

ÍNDICE

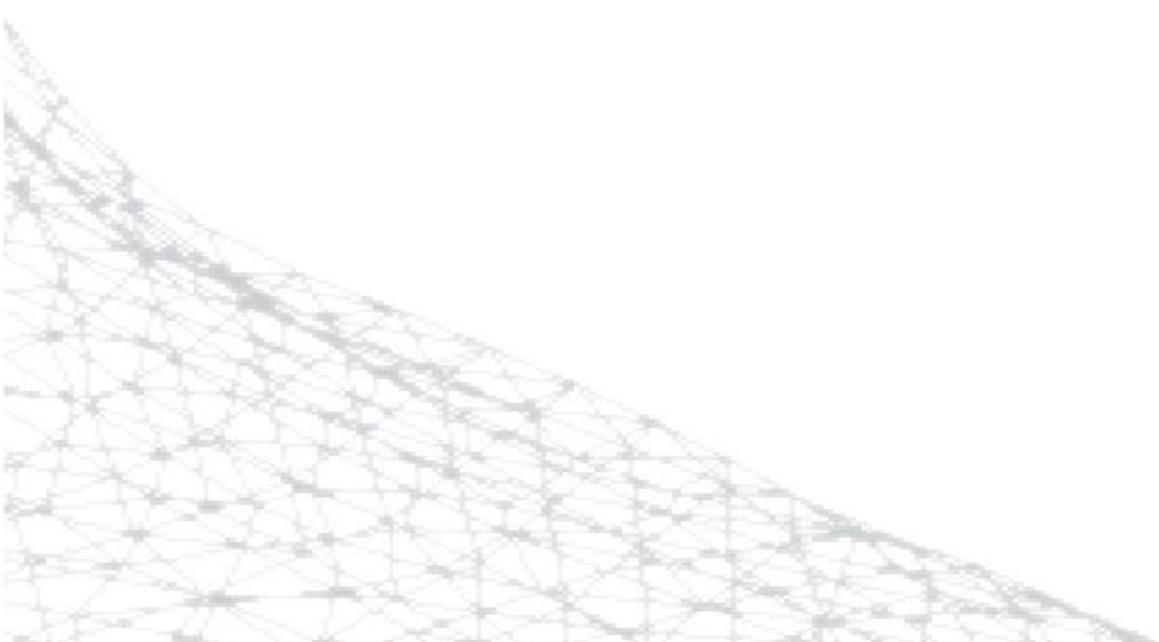
Conceptos básicos

Esquema del procedimiento

Tipos de elementos básicos

Procedimiento de análisis

Otros tipos de análisis

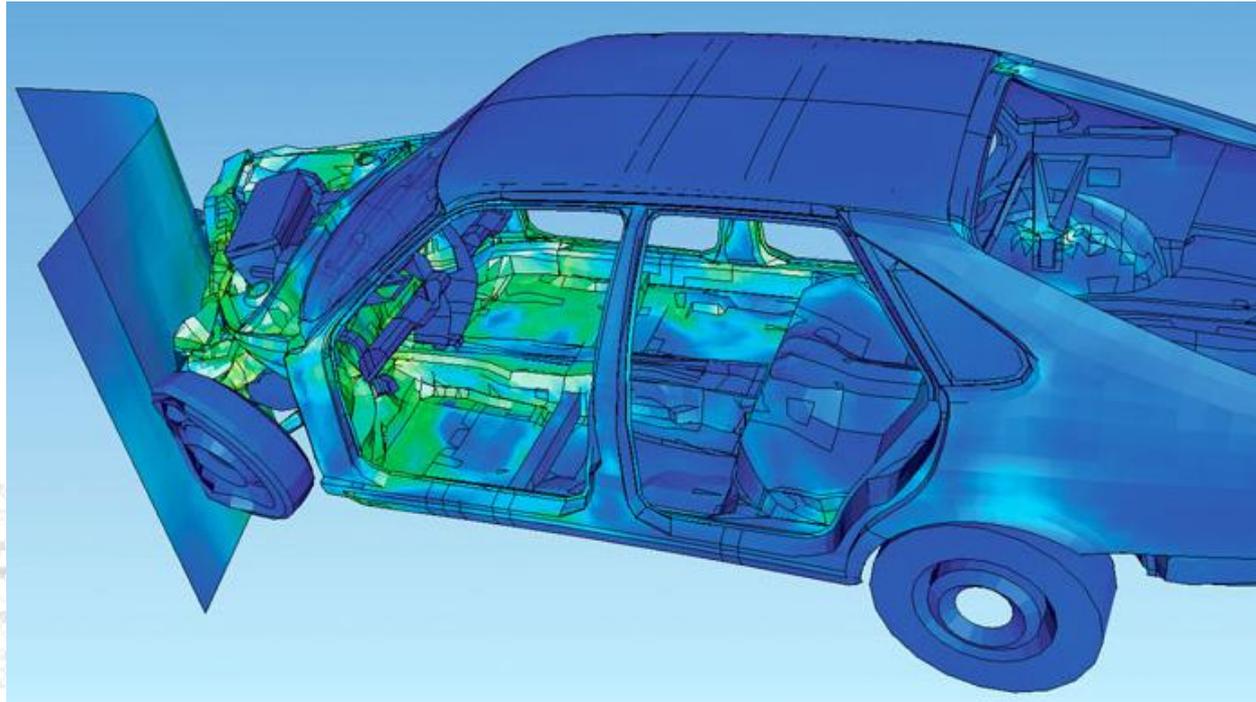


Conceptos básicos

Ejemplo: Diseño de vehículos. Simulación de crash-tests.

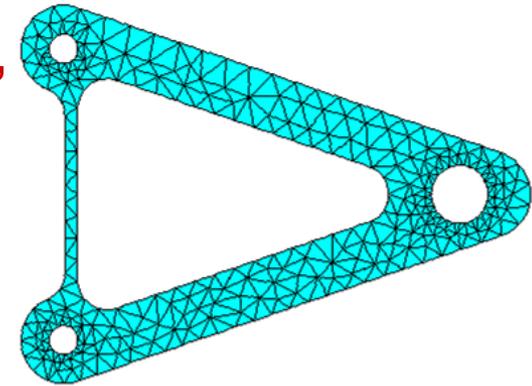
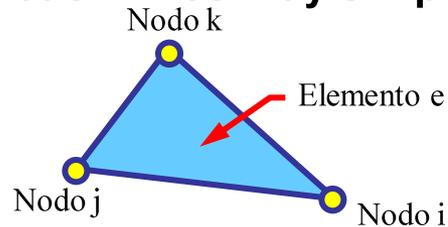
En necesario utilizar técnicas numéricas para predecir el comportamiento del vehículo durante la etapa de diseño

El **método de los elementos finitos (MEF)** es una herramienta CAE ampliamente utilizada en la industria.



