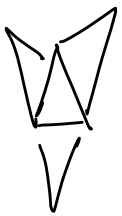
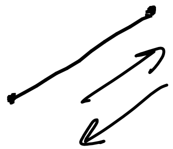
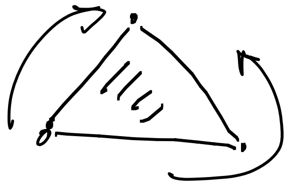
ZPG-7

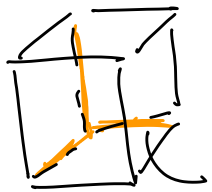
Note Title 7.11.2008

Datové struktury

$\{\triangle\}_{i=1}^{N} \rightarrow$ 







E^3

Plocha & body

Plocha & hrany & body

zakryté hrany

$f_{HASH}(A) = \alpha x + \beta y + \gamma z \quad x, y, z \in \mathbb{R}$

řetězec $= \sum \alpha_i x_i$.

↳ znaky

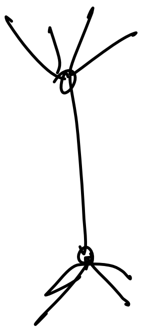
↳ věty

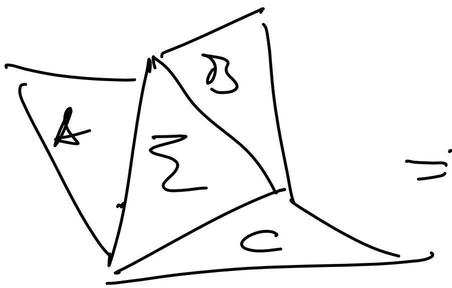
↳ α, β, γ ... $\sqrt{2}, \pi, \sqrt{3}$ „iracionální"

Hidden Line

Hidden Surface

R G





$\Rightarrow$ datová struktura

Visualizace dat & informací

atributy – teplota – směr pohybu $\vec{v}$ – $\{\langle x, y, z, t \rangle$ atributy$\}$

– hmotnost – akcelerace a

– tlak – rotace

⋮

$\left.\begin{matrix}\text{teplota}\\ \text{hmotnost}\\ \text{tlak}\end{matrix}\right\}$ skalární

