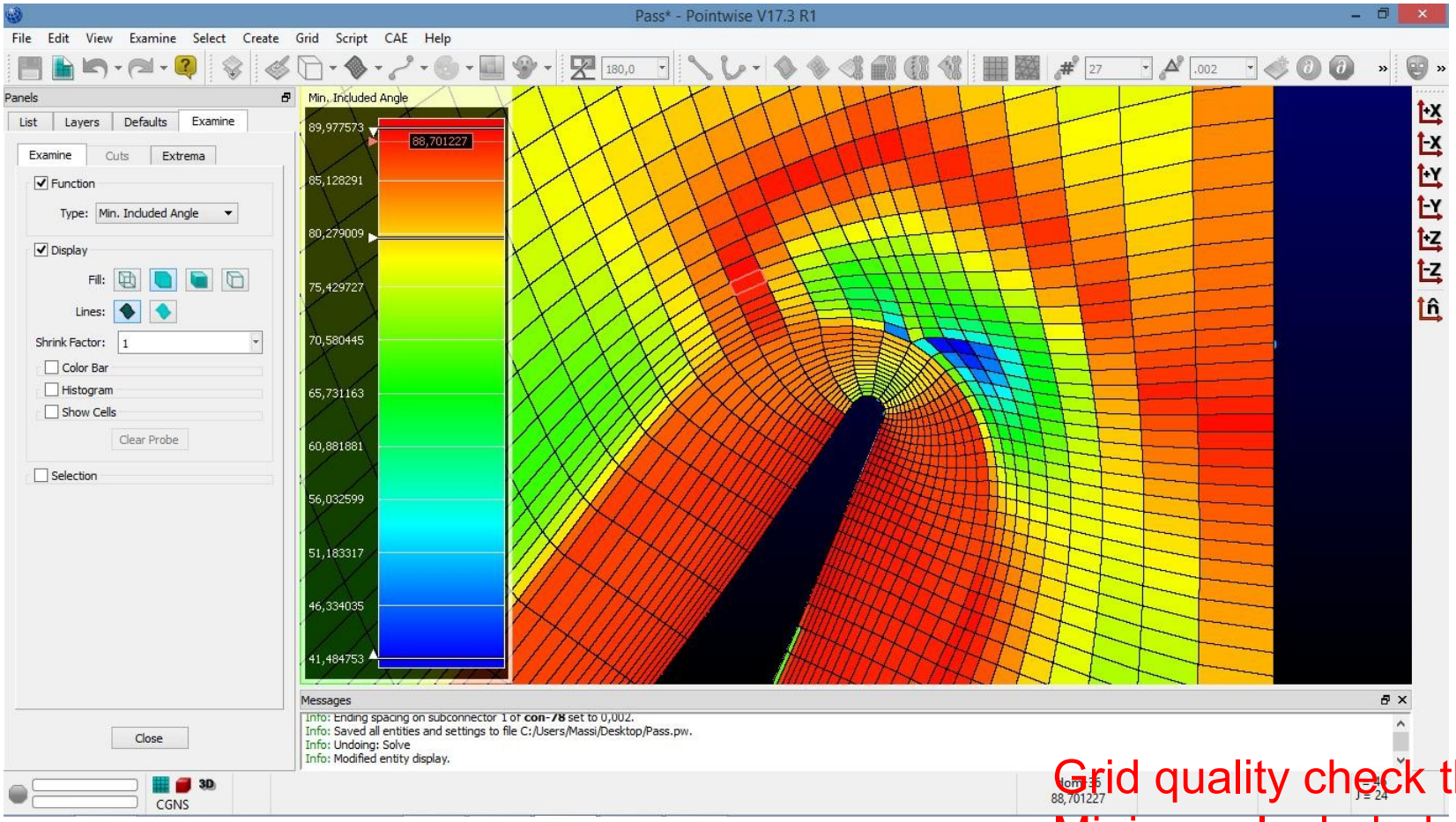


Elliptic smoothing attributes

