Metode Končnih Elementov – Mreženje

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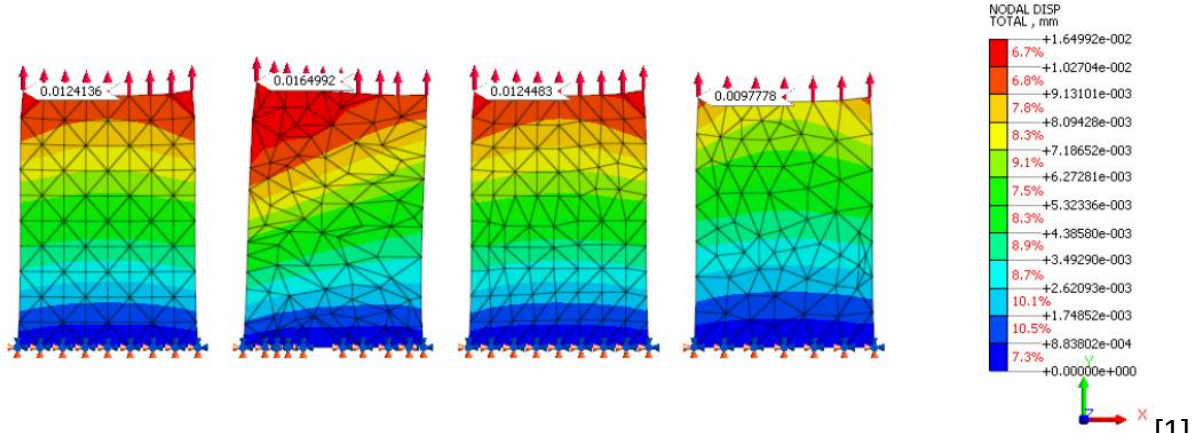
Miroslav, Halilovič, FS UL
Bojan, Starman, FS UL
Nikolaj, Mole, FS UL

Dne: 09-02-2022

Pomembnost ustrezne mreže

pomiki

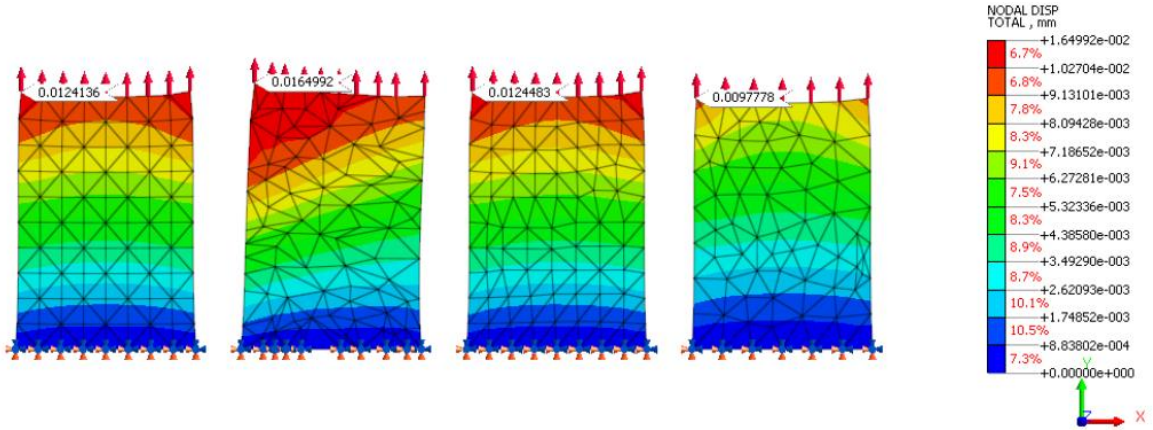


[1]

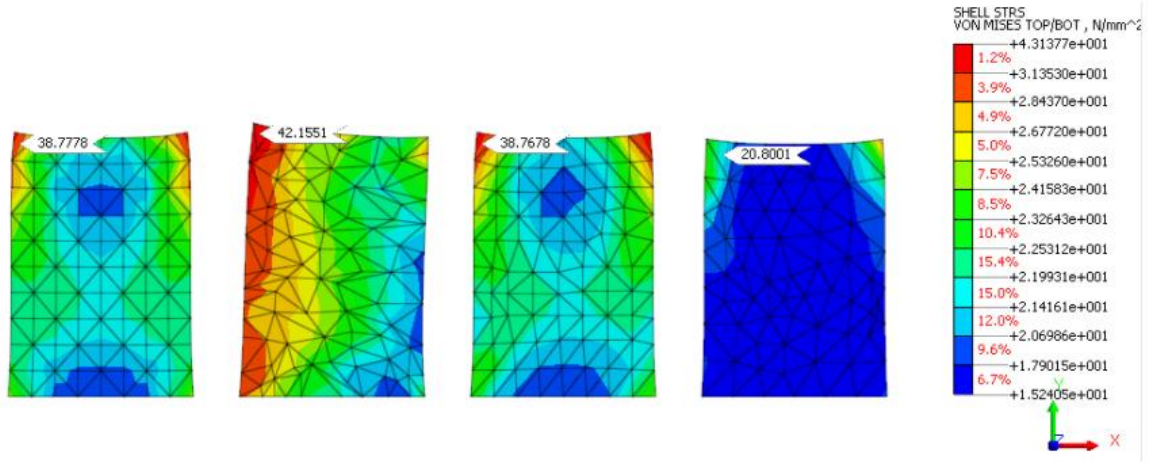
[1] 7 wrong beliefs about meshing that you may have, Available at: https://feaforall.com/7-wrong-meshing-beliefs-may/

Pomembnost ustrezne mreže

pomiki



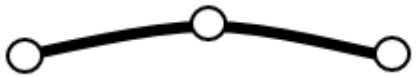
Primerjalna napetost

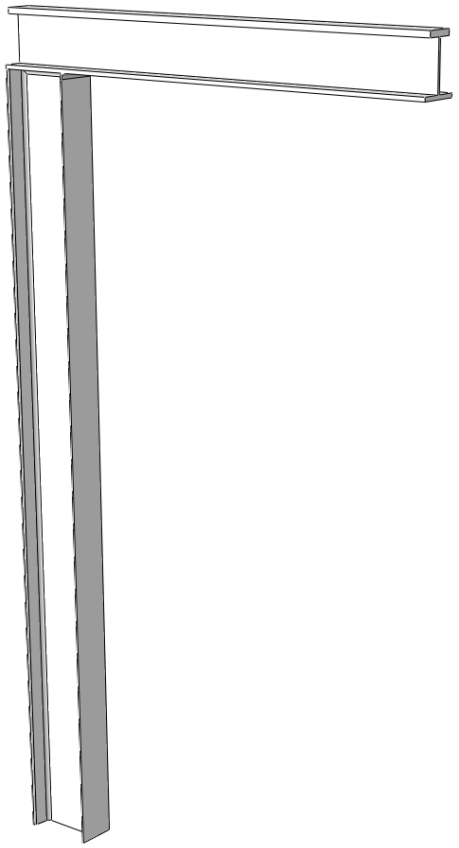


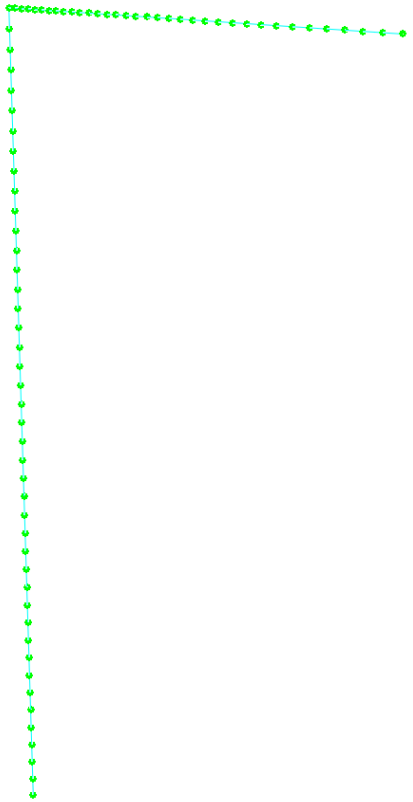
[1]

[1] 7 wrong beliefs about meshing that you may have, Available at: https://feaforall.com/7-wrong-meshing-beliefs-may/

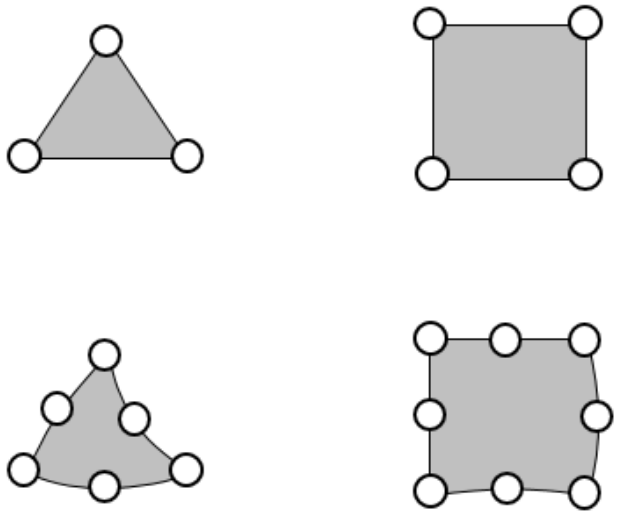
1D Elementi/Mreženje







2D Elementi



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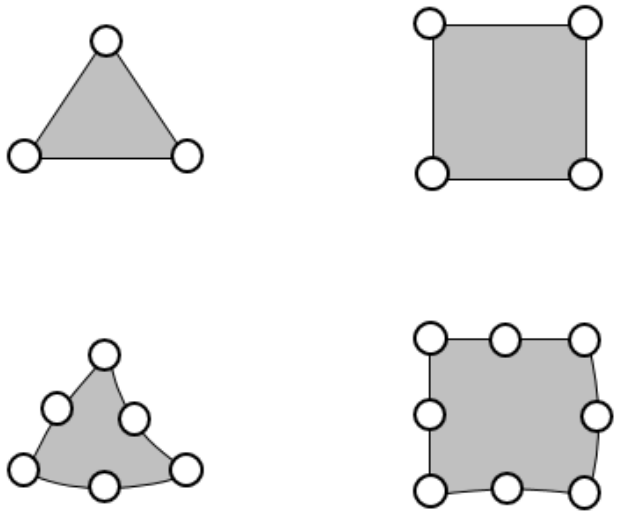