v_x, v_y, v_z

a_x, a_y, a_z

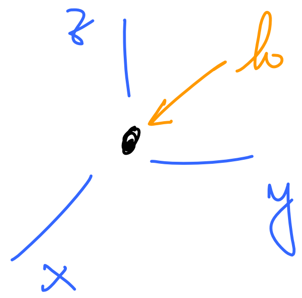
$\}$ vektorová data

⋮

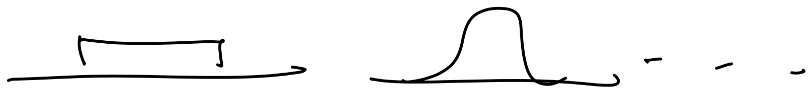
další typy dat

Skalární pole

$\langle (x, y, z), h \rangle$



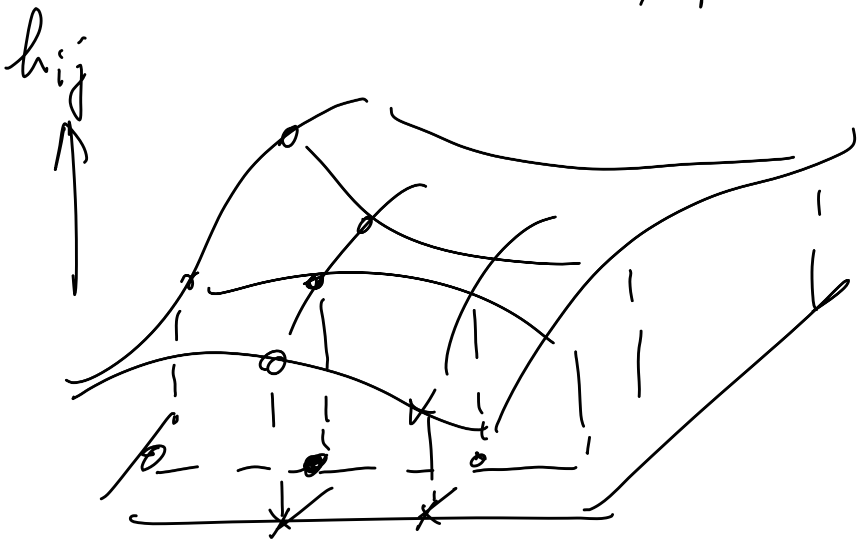
- scattered – rozložení

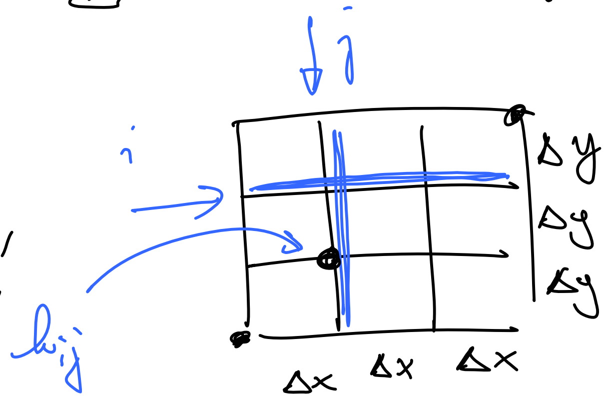


  - clusters

x_i x_j nejbližší?

- uspořádaná
  - structured – regular
    – nepravidelné





$f(x,y) \to (i,j)$

$(i,j) \to (x,y)$

$\#_{ij}$

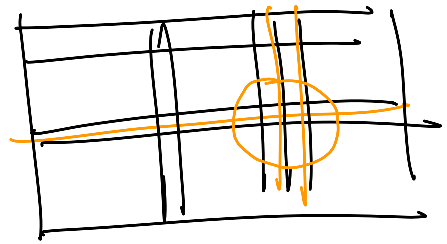
x_{ij}, y_{ij}

$$X = [x_0, \dots, x_n]$$

$$Y = [y_0 \dots, y_m]$$

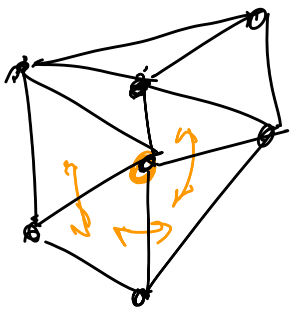
$$H = \{h_{ij}\}$$

$\cancel{}$ $\rightarrow \overline{H}_{\underline{\underline{k}}}$



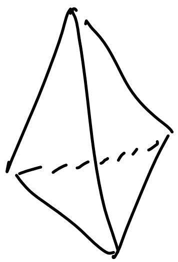
$x_i = x_{min} + i \cdot \Delta x$

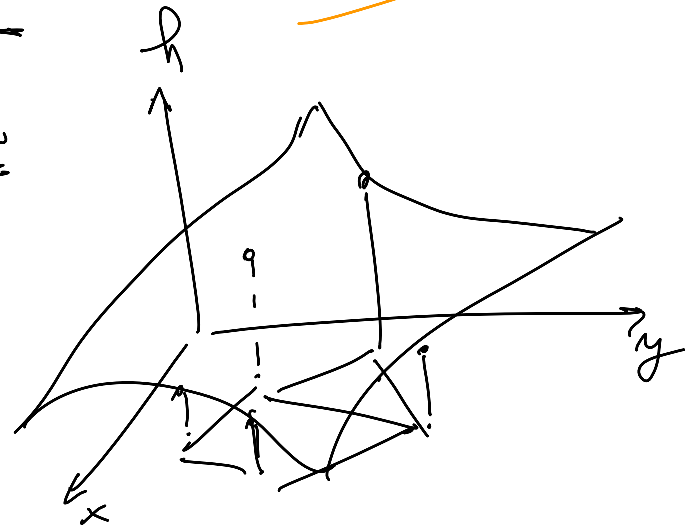
Nestrukturované sítě

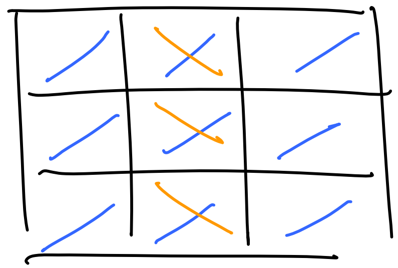


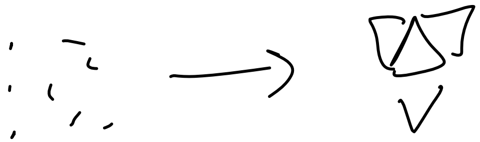
(x, y, h)