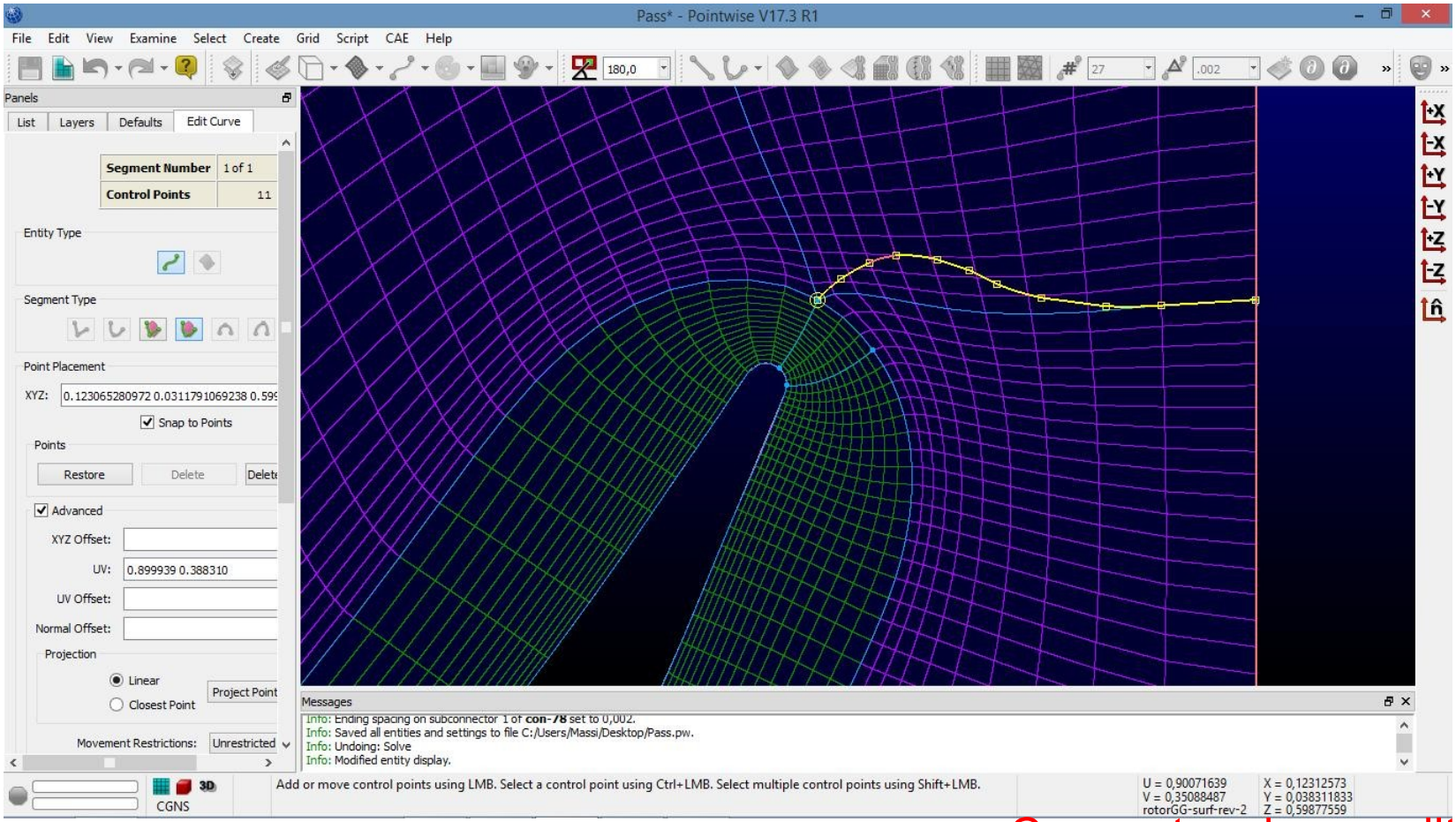
Smoothing through the structured elliptic solver