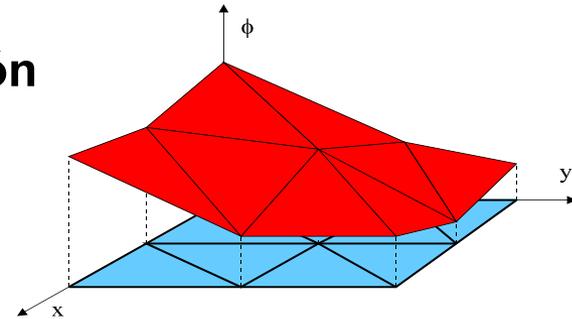
Conceptos básicos. Esquema del procedimiento

- (1°) Discretización del dominio en “**elementos**”
(subdominios muy simples)



- (2°) Suponer una aproximación a la solución
en cada subdominio

Ecuaciones de elemento: $\mathbf{k}^e \cdot \mathbf{u}^e = \mathbf{f}^e$

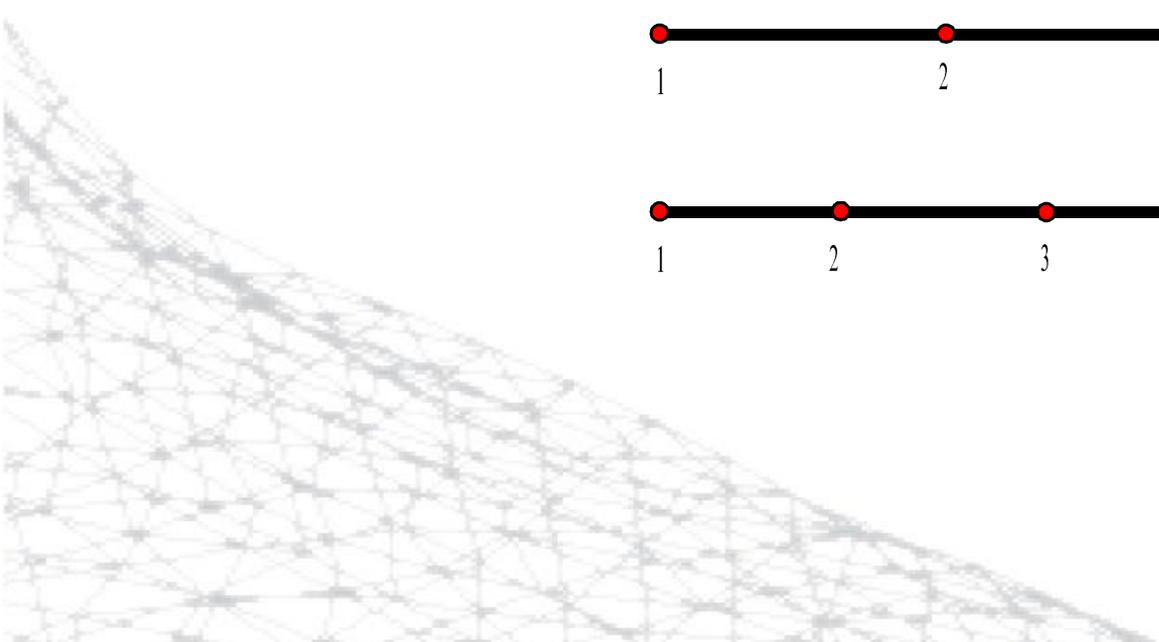
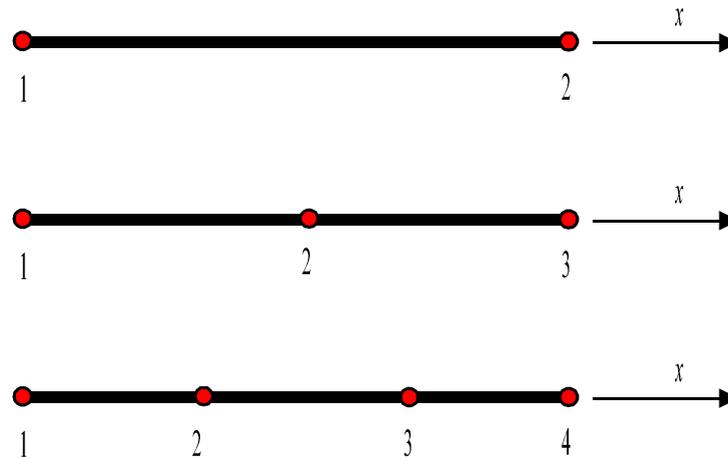


- (3°) Ensamblado de ecuaciones de elemento: $\mathbf{K} \cdot \mathbf{U} = \mathbf{F}$

- (4°) Aplicación de restricciones

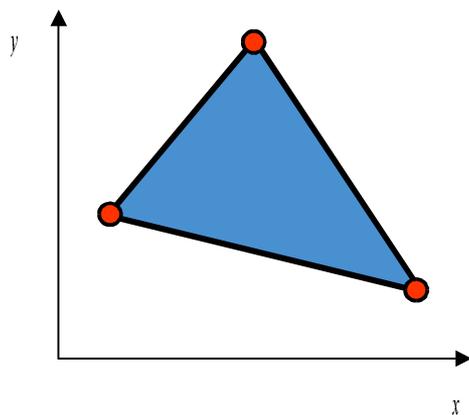
- (5°) Resolución numérica del problema y análisis de resultados