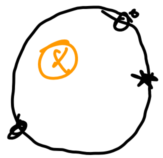
(x, y, z, h)









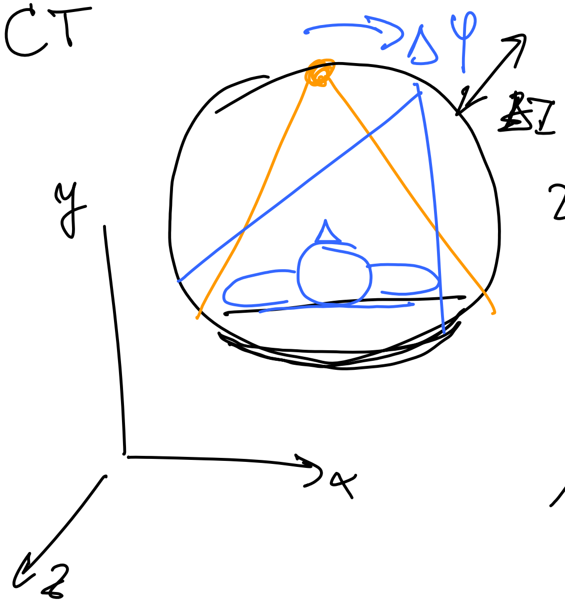


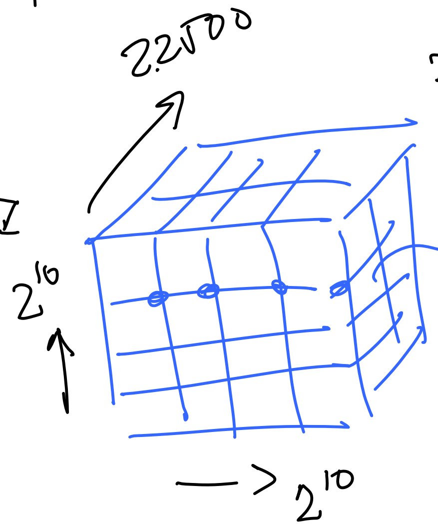
Delaunay

triangulační metody

$\longrightarrow$ VAM / KIV

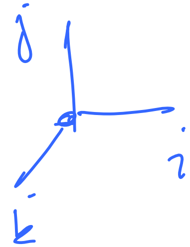
CT





h – pohltivost tkání

T_{ijk}



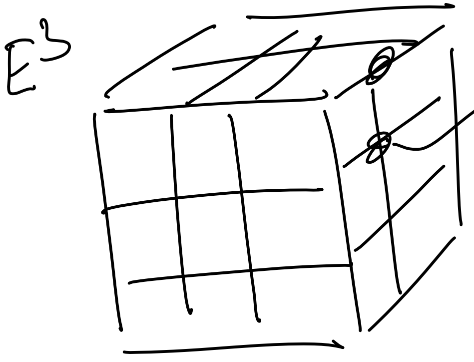
96

h .. 2B

$$\underbrace{2^{10} \cdot 2^{10} \cdot 2^{12}}_{} = \underline{2^{32}\,[B]} \ ?$$

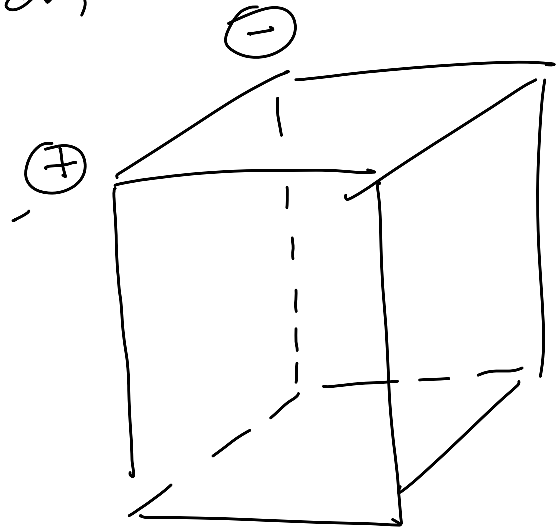
$$22500 \doteq 2 \cdot 10^4 \sim 3 \cdot (2^3)^4 = 3 \cdot 2^{12}$$