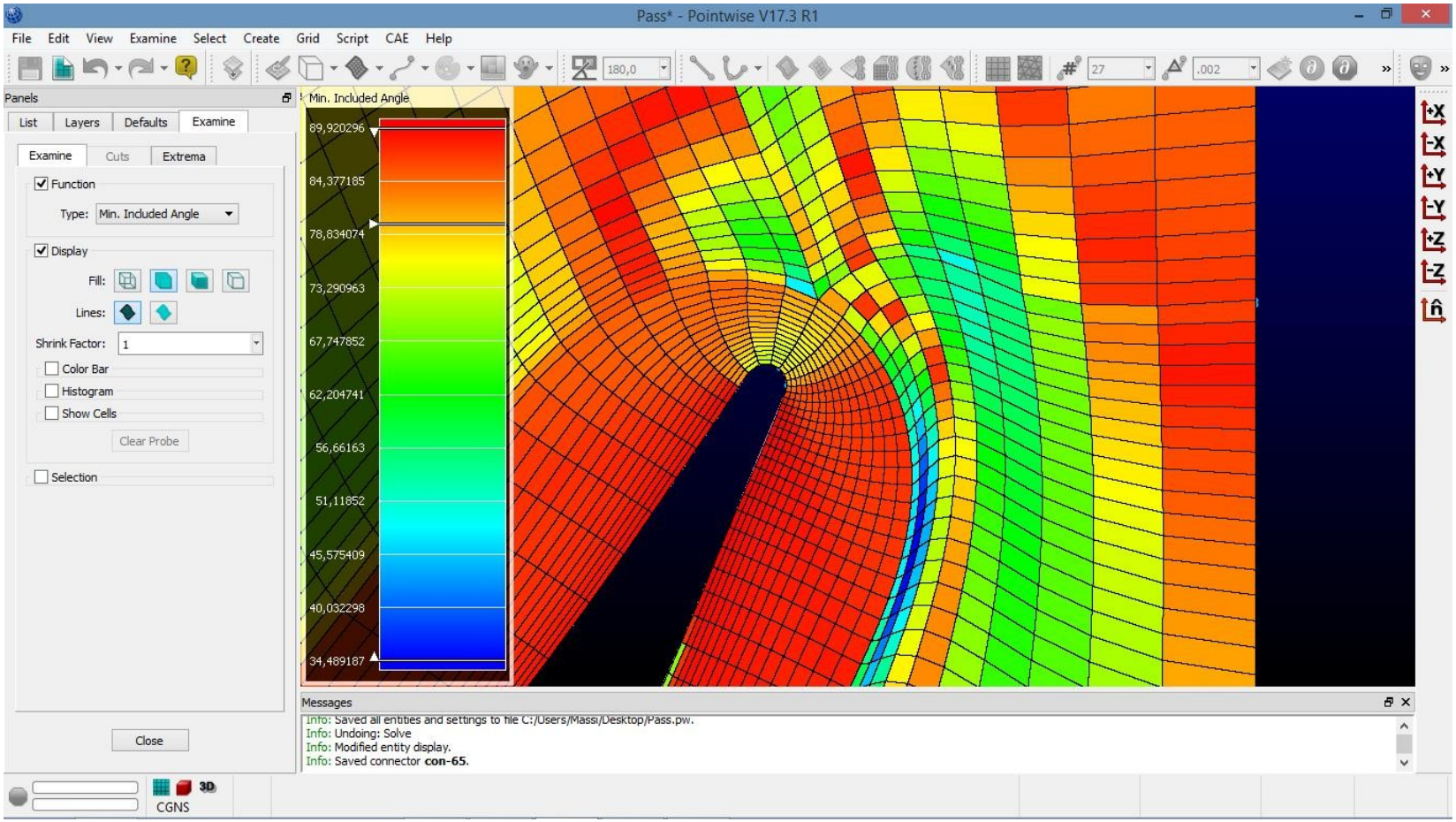
Grid quality check through Minimum Included Angle



