COMPutational
ASsessment
Suite

COMPutational·ASsessment·Suite

STRATOFEM™

Code Details V1

STRATOFEM™

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comp-as-s.com

COMPutational ASsessment Suite

Contents

Finite Element Library

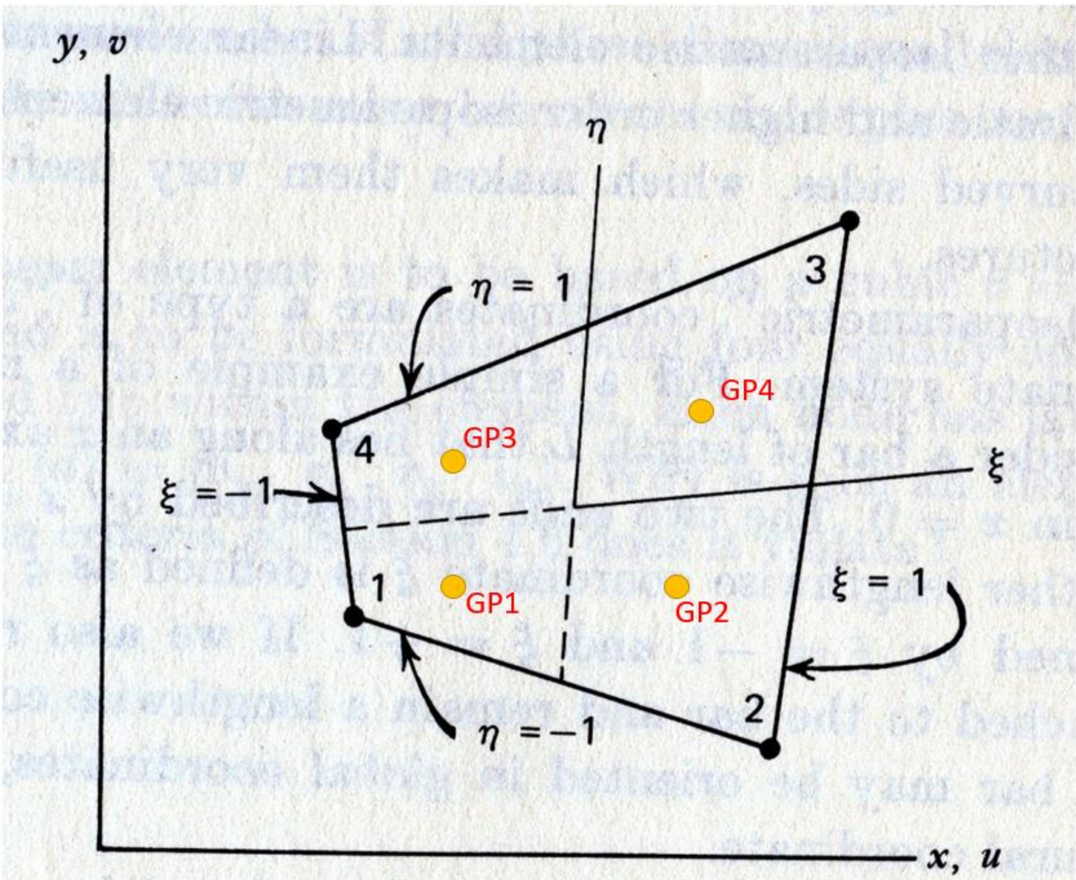
All the Finite Elements are isoparametric elements of either classical or customized formulation.