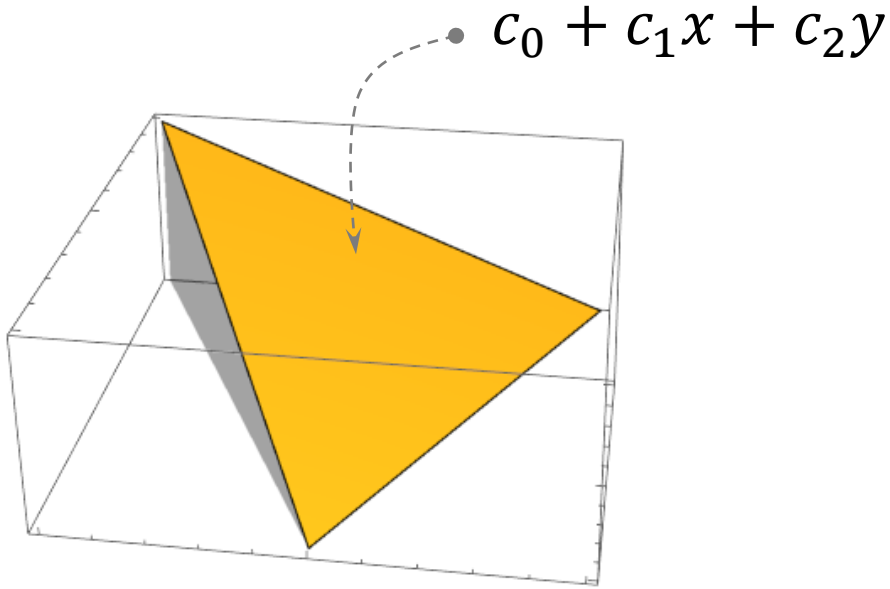

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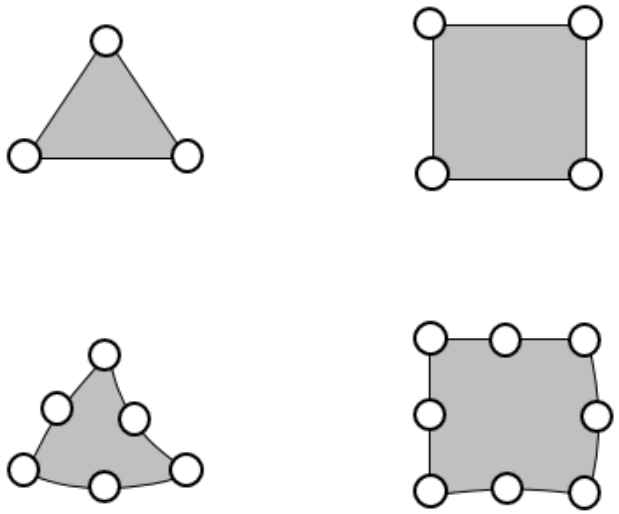
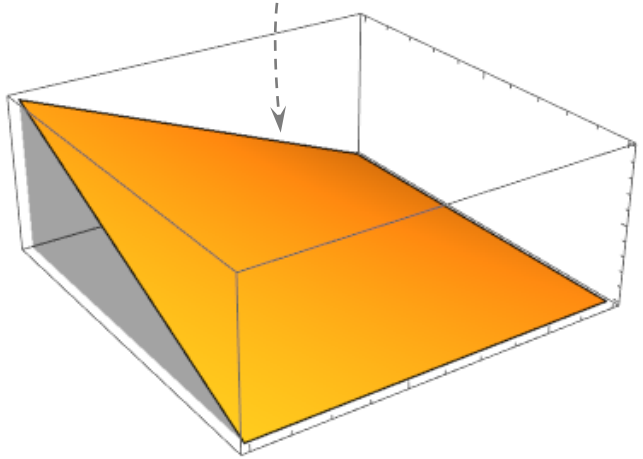
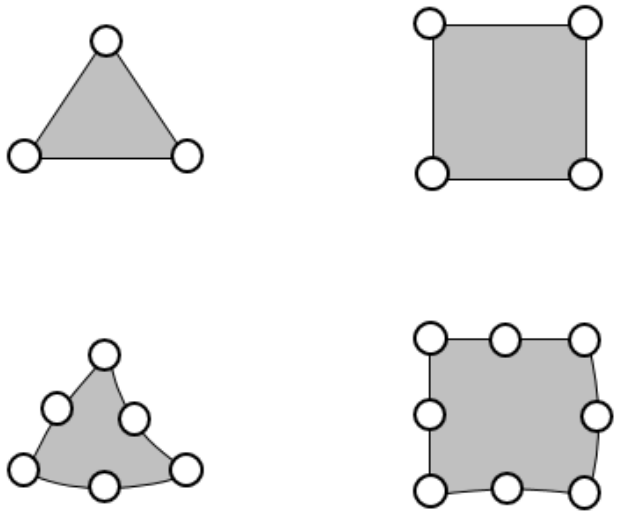