Grid quality check through Minimum Included Angle at Trailing Edge



Connector shape edit and modification



New grid quality check

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Entities modification for grid quality

Mesh under control

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Glyph

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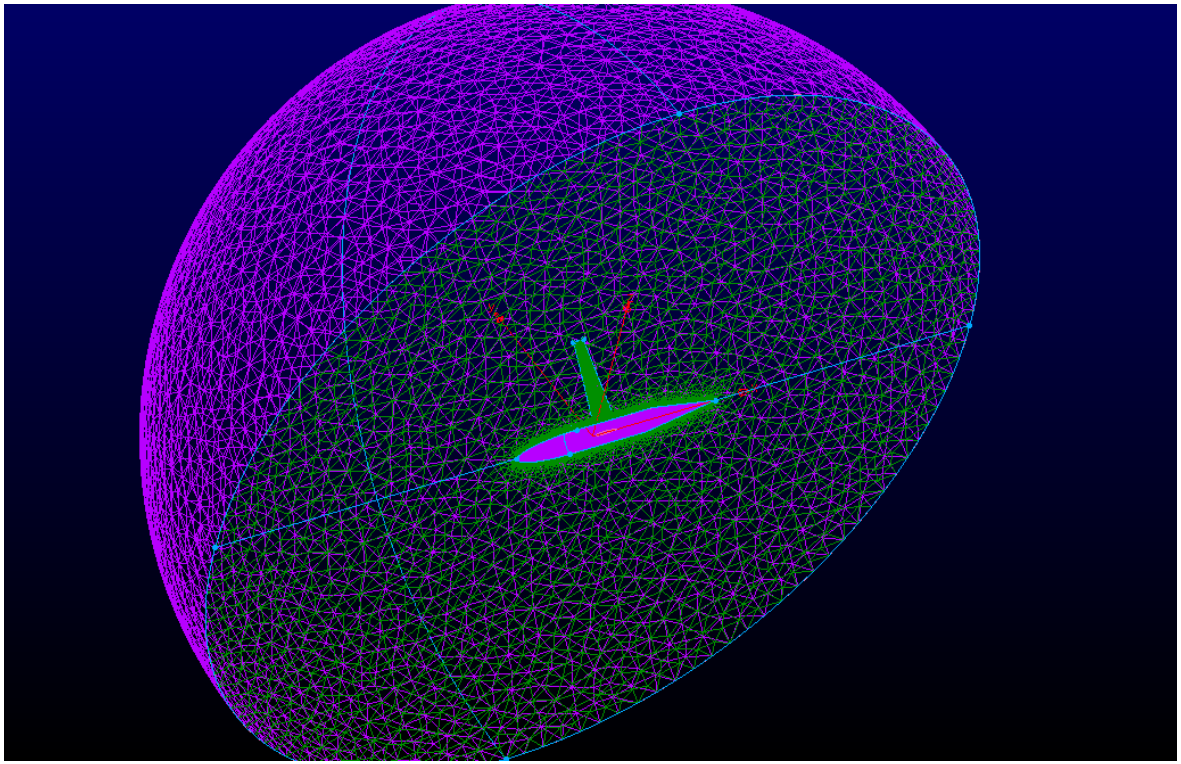
Glyph



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Glyph

Pointwise's Tcl-based scripting language, Glyph, provides customization capabilities

Rather than type scripts entirely by hand you can use journaling

Glyph gives the possibility to:
- automate complex grids
- reproduce the same grid for similar geometries (results not mesh depending)
- link Pointwise to a Process Integration and Design Optimization software