2D plane elements

2D plane stress or plain strain elements are in the element group between 1 and 10. Currently available are:

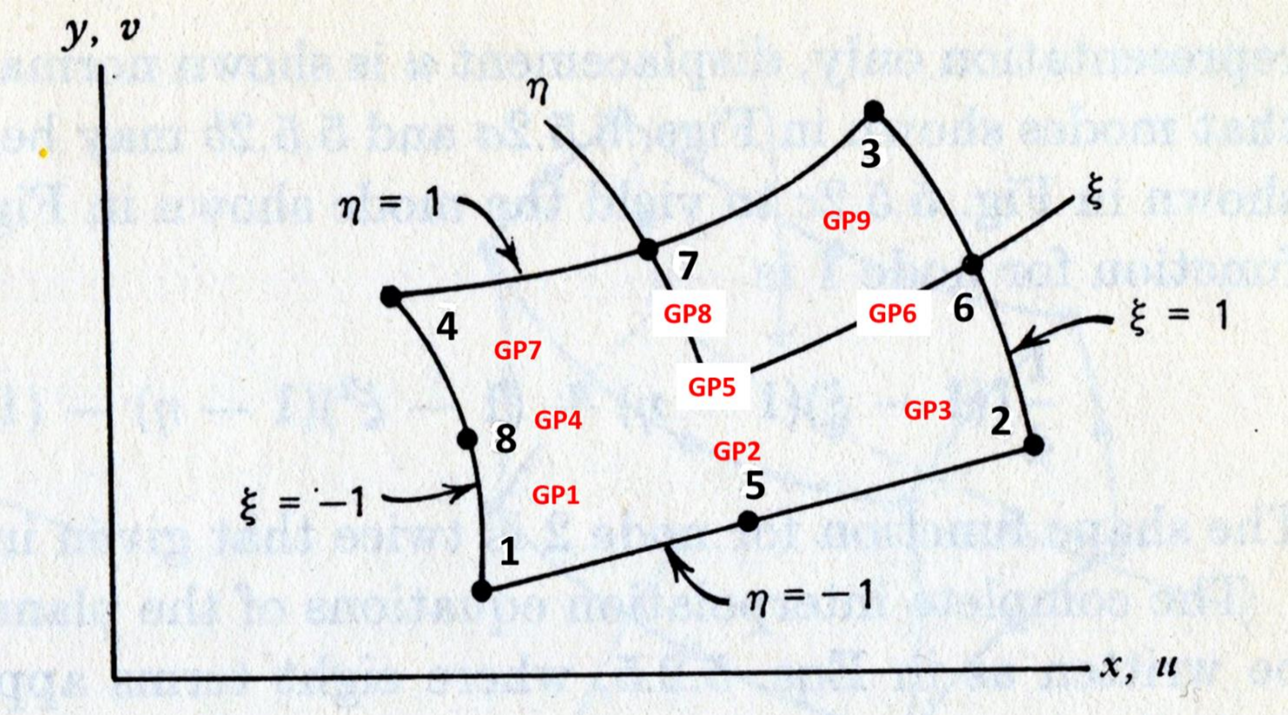
Element 4

Classical 4 node isoparametric element with 2x2 Gaussian integration.



Element 8

Classical 8 node "serendipity" isoparametric element with 3x3 Gaussian integration.