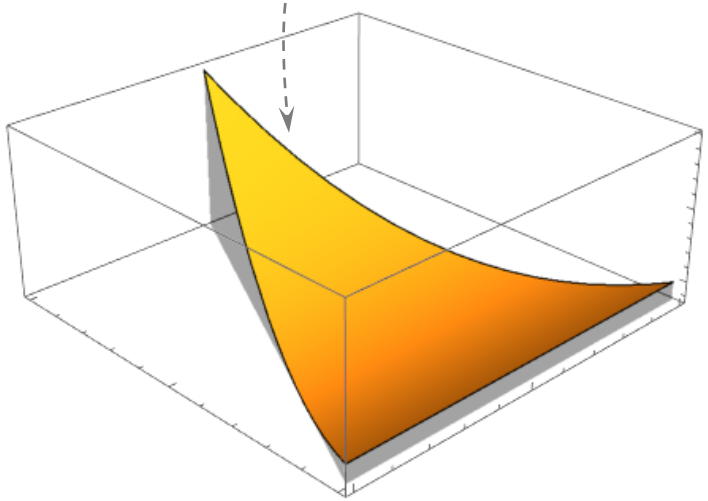
$$c_0 + c_1 x + c_2 y + c_3\, x\, y$$



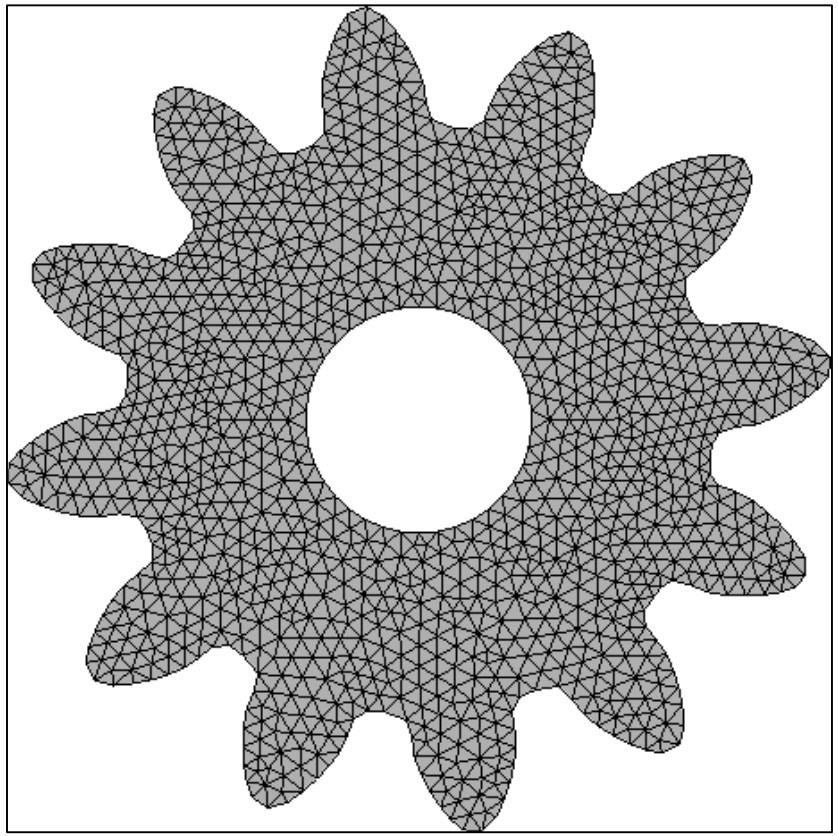
2D Elementi



$$c_0 + c_1 x + c_2 y + c_3\, x\, y + c_4\, x^2 + c_5\, y^2$$



2D/Lupinsko Mreženje



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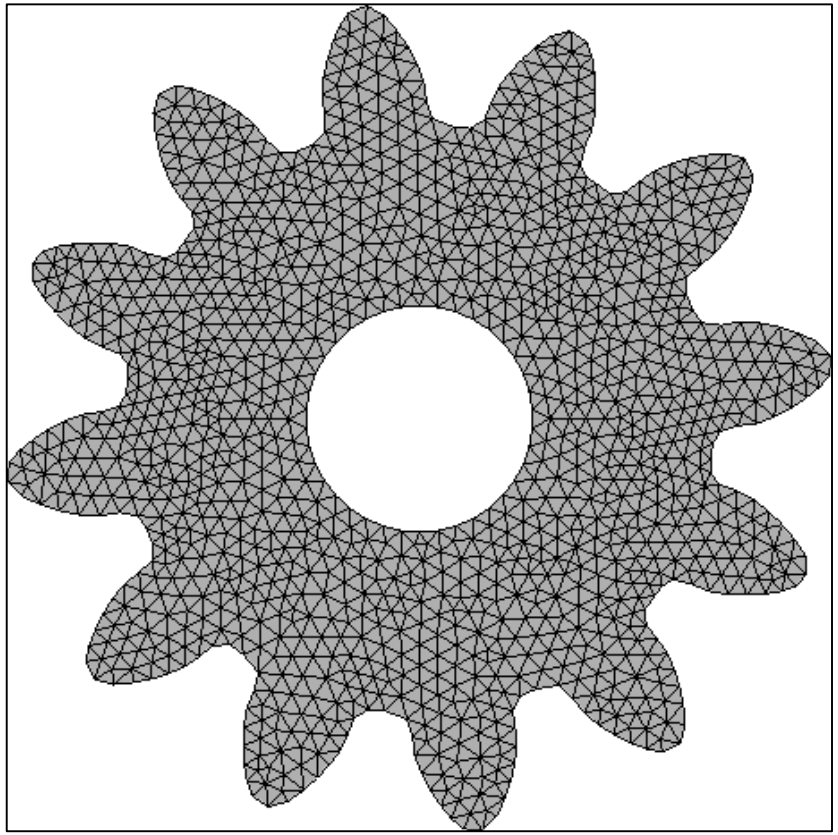
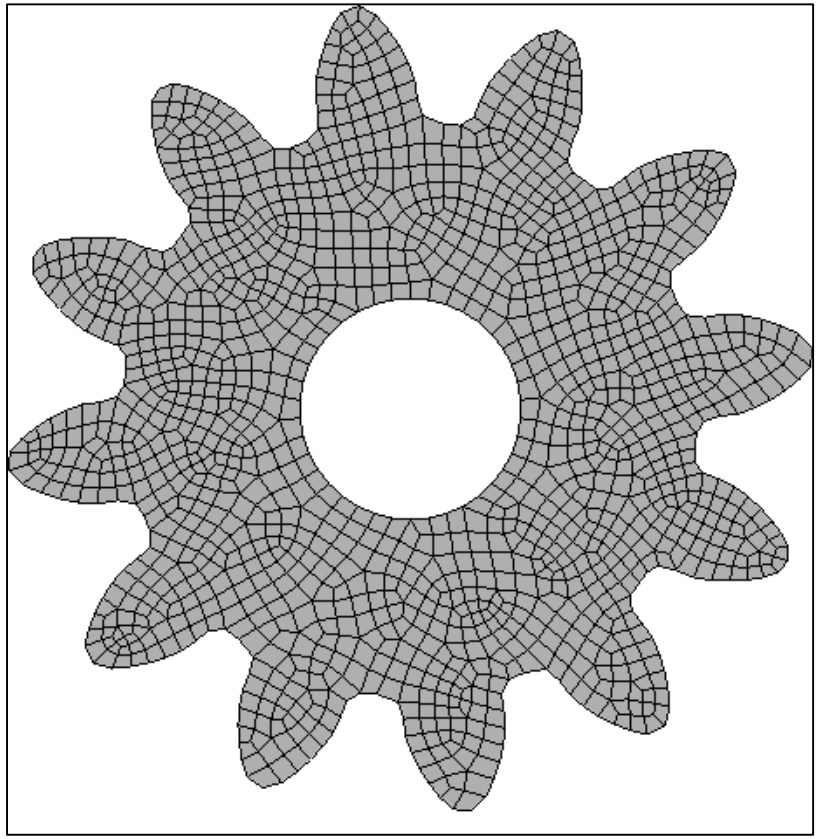
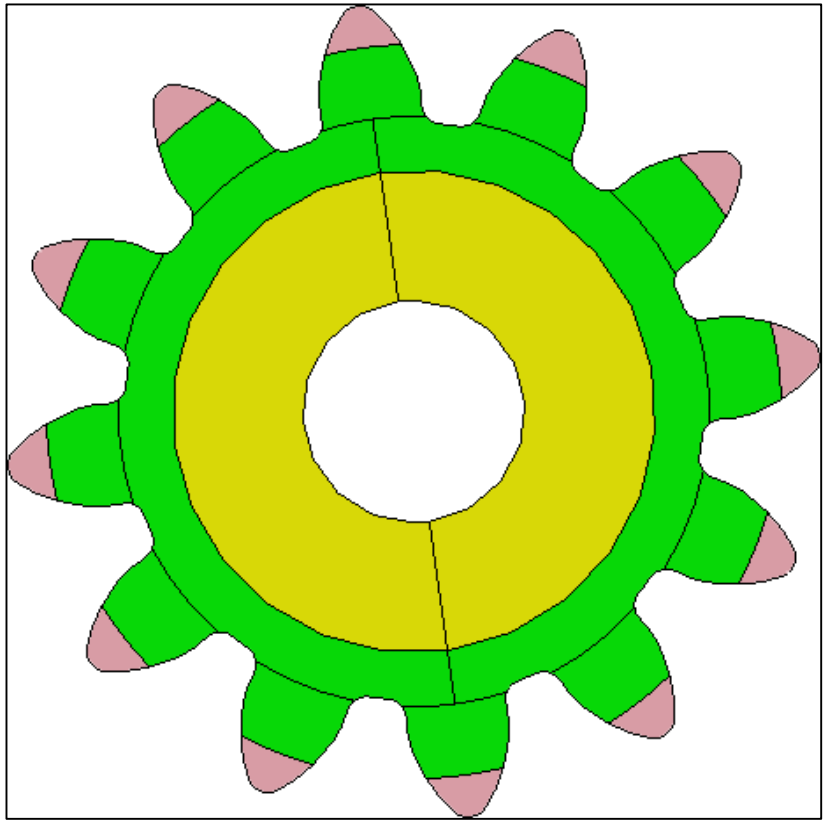
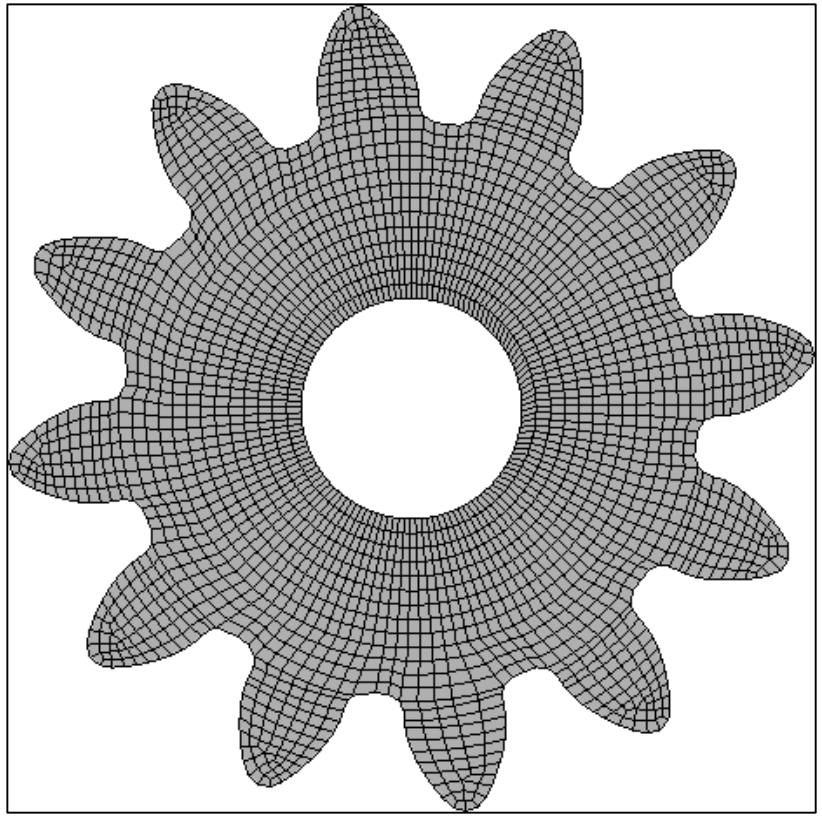




2D/Lupinsko Mreženje





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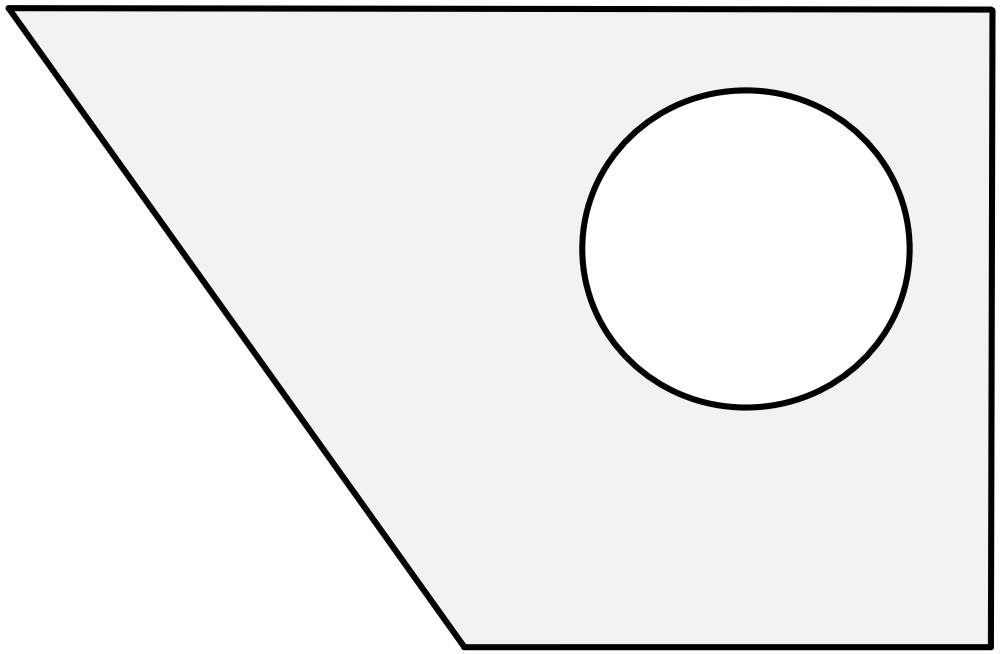