Script file example: text file

Automatic-Airplane.glf - WordPad

File Modifica Visualizza Inserisci Formato ?

```
# Pointwise V17.0R2 Journal file - Fri Oct 26 16:01:37 2012

package require PWI_Glyph 2.17.0

pw::Application setUndoMaximumLevels 5
pw::Application reset
pw::Application markUndoLevel {Journal Reset}

pw::Application clearModified

# Directory from which script is run
set cwd [file dirname [info script]]

#
# Fuselage conica and line data
#

set point1 "-4.00 0.00 0.00"
set point2 "-1.00 0.00 0.75"
set CornerP1 "-4.00 0.00 0.75"
set curvatura1 "0.40"
set point3 "3.00 0.00 0.75"
set point4 "6.50 0.00 0.00"

#
# Wing data
#

set RootScale "1.20 1.20 1.20"
set RootPich "1.00"
set RootPosition "0.20 0.00 0.00"
set TipScale "0.50 0.50 0.50"
set TipPich "-2.00"
set TipPosition "2.00 5.00 0.50"

#
# Shape Creation
#

pw::Display resetView +Y
set _TMP(mode_1) [pw::Application begin Create]
  set _TMP(PW_1) [pw::SegmentConic create]
  $_TMP(PW_1) addPoint $point1
  $_TMP(PW_1) addPoint $point2
  $_TMP(PW_1) setRho $curvatura1
  $_TMP(PW_1) setIntersectPoint $CornerP1
  set _TMP(curve_1) [pw::Curve create]
  $_TMP(curve_1) addSegment $_TMP(PW_1)
  unset _TMP(PW_1)
$_TMP(mode_1) end
```