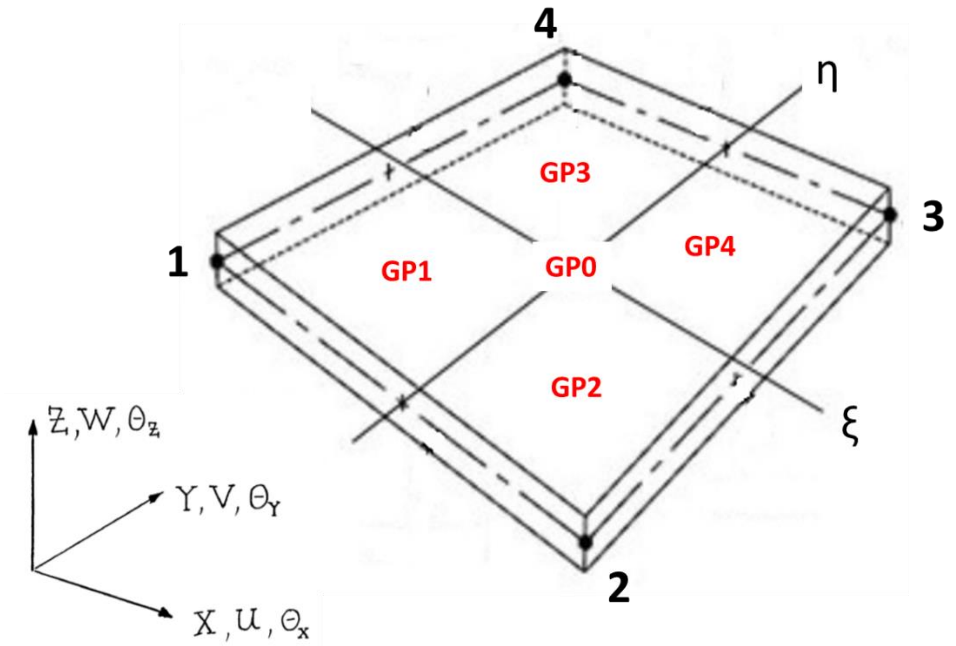


3D shell elements

3D shell elements are in the element group between 11 and 20. Currently available are:

Element 14

Non-classical 4 node shell. Based on the publications of Richard McNeil of MSC (QS04 element), it is a Mindlin-type 4 node isoparametric shell element with selective reduced Gaussian integration to prevent transverse shear locking.



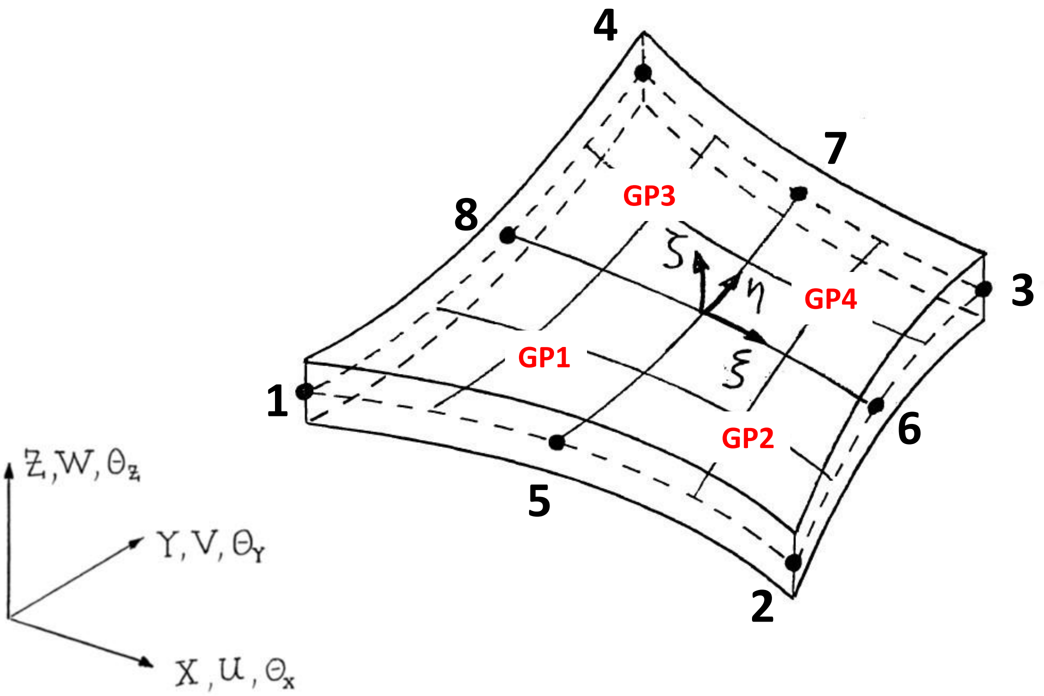
where GPs are the Gauss points (integration points)

The strain energy U is as below in terms of the membrane, bending and transverse shear components.

$$U = \frac{1}{2} \iint_A \left\{ \underset{\sim}{\epsilon}' \; \underset{\sim}{\kappa}' \; \underset{\sim}{\gamma}' \right\}^T \begin{bmatrix} \underset{\sim}{C}_\epsilon & & \\ & \underset{\sim}{C}_\kappa & \\ & & \underset{\sim}{C}_\gamma \end{bmatrix} \begin{Bmatrix} \underset{\sim}{\epsilon}' \\ \underset{\sim}{\kappa}' \\ \underset{\sim}{\gamma}' \end{Bmatrix} dA$$

Element 18

Non-classical 8 node thick shell. Based on the PhD thesis of Dr Kamoulakos, it is a quadratic isoparametric Mindlin-type shell element with reduced Gaussian integration of 2x2 to prevent transverse shear locking.



where GPs are the Gauss points (integration points)

The strain energy U is as below in terms of the membrane, bending and transverse shear components.