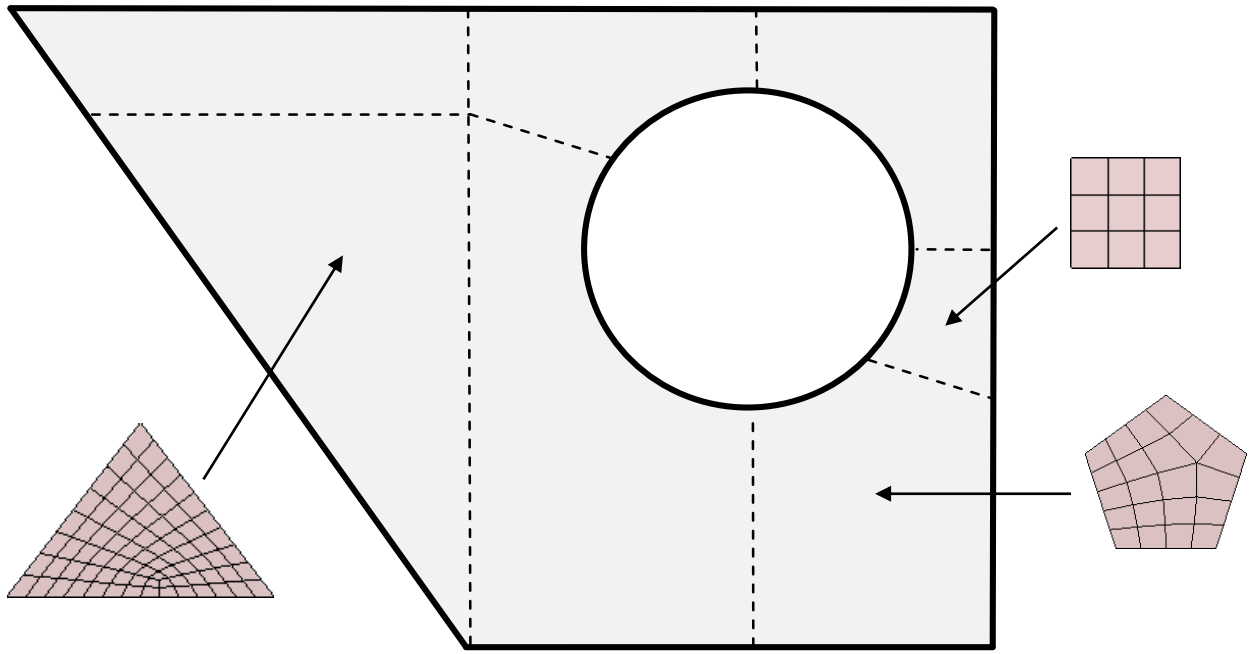

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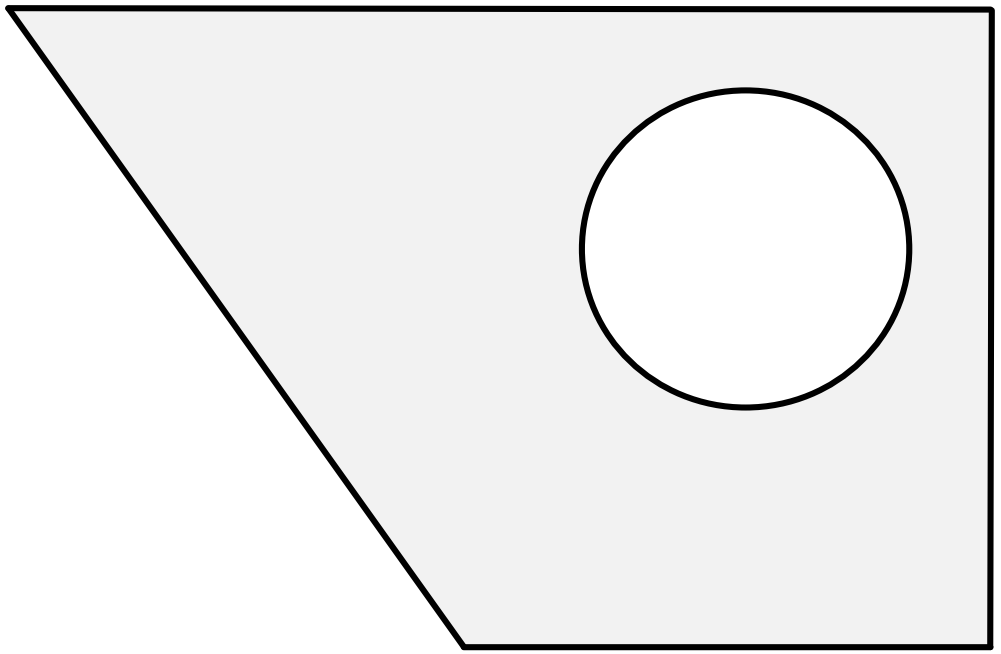
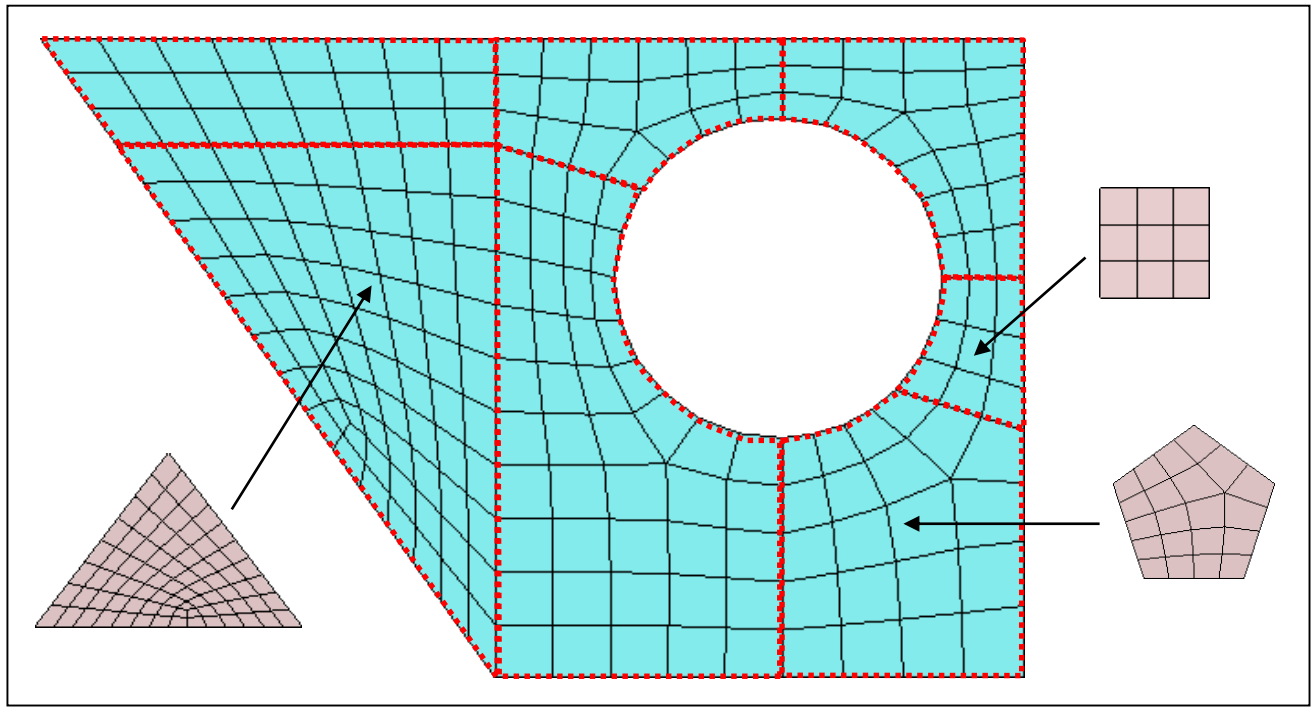
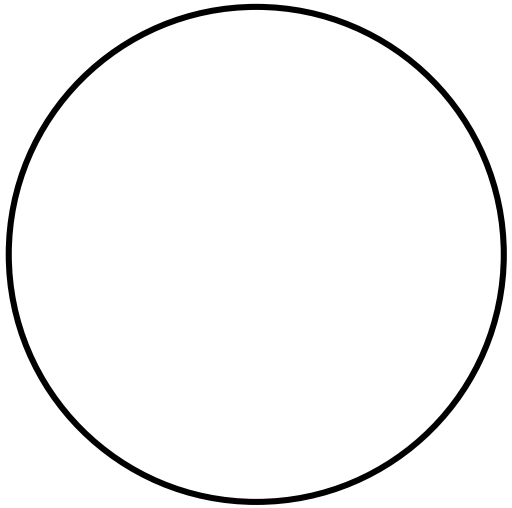
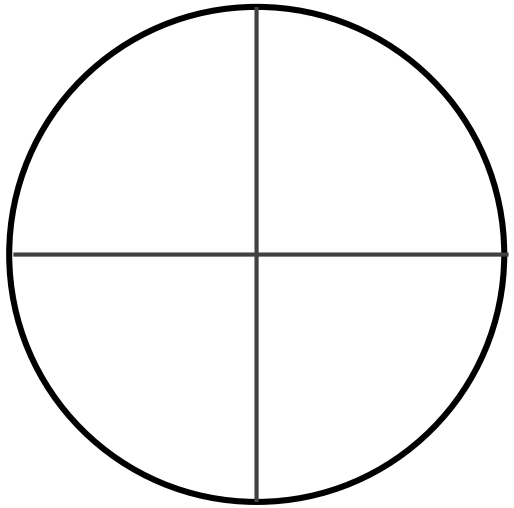




2D/Lupinsko Mreženje





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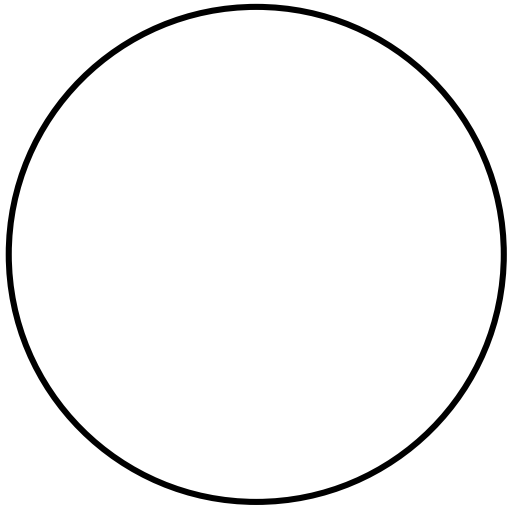