Per ottenere la Guida, premere F1

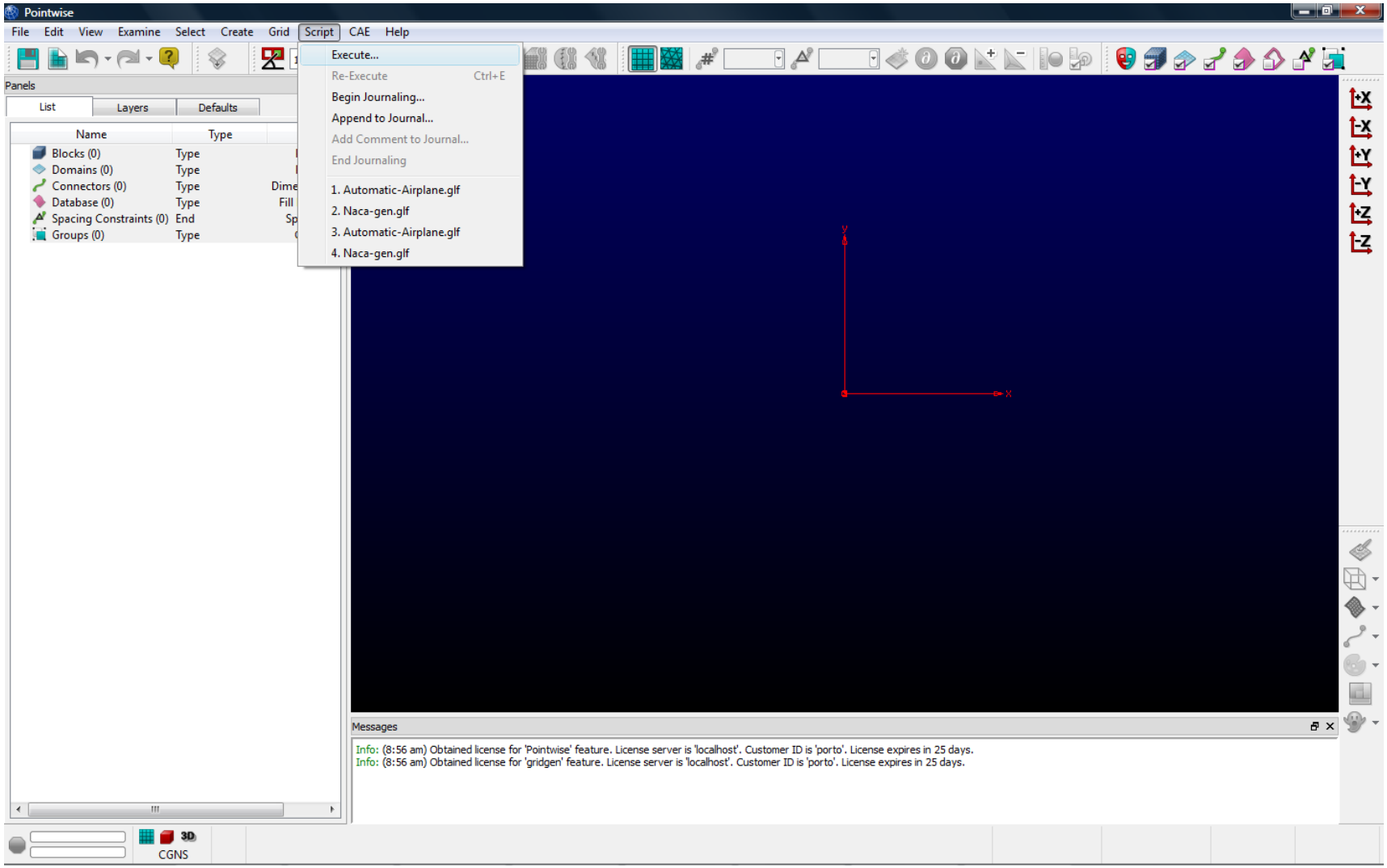
Variables declaration

Automatic-Airplane.glf - WordPad

File Modifica Visualizza Inserisci Formato ?

```
# Directory from which script is run
set cwd [file dirname [info script]]

#
# Fuselage conica and line data
#

set point1 "-4.00 0.00 0.00"
set point2 "-1.00 0.00 0.75"
set CornerP1 "-4.00 0.00 0.75"
set curvatura1 "0.40"
set point3 "3.00 0.00 0.75"
set point4 "6.50 0.00 0.00"

#
# Wing data
#

set RootScale "1.20 1.20 1.20"
set RootPich "1.00"
set RootPosition "0.20 0.00 0.00"
set TipScale "0.50 0.50 0.50"
set TipPich "-2.00"
set TipPosition "2.00 5.00 0.50"

#
# Shape Creation
#

pw::Display resetView +Y
set _TMP(mode_1) [pw::Application begin Create]
  set _TMP(PW_1) [pw::SegmentConic create]
```

