UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

Dipartimento di Ingegneria "Enzo Ferrari"

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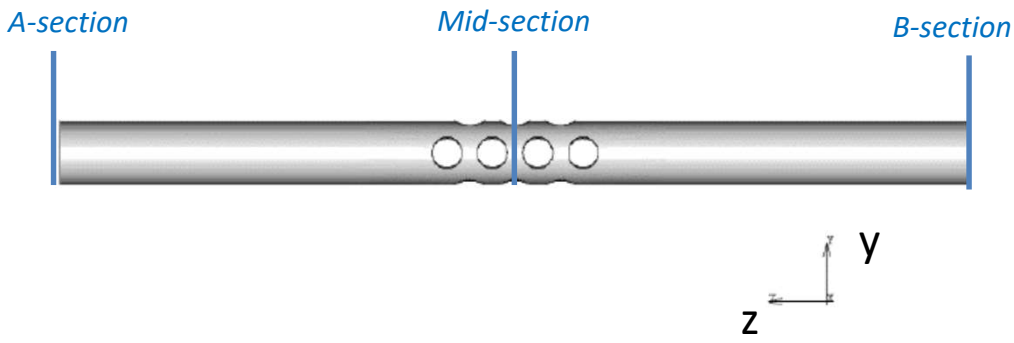
Agenda

Lightened thin-profile for *symmetric* and *skew-symmetric* analysis:

- Tensile load
- Bending moment load
- Torque
- Pressure



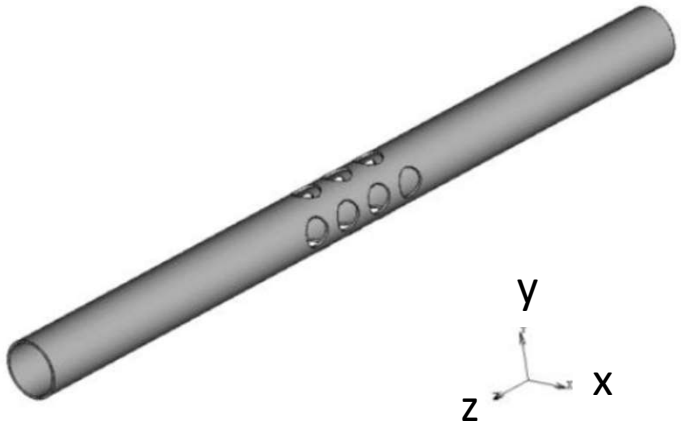
References

Agenda

Lightened profile for *symmetric* and *skew-symmetric* analysis:

- Tensile load, F = 15.708N
- Bending moment load, M_{f_xx}= 37.493 Nmm
- Torque M_t = 74,987 Nmm
- Pressure p = 1 MPa

References



Extrapolation

These commands control the manner in which element integration point data is extrapolated to the nodes of an element. In addition they control the inter-element averaging of the nodal data after it has been extrapolated.

`post_extrap_linear`
Extrapolate by averaging the integration points to the centroid of the element and then doing a linear extrapolation from the centroid through the integration point to the node.

`post_extrap_translate`
Actually do not extrapolate, but rather copy the data at each integration point to its corresponding node. In those cases where there are fewer integration points than nodes, some averaging of neighboring integration points is done.

`post_extrap_average`
The average of all the integration points is computed and assigned to the nodes. Therefore, all nodes have an equal value assigned to them.

Nodal Averaging

`post_nodal_averaging <on/off>`

This commands toggles the averaging of element values at the nodes. Averaging is done to assure that contour lines are continuous. When it is turned off, each element is independently contoured and contour lines usually will appear discontinuous.

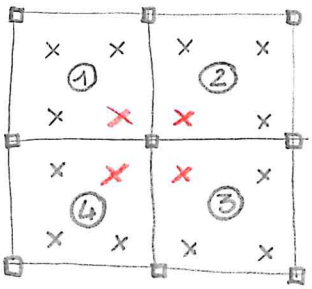
References

FE models:

tubo_sforacchiato_allungato_rev0.mud → Starting model

tubo_sforacchiato_allungato_svolto.mfd → Model with solutions

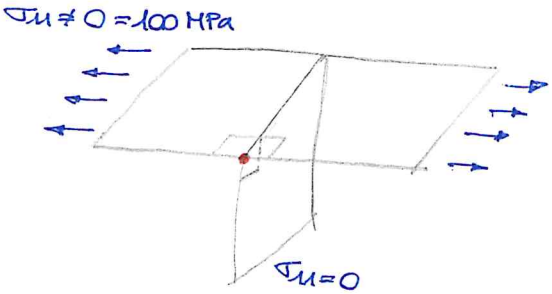
NODAL AVERAGING
- ON → CALCOLA LA MEDIA TRA I VALORI DEGLI ELEMENTI ADIACENTI E LA RIPORTA AL NODO COMUNE.
- OFF → CONTOUR PLOT DISCONTINUO