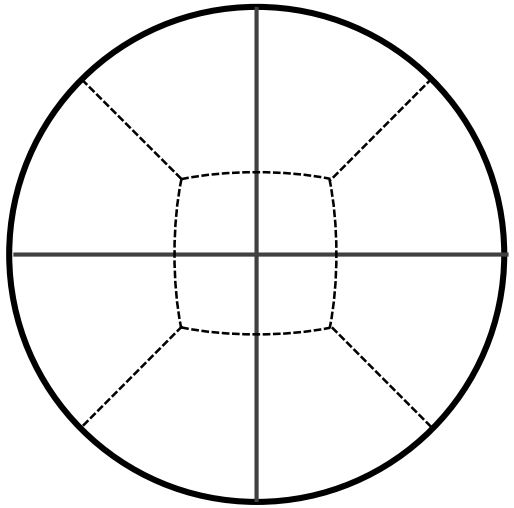

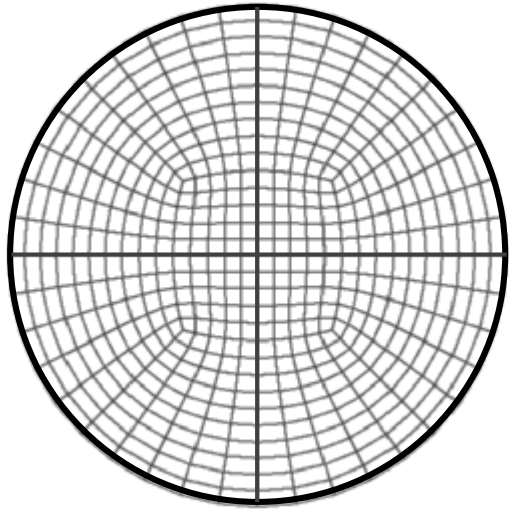

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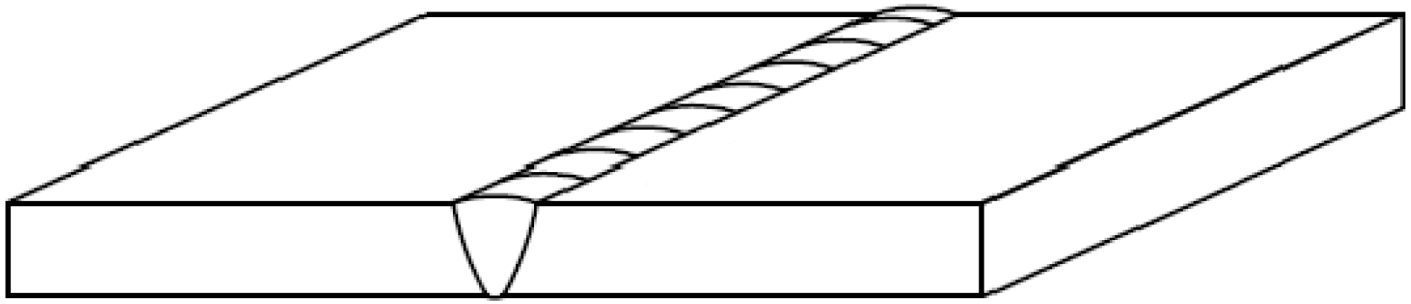

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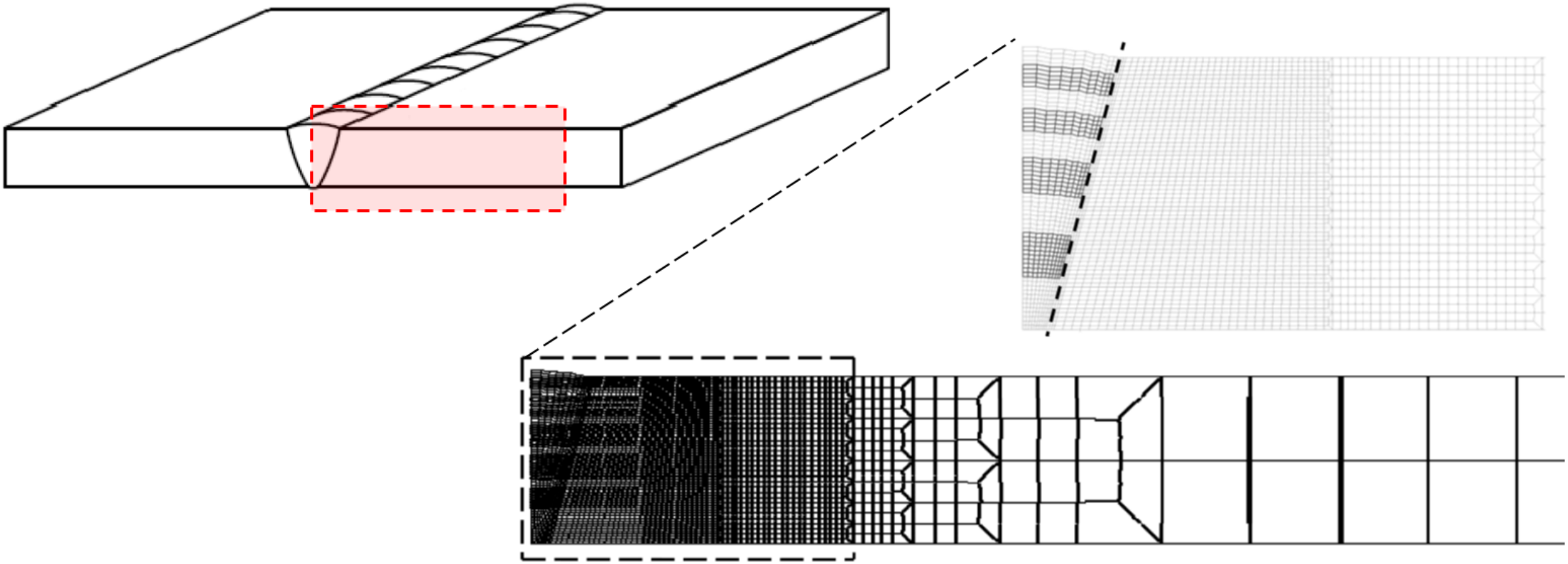
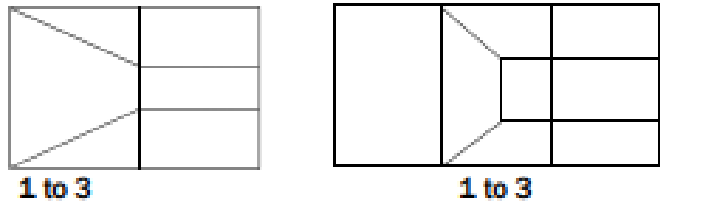


2D/Lupinsko Mreženje

Mesh transition techniques and flow lines

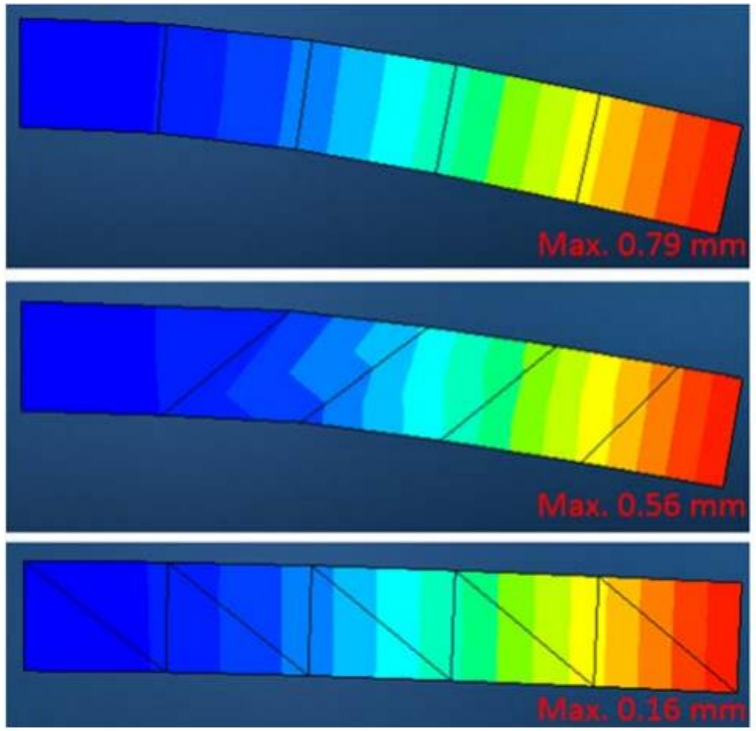


[1]

[1] Introduction to meshing, available at: https://altairuniversity.com/wp-content/uploads/2014/02/meshing.pdf

2D Kvaliteta mreže

- Razmerje stranic
- Najmanjši in največji kot
- Nagnjenost (*Skewness*)
- Jakobijeva determinanta



Poves

[1]

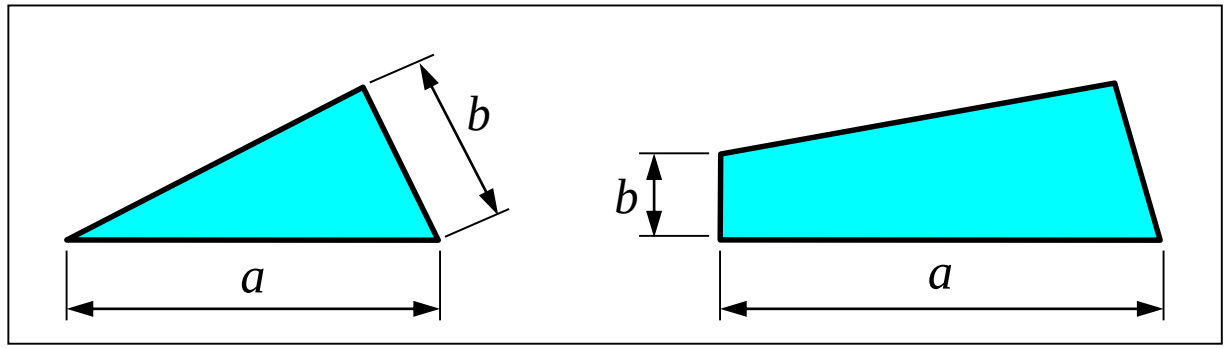
[1] Available at: https://www.mscsoftware.com/sites/default/files/whitepaper_how_to_create_a_good_fe_model.pdf