Per ottenere la Guida, premere F1



Execute script

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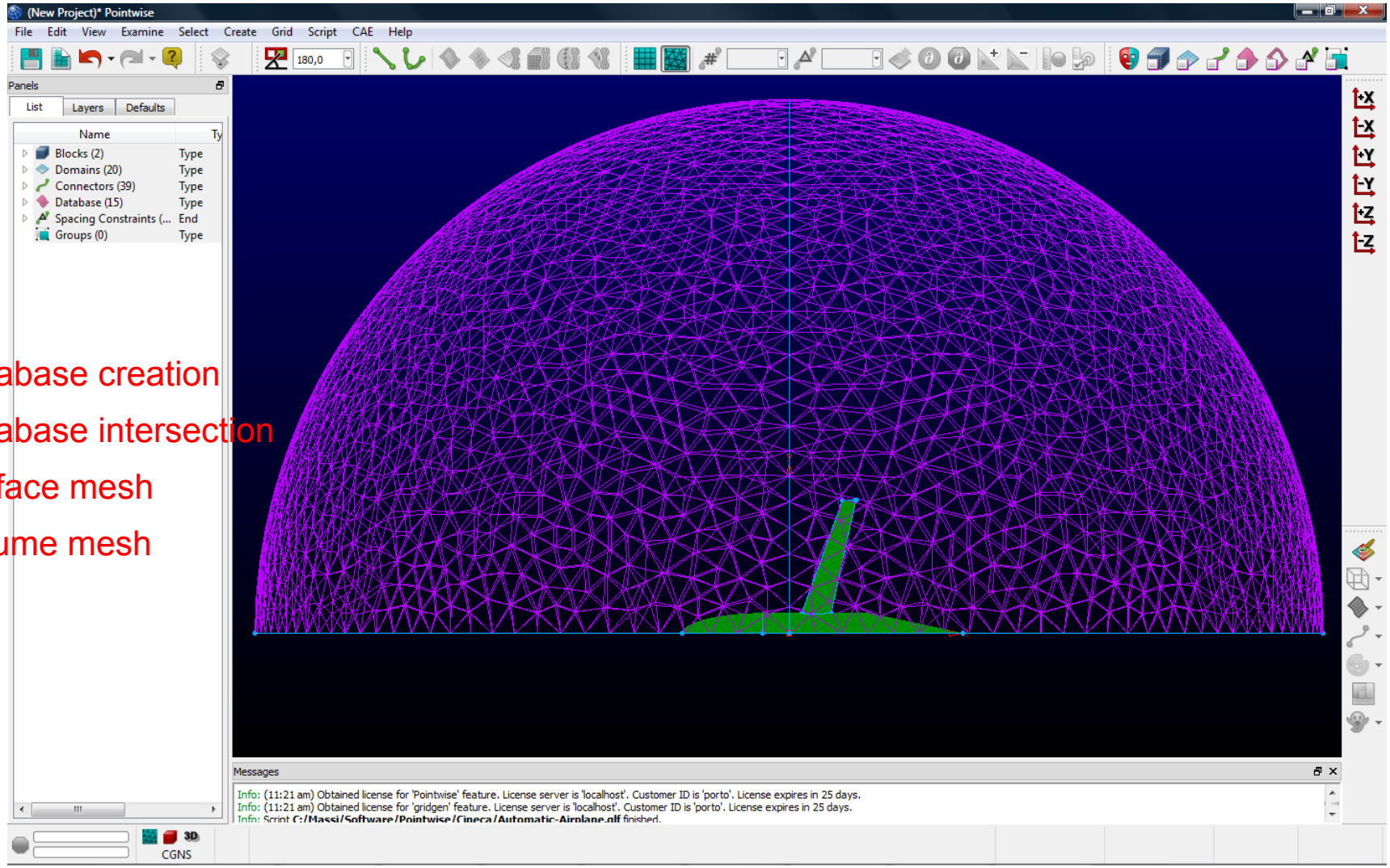

Database creation

Database intersection

Surface mesh

Volume mesh

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Script executed

Glyph

Automatic-Airplane.glf - WordPad

File Modifica Visualizza Inserisci Formato ?