Conceptos básicos. Tipos de elementos básicos

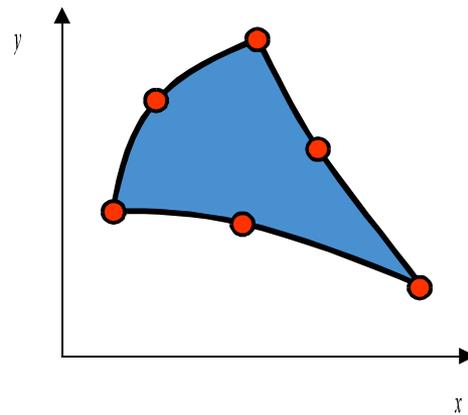


Conceptos básicos. Tipos de elementos básicos

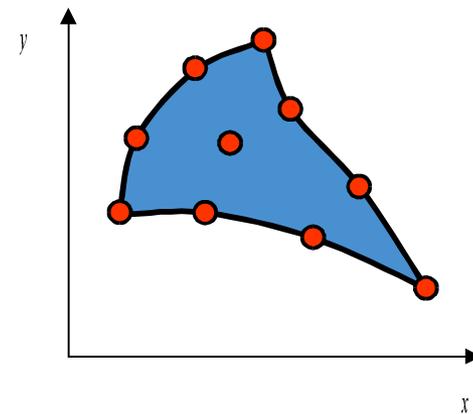
Lineal



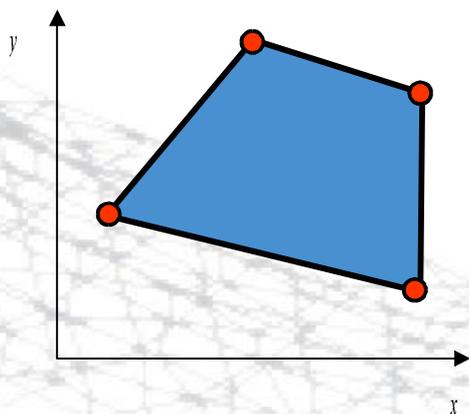
Cuadrático



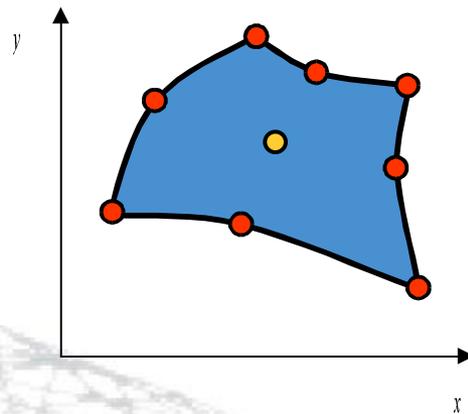
Cúbico



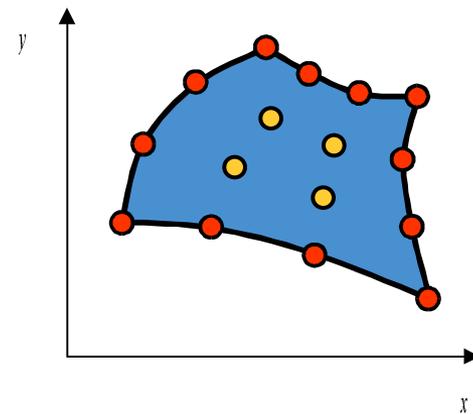
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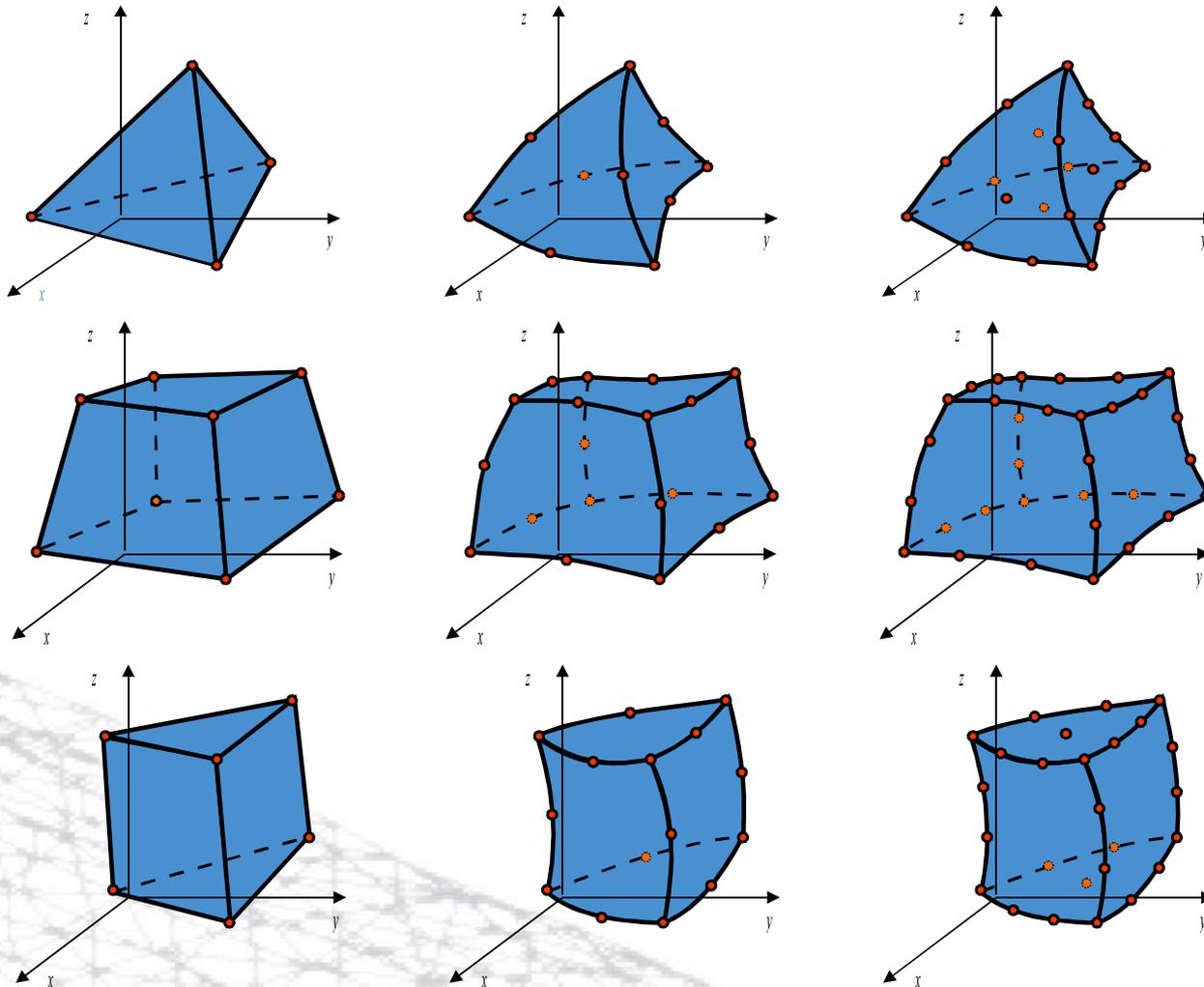
Cuadrático