E^3



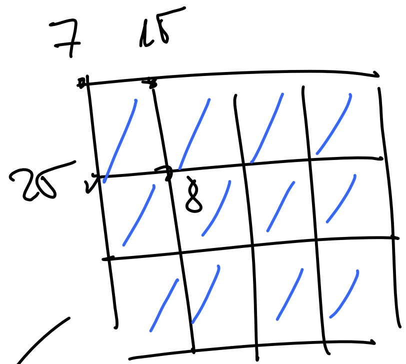
h_{ijk}

iso plocha



$2^8 = 256$ případů $\longrightarrow$ 128

symetrie tabulky



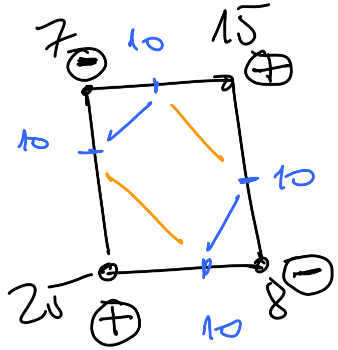
E^2

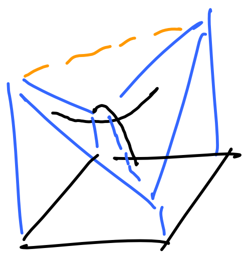
stejná výška

$= \underline{\underline{10}}$

tesselation

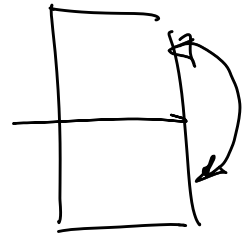
$h = 10$





iso čára / křivka

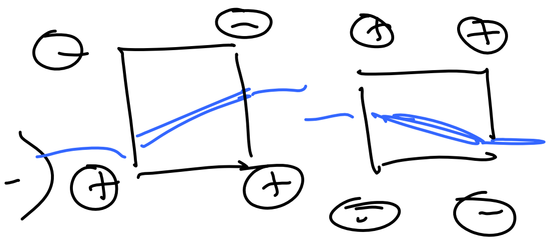
2^4 případů



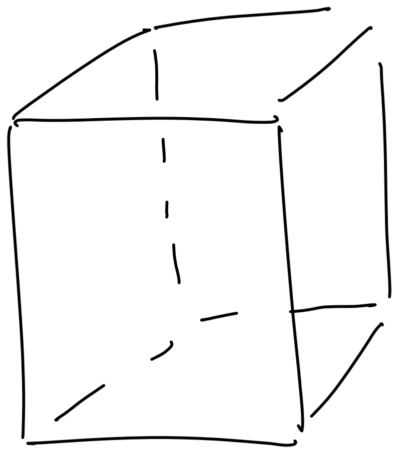
$2^8 = 256 \longrightarrow 128 \longrightarrow 16$ případů