2D Kvaliteta mreže

- **Razmerje stranic**
- Najmanjši in največji kot
- Nagnjenost (*Skewness*)
- Jakobijeva determinanta

$$1 \le f_r = \frac{a}{b} \le \infty \ , \ a \ge b$$

$$f_{rmax} \le 5$$



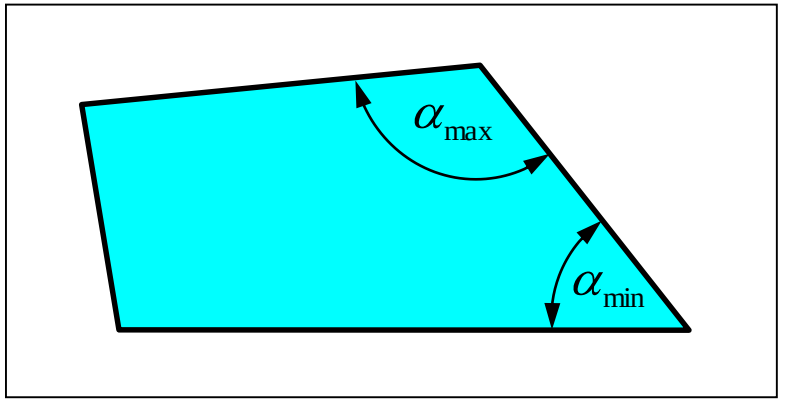
2D Kvaliteta mreže

- Razmerje stranic
- **Najmanjši in največji kot**
- Nagnjenost (*Skewness*)
- Jakobijeva determinanta

$$0^\circ \le \alpha \le 180^\circ$$

$$45^\circ \le \alpha_{\min}$$

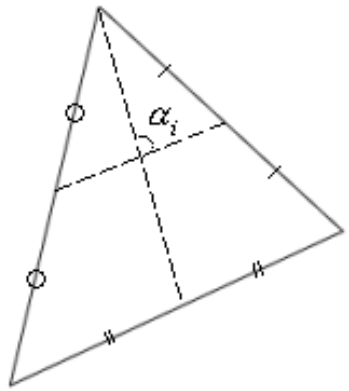
$$\alpha_{\max} \le 135^\circ$$



2D Kvaliteta mreže

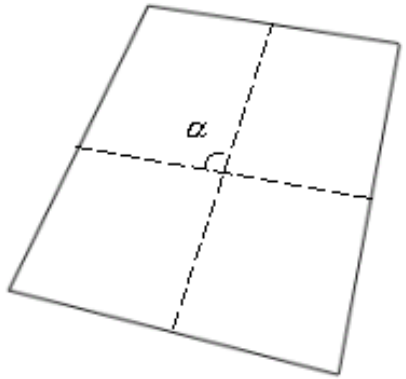
- Razmerje stranic
- Najmanjši in največji kot
- **Nagnjenost (*Skewness*)**
- Jakobijeva determinanta

Tria



$$Skew\ Angle = 1 - Max\left(\frac{90° - \alpha_i}{90°}\right)$$

Quad



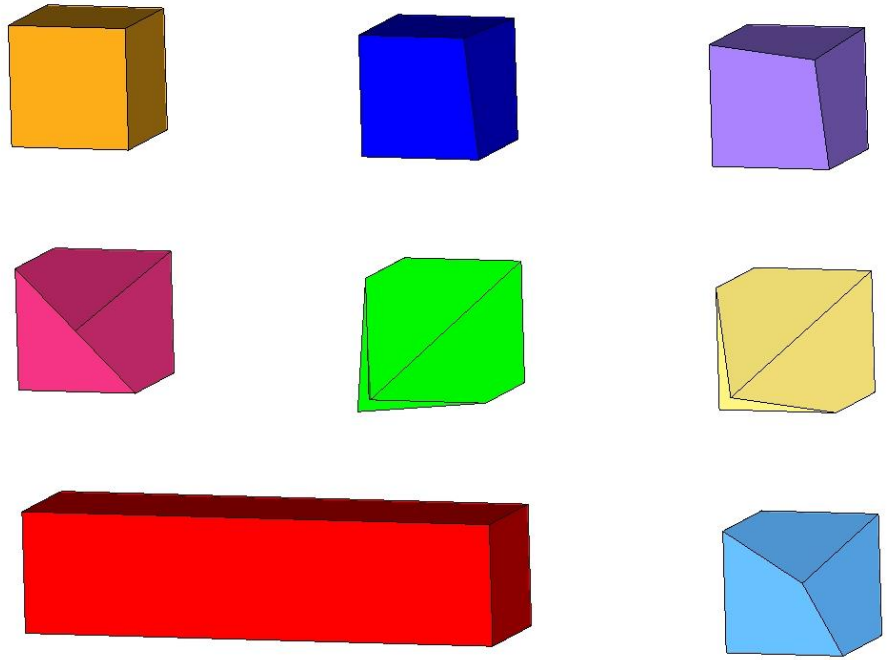
$$Skew\ Angle = 1 - \left(\frac{|90° - \alpha|}{90°}\right)$$

[1]

[1] Available at: https://www.mechead.com/mesh-good-enough/

2D Kvaliteta mreže

- Razmerje stranic
- Najmanjši in največji kot
- Nagnjenost (*Skewness*)
- **Jakobijeva determinanta**

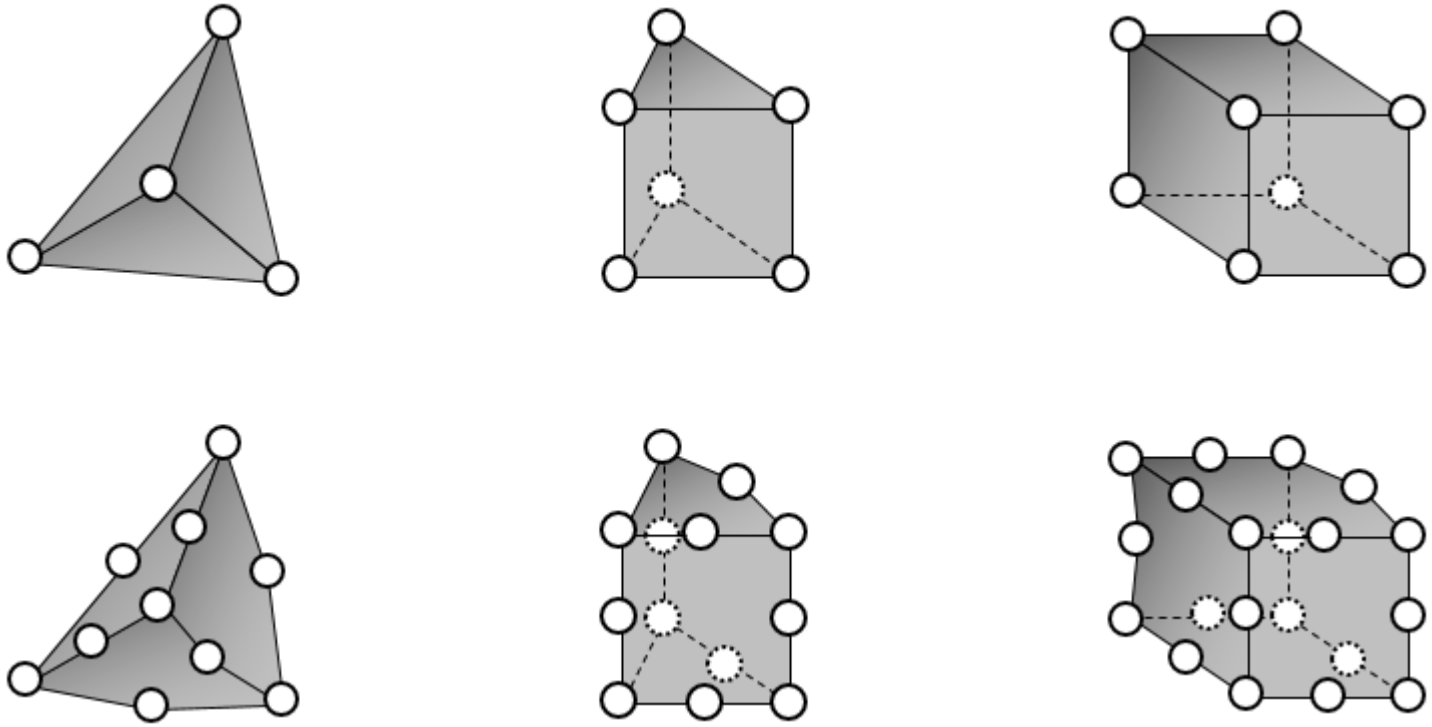


Jacobians (J):
Orange Cube J = 1.0
Blue J = .942
Purple J = .883
Pink J = .398
Green J = -.409
Tan J = -.130
Red J = 1.0
Light Blue J = .072