Cúbico



Conceptos básicos. Tipos de elementos básicos

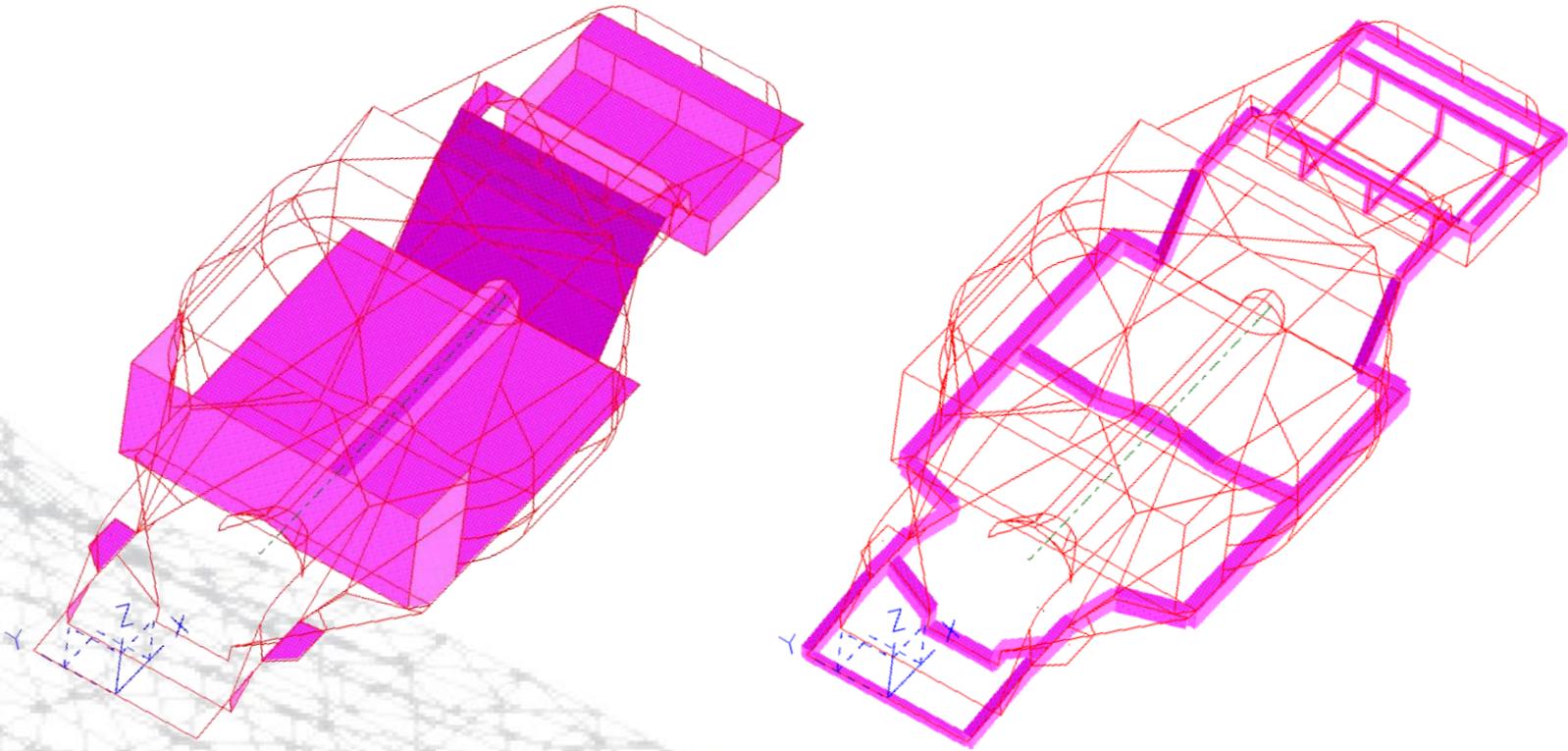


Conceptos básicos. Tipos de elementos. Librería de Ansys 5.4

Structural Point	Stec														
Structural Mass	Spar	Structural Solid	Axisym Harmo	Tetrahedral Thermal Solid	Therm	Hyperelastic Solid	Hyperelastic Mixed U-P Solid	Hyperela U-P Solid	Contact	Point-to-Point	Point-to-Ground	Point-to-Surface	Point-to-Surface	Point-to-Point	
						SOLID87 10 nodes 3-D space DOF: TEMP	SOLID94 20 nodes DOF:	HYPER56 4 nodes 2-D space DOF: UX, UY, UZ		HYPER58 8 nodes 3-D DOF: UX	CONTACT12 2 nodes 2-D space DOF: UX, UY	CONTACT26 3 nodes 2-D space DOF: UX, UY	CONTACT48 3 nodes 2-D space DOF: UX, UY, TEMP	CONTACT49 5 nodes 3-D space DOF: UX, UY, UZ, TEMP	CONTACT51 2 nodes 3-D space DOF: UX, UY, UZ
Structural 3-D Lines	Tensile	Reinforced Solid	Solid wi	Acoustic Fluid	Dynam Coupli	Visco Solid	Viscoelastic Solid	Viscoplas	Combination	Revolute Joint	Spring-Damper	Control	Nonlinear Spring	Combination	
						FLUID30 8 nodes 3-D space DOF: UX, UY, UZ, PRES	FLUID38 2 nodes DOF:	VISCO88 8 nodes 2-D space DOF: UX, UY		VISCO106 4 nodes 2-D DOF: UX	COMBIN7 3 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ	COMBIN14 2 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ, PRES, TEMP	COMBIN37 4 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ, PRES, TEMP	COMBI-39 2 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ, PRES, TEMP	COMBIN40 2 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ, PRES, TEMP
Offset Tapered Unsymmetric Beam	Elasti	Plastic Axisymmetric Shell with Torsion	Axisym Harmon	Axisymmetric Harmonic Contained Fluid	Therm Solid	Thermal Line	Radiation Link	Conduct	Matrix	Stiffness, Mass or Damping Matrix	Superelement	Infinite Boundary	Infinite Boundary	Surface Effect	
						FLUID301 4 nodes 2-D space DOF: UX, UY, UZ	PLANE67 4 nodes DOF:	LINK31 3 nodes 3-D space DOF: TEMP		LINK32 2 nodes 2-D DOF: TE	MATRIX27 3 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ	MATRIX50 2-D or 3-D space DOF: Any	INFIN9 2 nodes 2-D space DOF: MAG, TEMP	INFIN47 4 nodes 3-D space DOF: MAG, TEMP	SURF19 3 nodes 2-D space DOF: UX, UY, TEMP, PRES
Immersed Pipe	Plastic	Elastic Shell	16-Layer Shell	Magnetic-Electric Solid	Magnet Solid	Thermal Solid	Thermal Solid	Axisym Harmonic Solid	Surface Effect	SURF22 8 nodes 3-D space DOF: UX, UY, UZ, TEMP, PRES					
						PIPE59 2 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ	PIPE60 2 nodes DOF: RO	SHELL63 8 nodes 3-D space DOF: UX, UY, UZ, ROTX, ROTY, ROTZ		SHELL91 8 nodes DOF: U, ROTX	PLANE53 8 nodes 2-D space DOF: VOLT, AZ	SOLID90 8 nodes DOF:	PLANE55 4 nodes 2-D space DOF: TEMP	PLANE75 4 nodes 2-D DOF: TE	

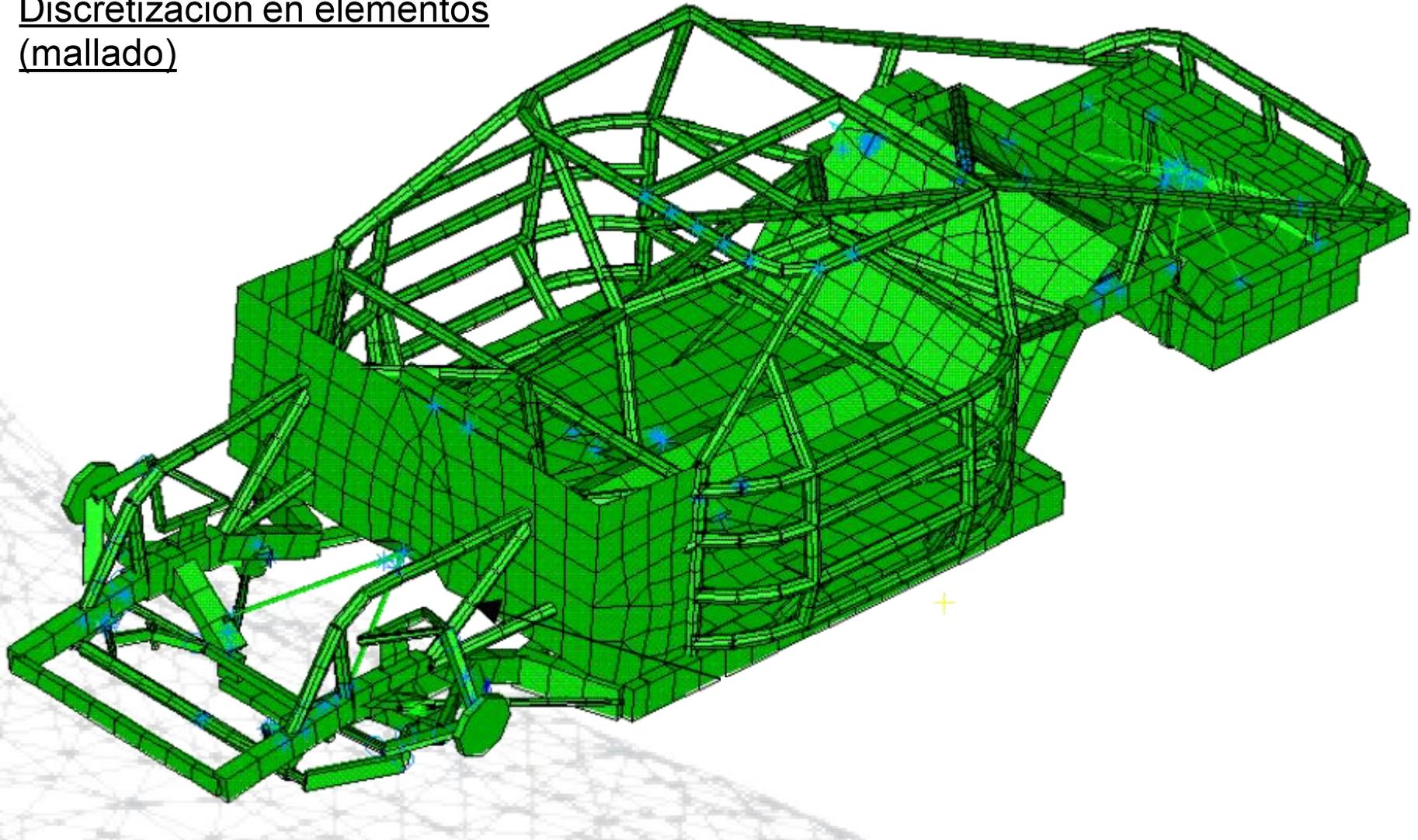
Conceptos básicos. Procedimiento de análisis