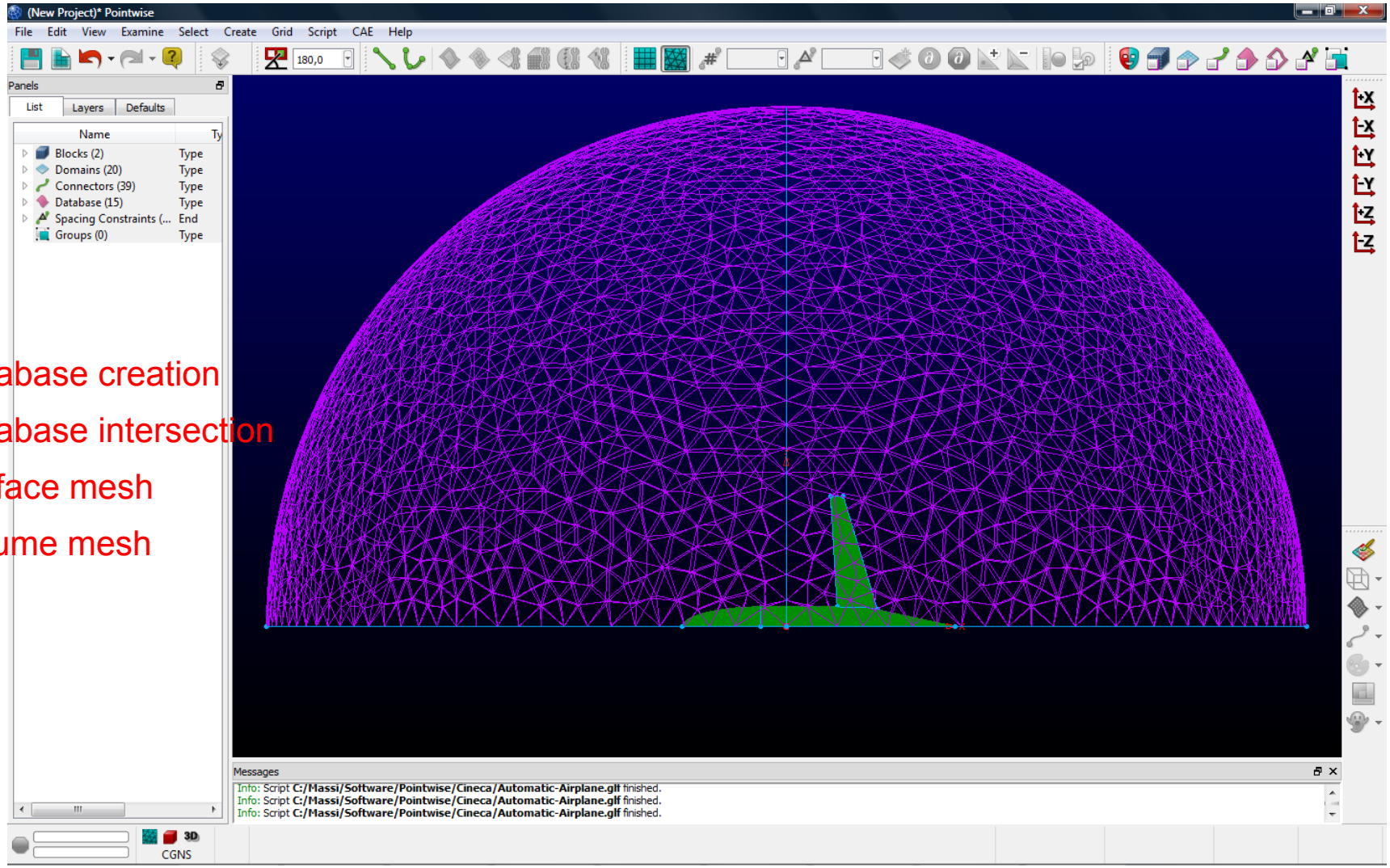
```
# Directory from which script is run
set cwd [file dirname [info script]]

#
# Fuselage conica and line data
#

set point1 "-4.00 0.00 0.00"
set point2 "-1.00 0.00 0.75"
set CornerP1 "-4.00 0.00 0.75"
set curvatura1 "0.40"
set point3 "3.00 0.00 0.75"
set point4 "6.50 0.00 0.00"

#
# Wing data
#

set RootScale "1.70 1.20 1.20"
set RootPich "1.00"
set RootPosition "2.00 0.00 0.00"
set TipScale "0.50 0.50 0.50"
set TipPich "-2.00"
set TipPosition "1.70 5.00 0.50"

#
# Shape Creation
#

pw::Display resetView +Y
set _TMP(mode_1) [pw::Application begin Create]
  set _TMP(PW_1) [pw::SegmentConic create]
```

Per ottenere la Guida, premere F1

Wing X Root Scale: from 1.20 to 1.70

Wing X Root Position: from 0.20 to 2.00

Wing X Tip Position: from 2.00 to 1.70



Database creation

Database intersection

Surface mesh

Volume mesh

Script re-executed

Glyph

Ricerca

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Thank you for attending.

more examples at

http://www.pointwise.com/webinar/

for more info

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info@portoricerca.com

Pointwise

www.pointwise.com

sales@pointwise.com

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