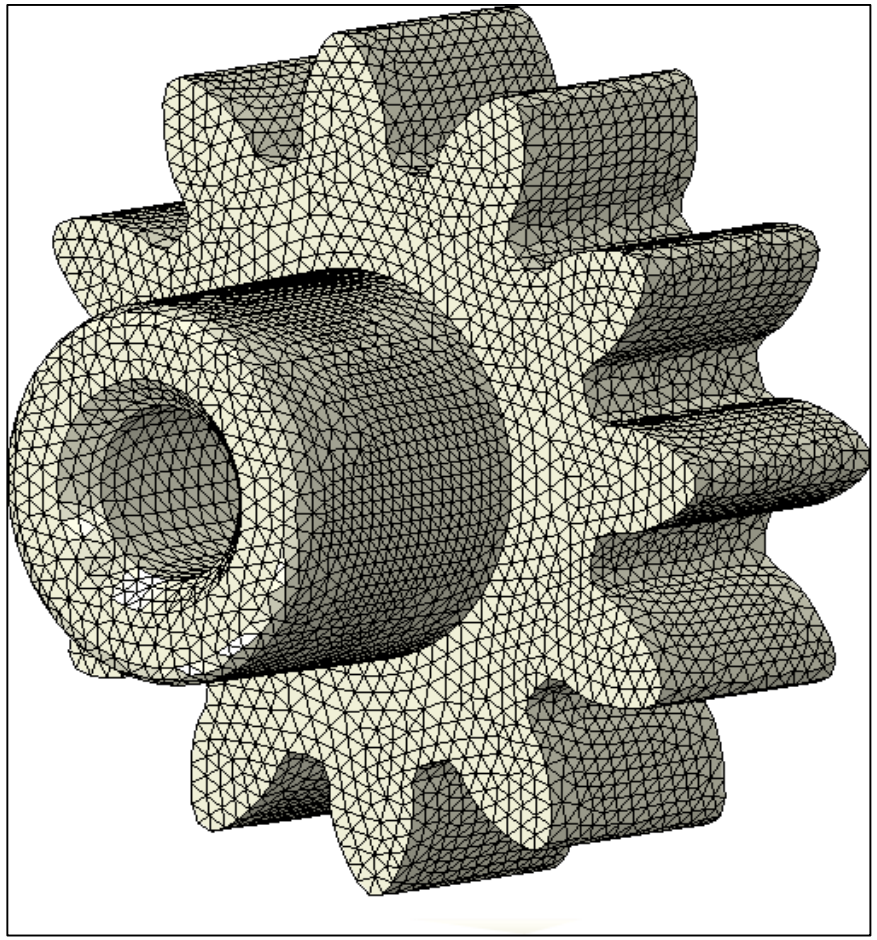
[1]

[1] Available at: http://www.isaiahjanzen.com/2012/08/the-jacobian-finite-element-mesh-quality.html?m=1