Generación modelo CAD



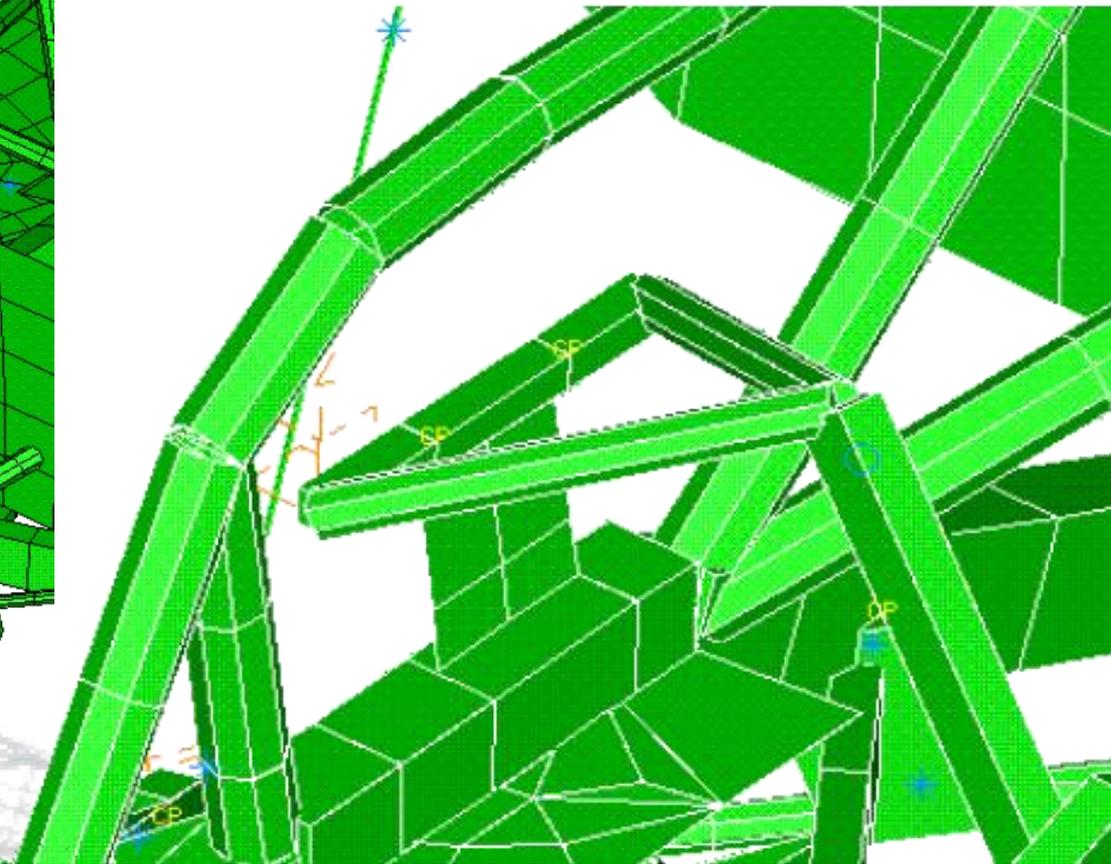
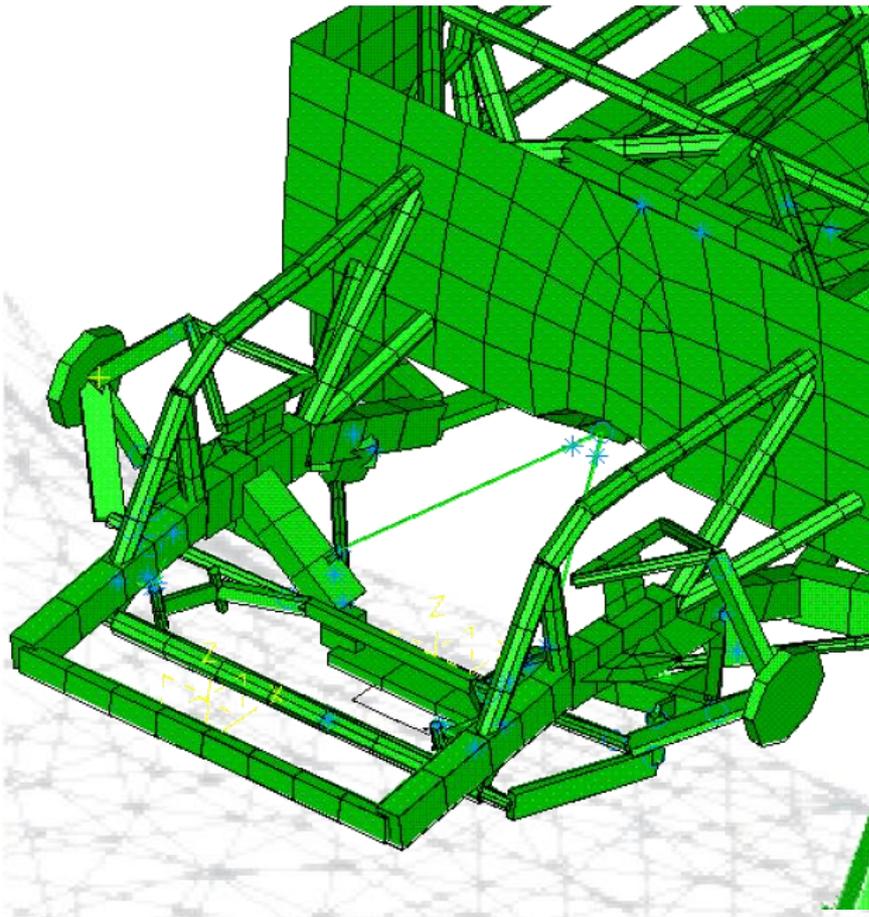
Conceptos básicos. Procedimiento de análisis

Discretización en elementos
(mallado)



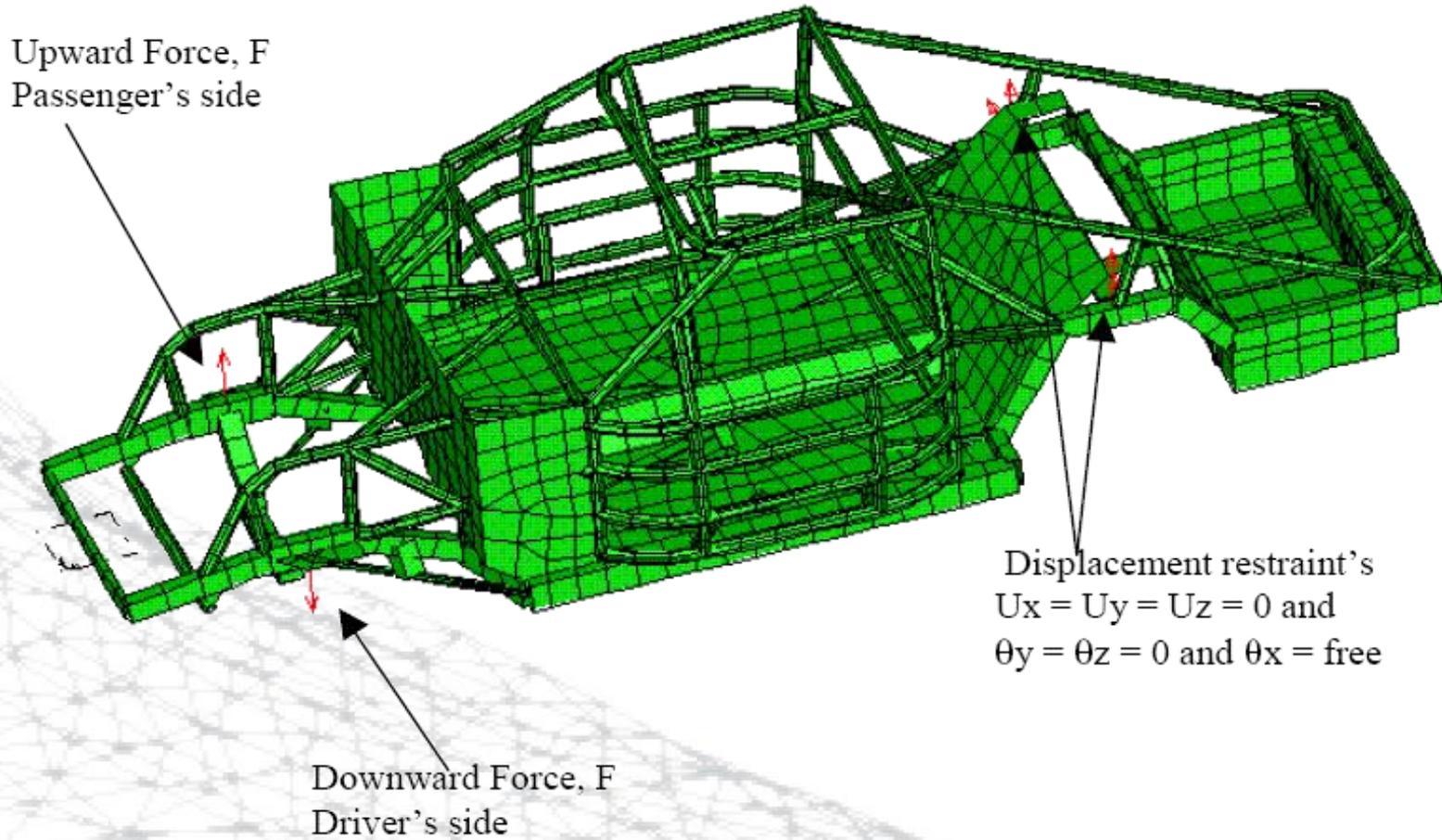
Conceptos básicos. Procedimiento de análisis