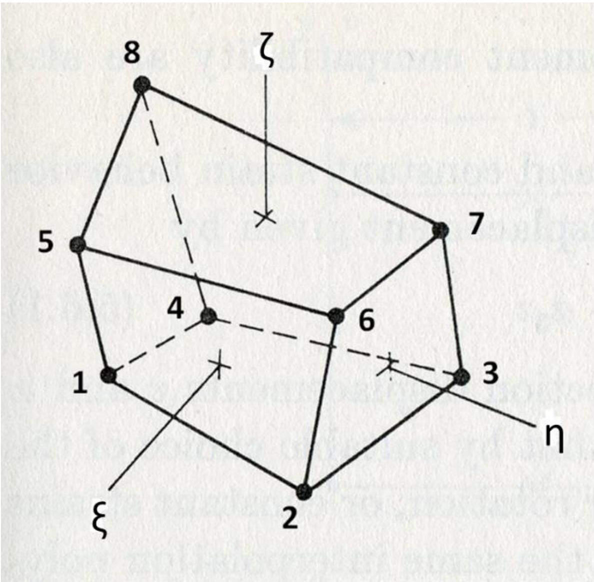
$$U = \frac{1}{2} \iint_A \left\{ \underset{\sim}{\epsilon}' \; \underset{\sim}{K}' \; \underset{\sim}{\gamma}' \right\}^T \begin{bmatrix} \underset{\sim}{C}_\epsilon & & \\ & \underset{\sim}{C}_\kappa & \\ & & \underset{\sim}{C}_\gamma \end{bmatrix} \begin{Bmatrix} \underset{\sim}{\epsilon}' \\ \underset{\sim}{K}' \\ \underset{\sim}{\gamma}' \end{Bmatrix} dA$$

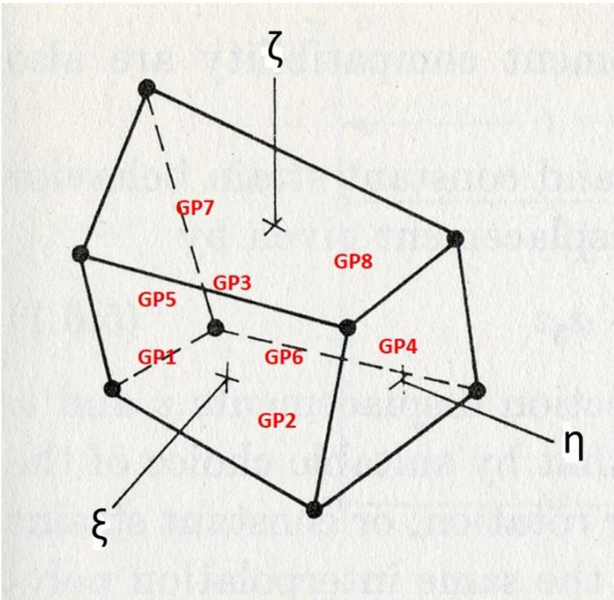
3D solid elements

3D solid elements are in the element group between 21 and 30. Currently available are:

Element 24

Classical 8 node "brick" isoparametric element with 2x2x2 Gaussian integration.





3D bar//beam elements

3D bar/beam elements are in the element group between 31 and 40. Currently available are:

None, although **Element 34** will be soon integrated as a 2-node non-classical Hermitian (cubic) Kirchoff-type analytically integrated 3D beam element, based on the MSc thesis of Dr Kamoulakos (originally conceived for the flutter analysis of large wind-turbine (eolian) blades).