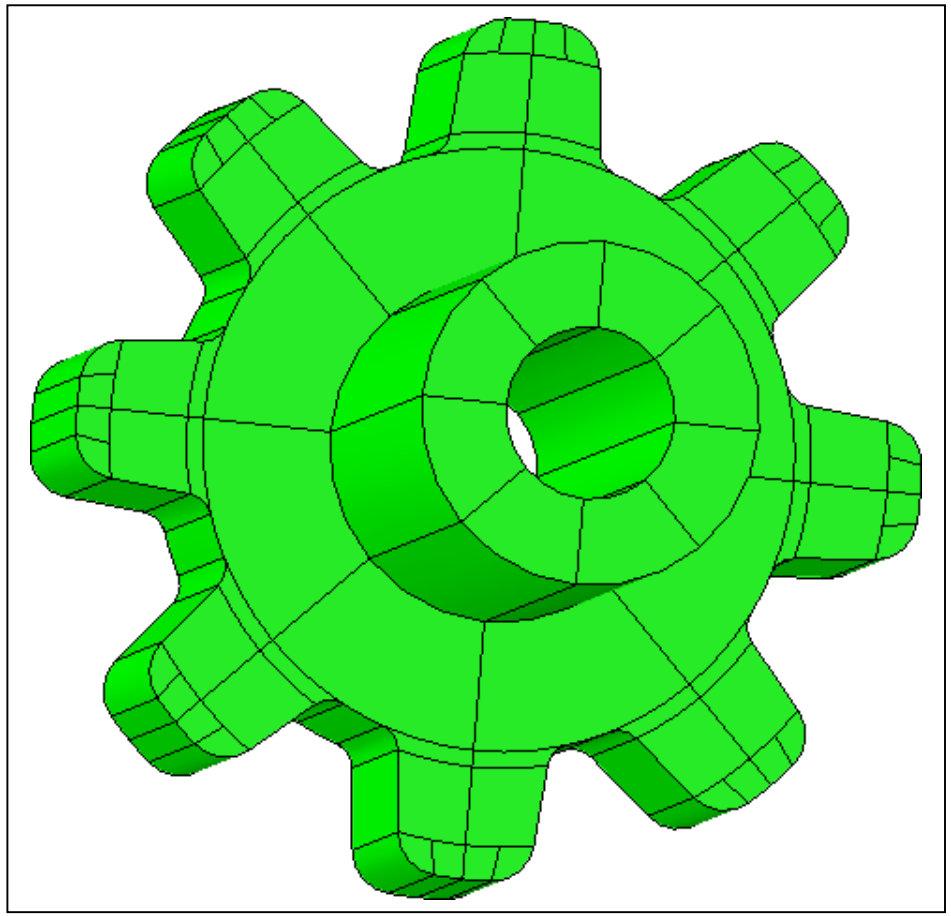
3D Elementi



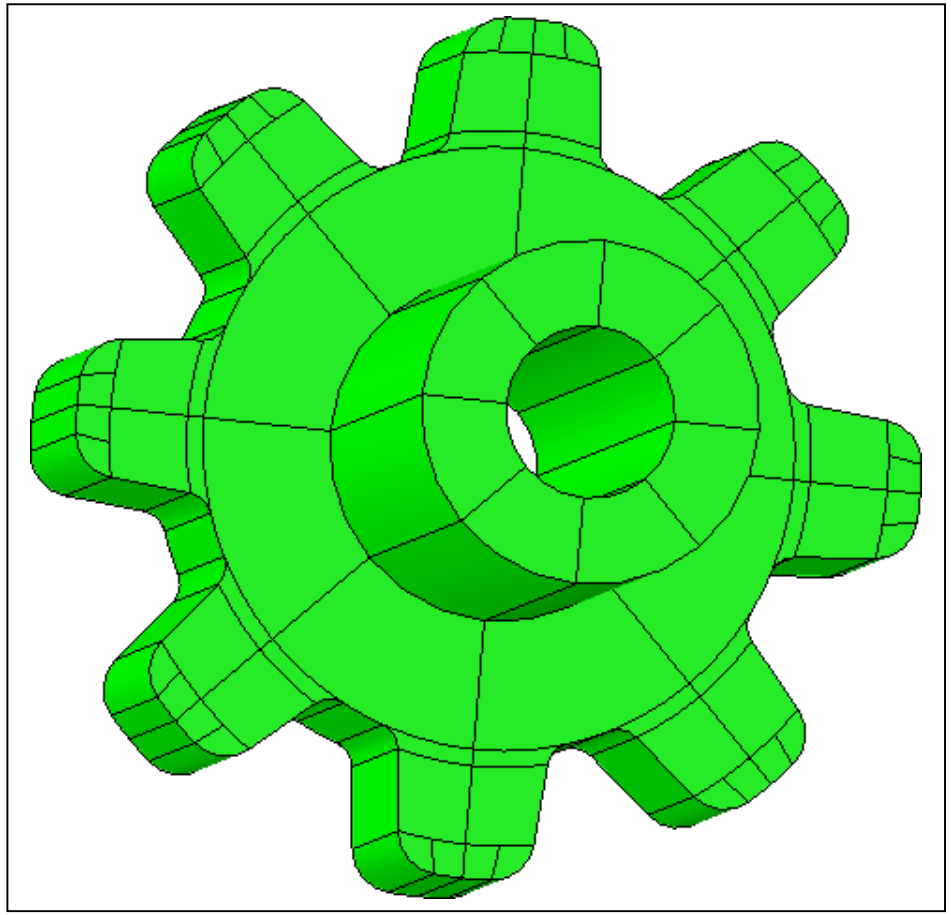
3D Mreženje

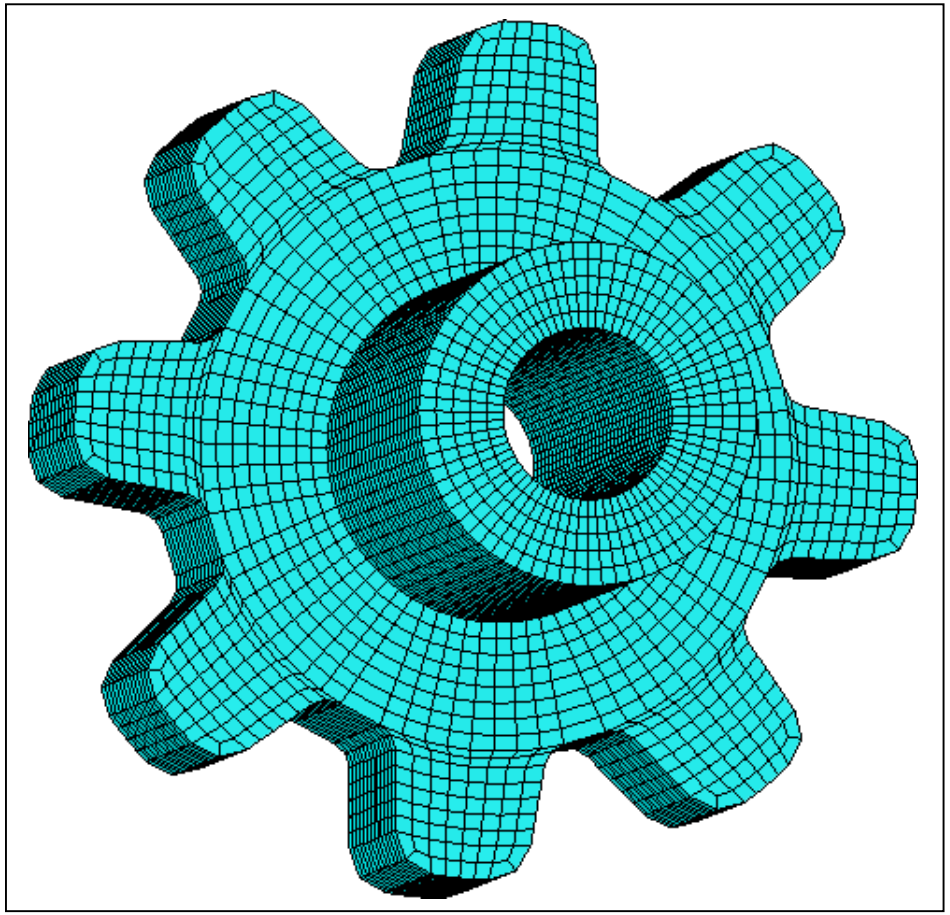


3D Mreženje

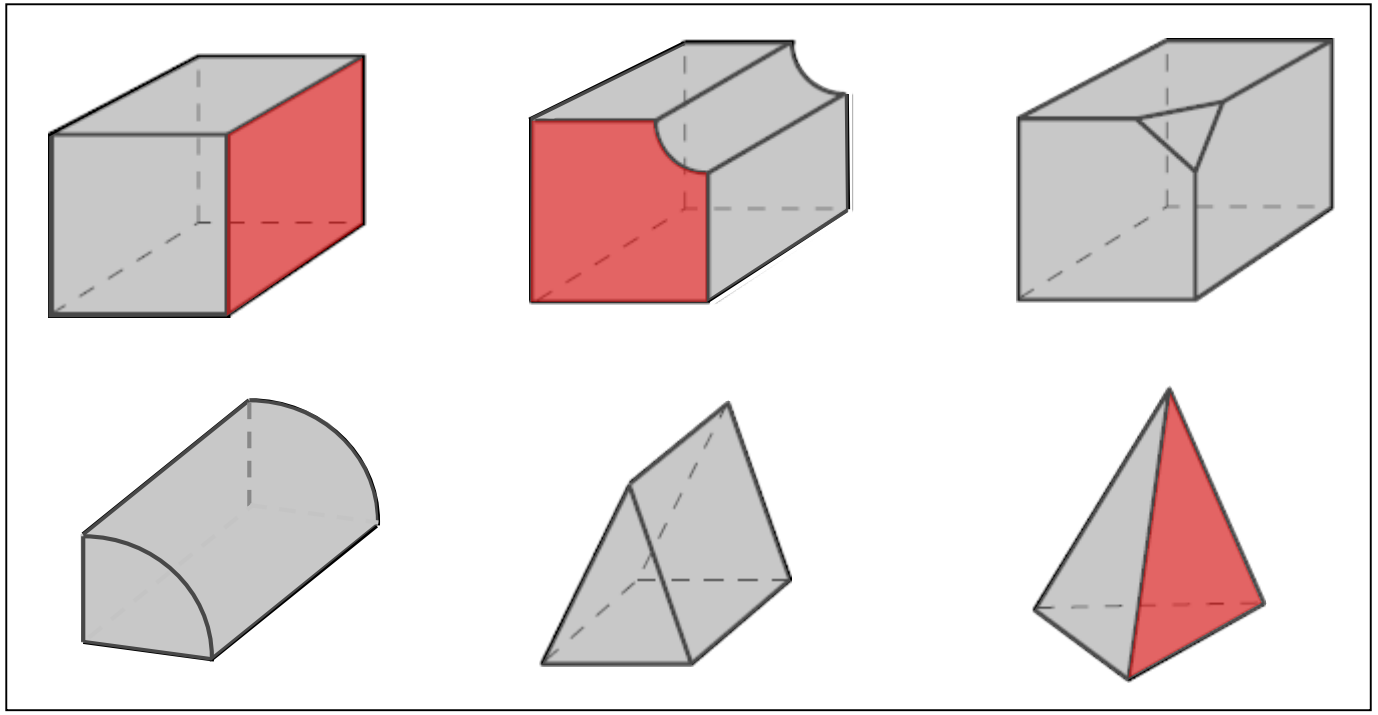


3D Mreženje

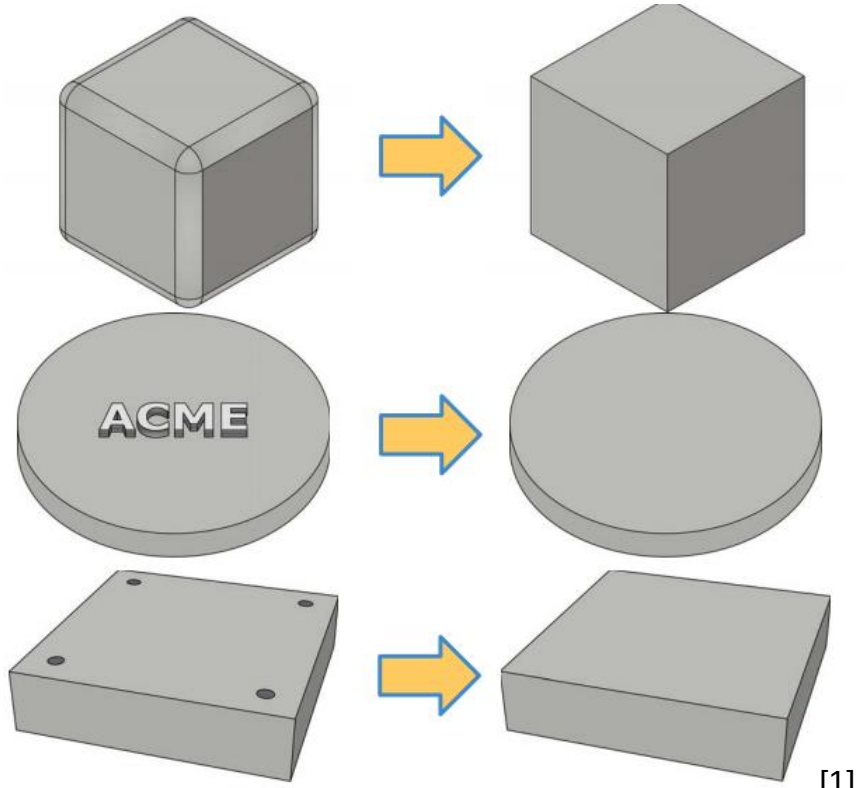




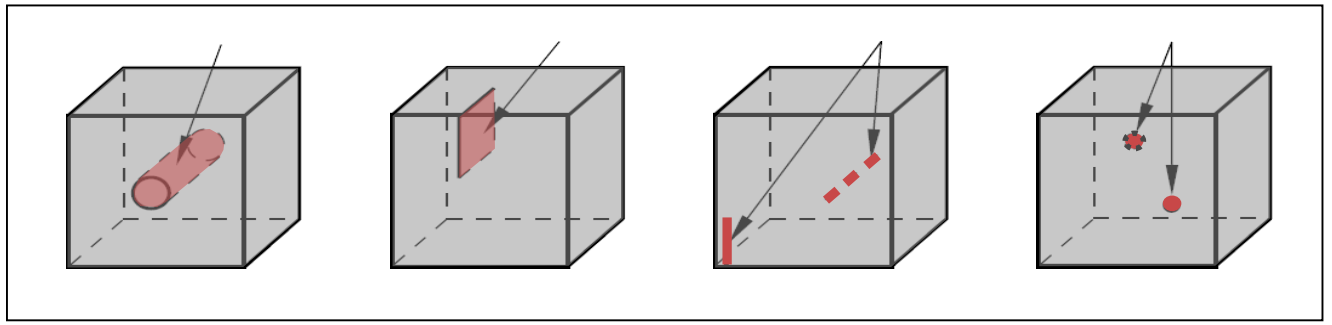
3D Mreženje



Izdelava kvalitetne mreže



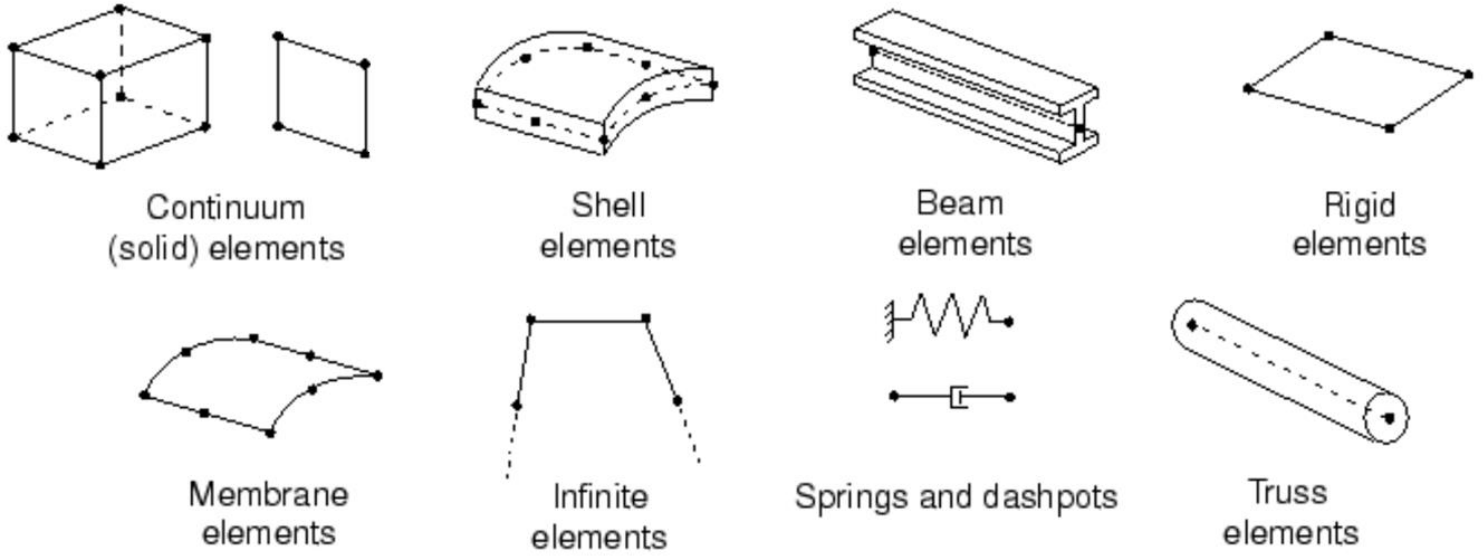
[1]



[1] Available at: http://ehf2018.iusiani.ulpgc.es/courses_files/JSarrate-Course.pdf

Tipi elementov

- Vrsta
- Prostostne stopnje
- Število vozlišč
- Formulacija
- Integracija



[1]

[1] Abaqus 6.12. Documentation, Abaqus Analysis User's Guide

O joj, trikotnik!!!

[1]

Hvala za pozornost!

[1] https://www.cartoonstock.com/cartoon?searchID=CX305112

This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 951732. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Germany, Bulgaria, Austria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Lithuania, Latvia, Poland, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom, France, Netherlands, Belgium, Luxembourg, Slovakia, Norway, Switzerland, Turkey, Republic of North Macedonia, Iceland, Montenegro