Discretización en elementos (mallado)



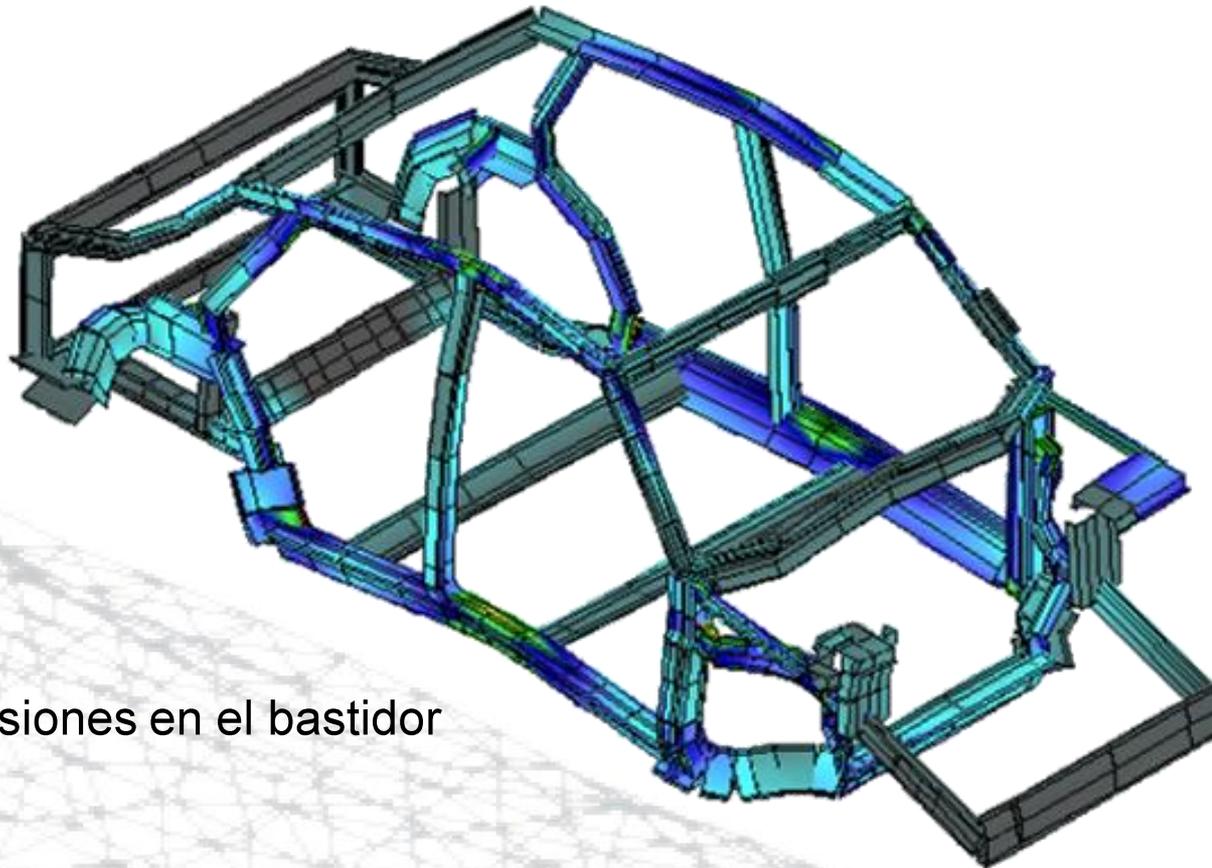
Conceptos básicos. Procedimiento de análisis