×, × PUNTI DI INTEGRAZIONE

□ NODI

① ② ③ ④ ELEMENTI ISOPARAMETRICI 4 NODI



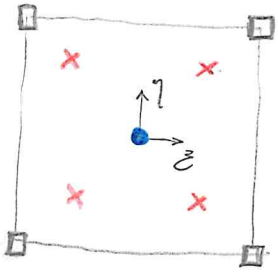
$\sigma_{11}^{\text{NODAL AVERAGING}} = \frac{100+100+0}{3}$

$\downarrow$

$66.\bar{6}$ MPa

SOTTOSTIMO DI 1/3 LO STATO TENSIONALE.

EXTRAPOLATION
- LINEAR
- TRANSLATE
- AVERAGE



● CENTROIDE

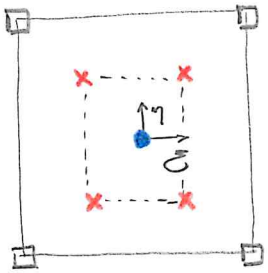
□ NODI

× PUNTI DI GAUSS

AVERAGE : CALCOLO LA MEDIA TRA I VALORI RICAVATI AI PUNTI DI INTEGRAZIONE E LA RIPORTO AI NODI. TUTTI I NODI HANNO STESSO VALORE

TRANSLATE : IL DATO CALCOLATO AI PUNTI DI INTEGRAZIONE VIENE RIPORTATO AI NODI, IN PARTICOLARE DAL PUNTO DI INTEGRAZIONE AL NODO PIÙ VICINO NON VIENE FATTA ALCUNA ESTRAPOLAZIONE O MEDIA.

LINEAR: 1) calcolo la media tra i valori ricavati ai punti di integrazione e la applico al centroide

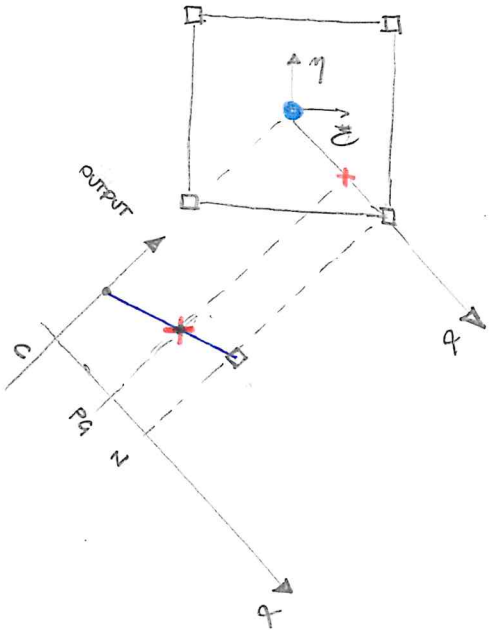


□ NODI

× PUNTI di INTEGRAZIONE (PI)

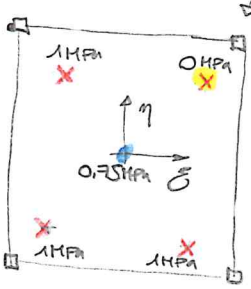
● CENTROIDE (C)

② estrapolo linearmente il valore ai nodi a partire dai valori del centroide e dal valore ottenuto al punto di Gauss prossimo al nodo di cui si sta facendo la valutazione



CASO (A)

- POSSO QUINDI OTTENERE VALORI DI TENSIONI IDEALI CALCOLATE SECONDO IL CRITERIO di VON MISES NEGATIVE ?



VALORE NEGATIVO !!

× = 1MPa

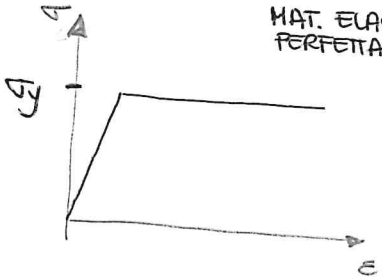
× = 0 MPa

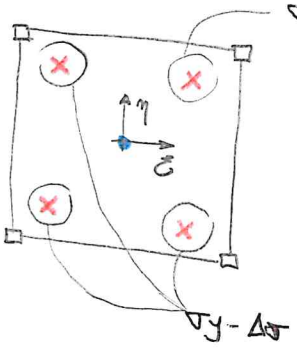
al centroide

● = 0,75MPa

CASO (B)

MAT. ELASTO PERFETTAM. PLASTICO





al centroide

$\sigma < \sigma_y$

al nodo × estrapolazione lineare

$\sigma > \sigma_y$!!!