Aplicación de restricciones



Conceptos básicos. Procedimiento de análisis

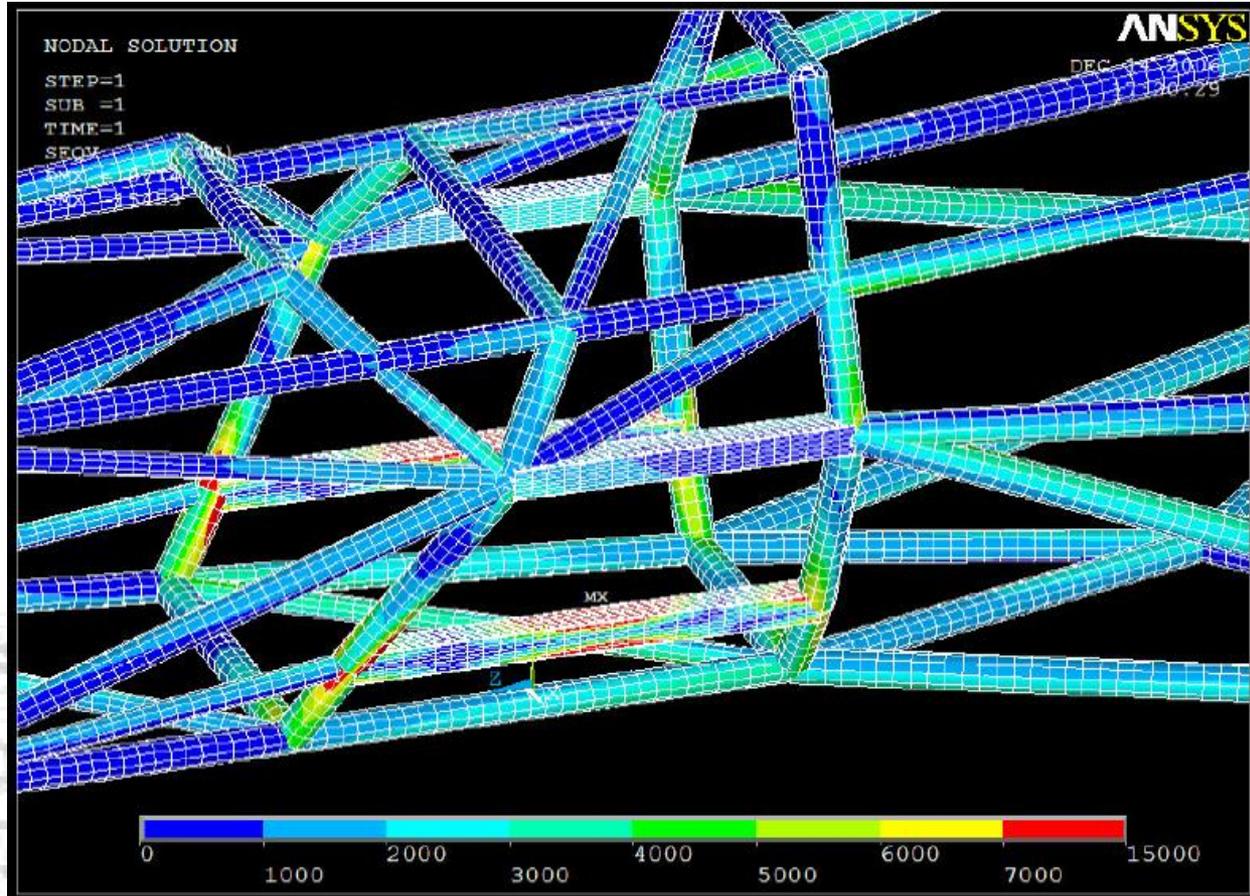
Análisis de resultados



Tensiones en el bastidor

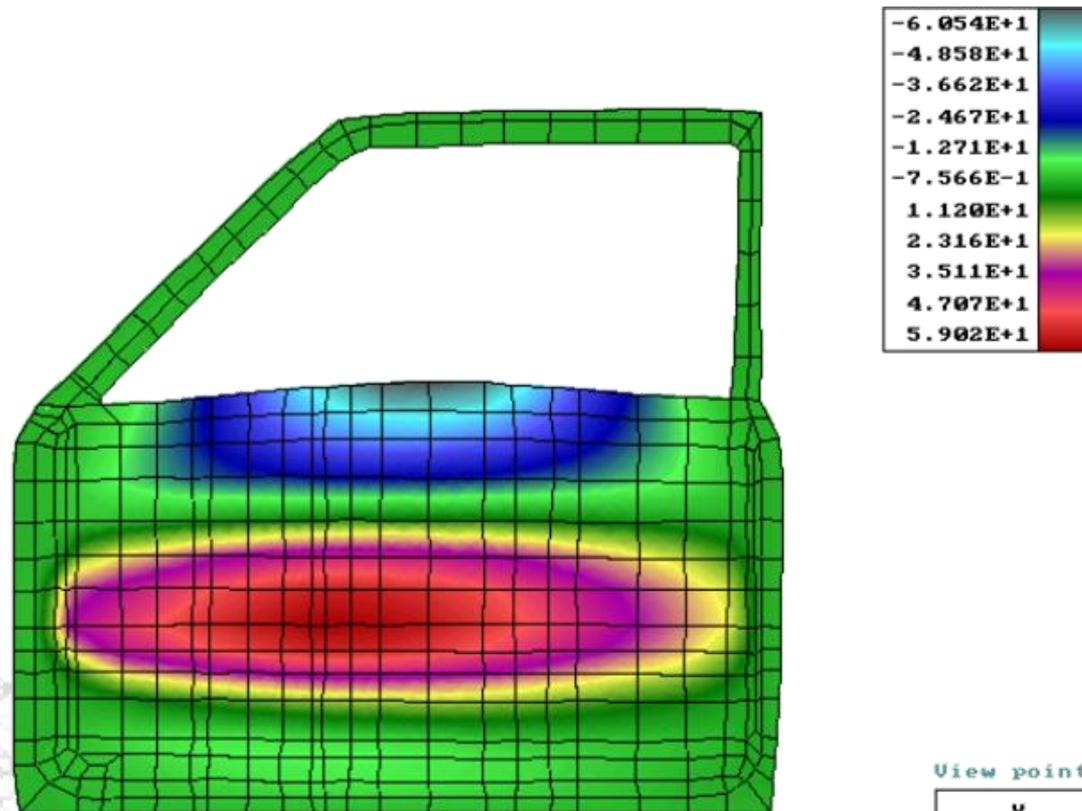
Conceptos básicos. Procedimiento de análisis

Análisis de resultados



Conceptos básicos. Otros tipos de análisis

Análisis elasto-plástico de impacto

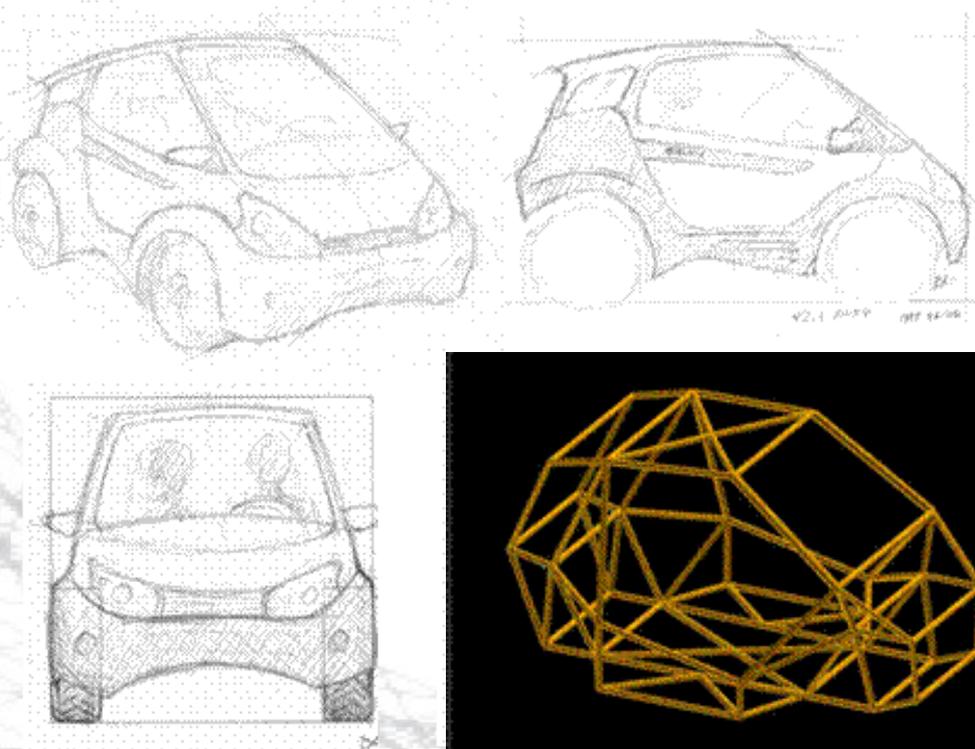


PAK-G v3.0

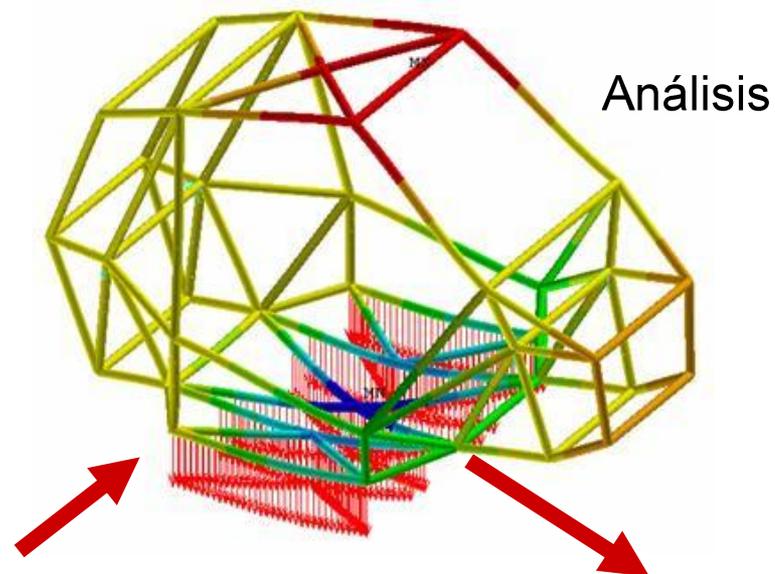
Points displacement - ZZ components

Conceptos básicos. Otros tipos de análisis

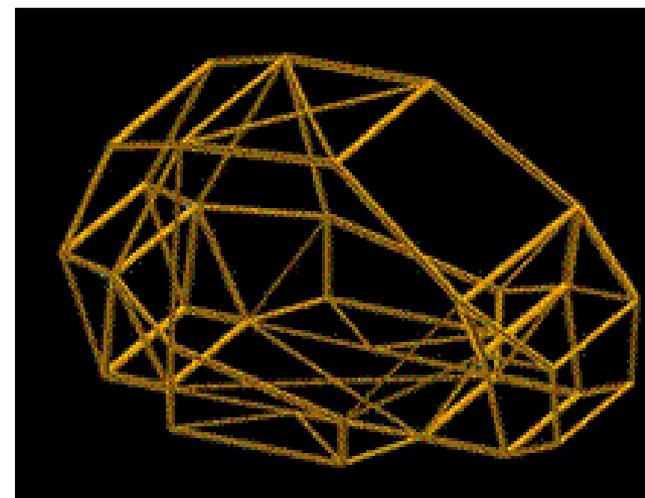
Optimización



Prediseño del bastidor



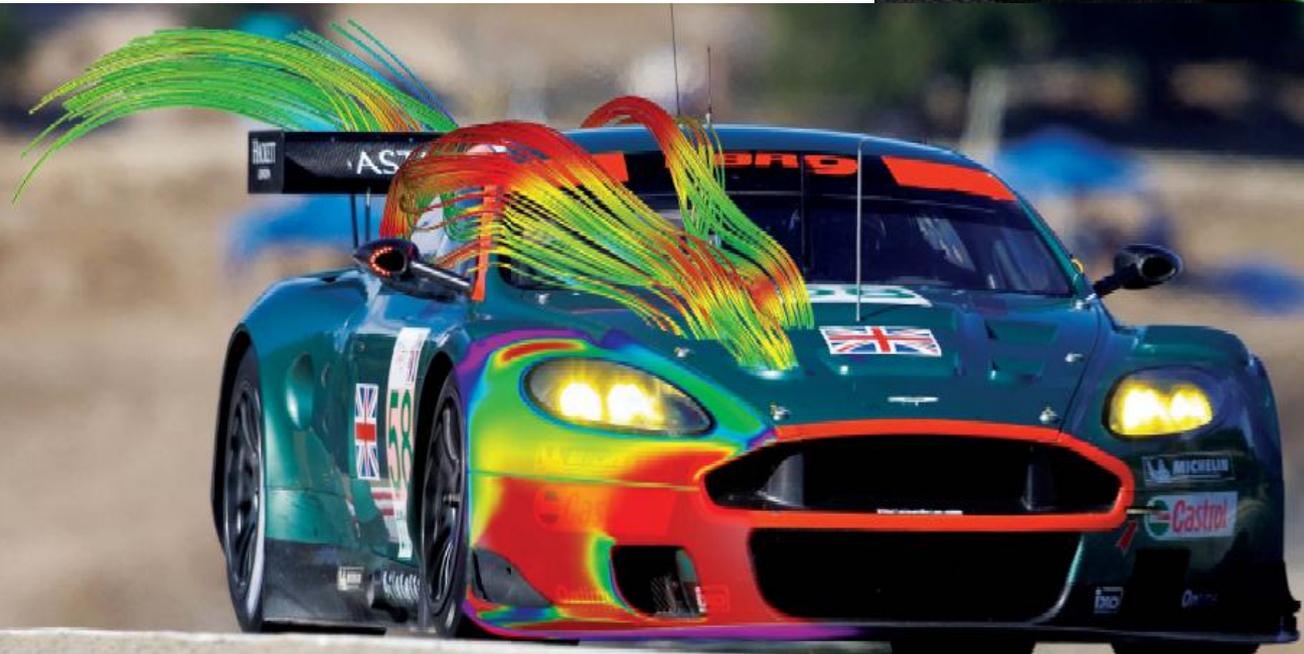
Análisis



Diseño optimizado

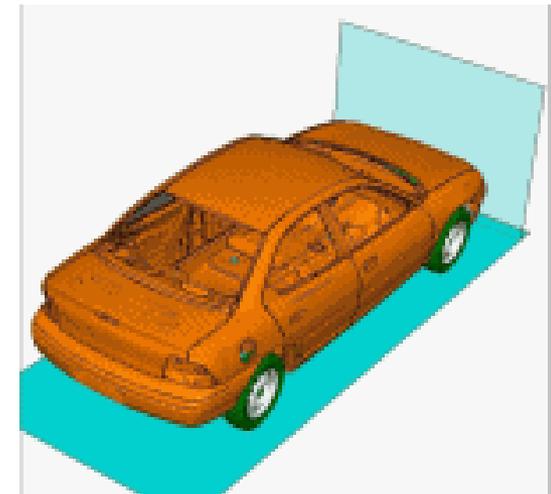
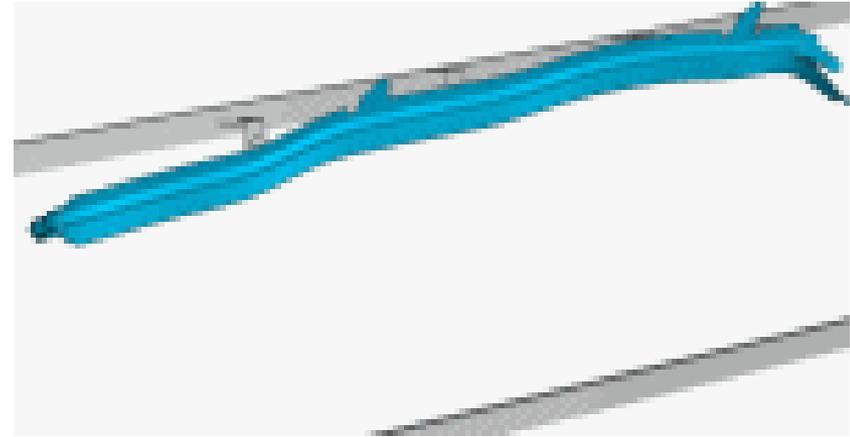
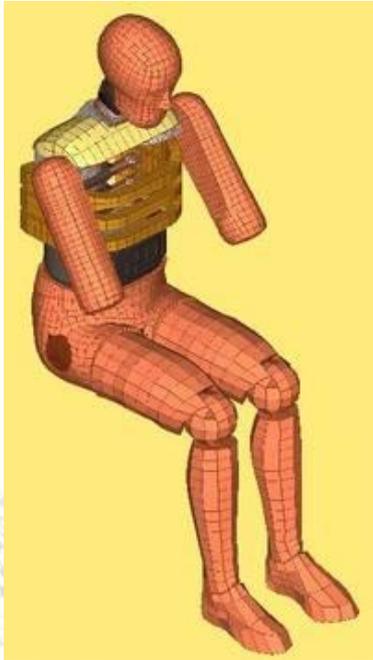
Conceptos básicos. Otros tipos de análisis

Computational Fluid Dynamics



Conceptos básicos. Otros tipos de análisis

Otros



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