↳ index

$f\,[\,\cdot\,](\,\ldots)$



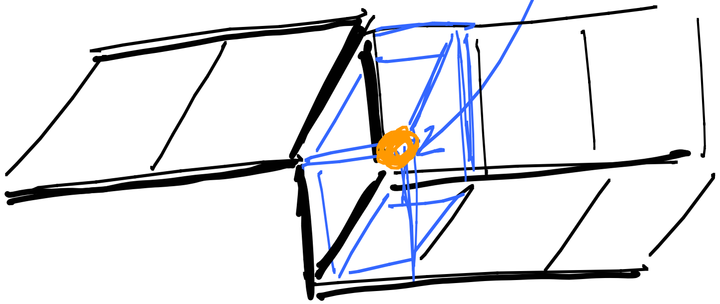
„Geometrické“ symetrie

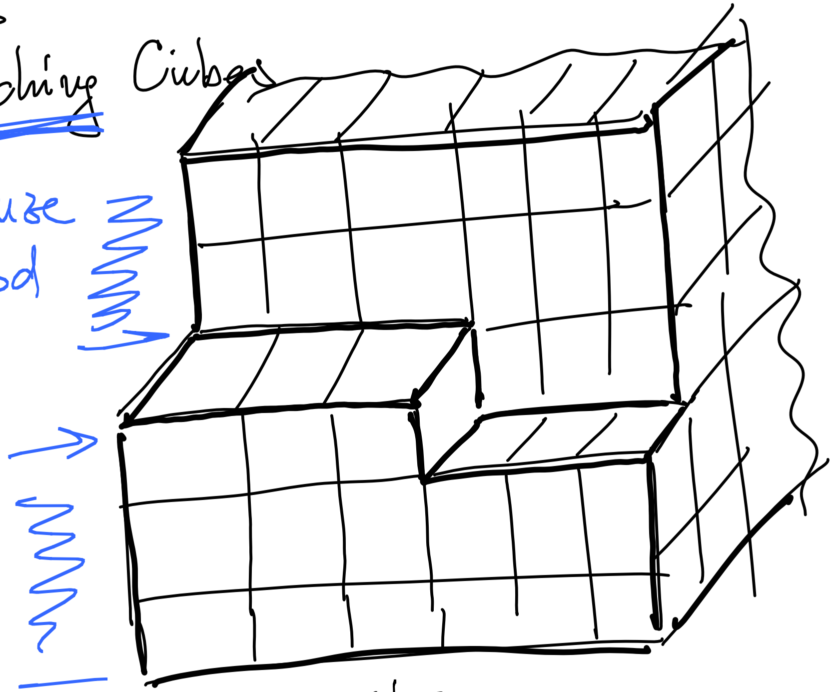


Metody

Marching Cubes

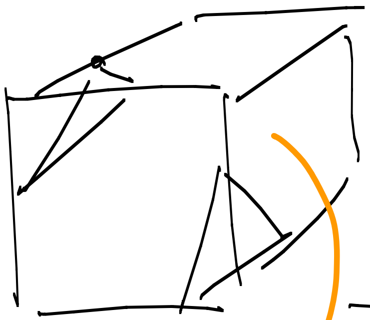
čte se pouze tento bod



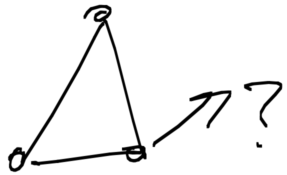


stav k

<u>Cube</u>



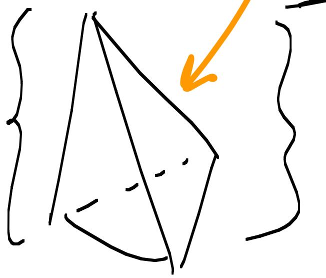
→ výstup množina {Δ}

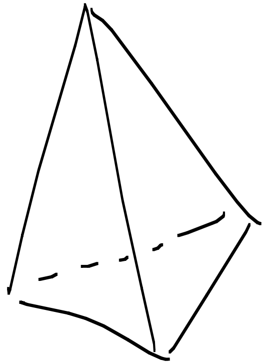


<u>Tesselation</u>

5, 6

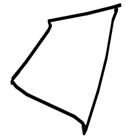
Tetrahedra (Marching) [čtyřstěn]





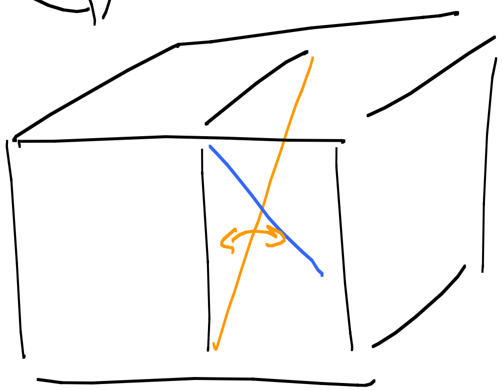
⇒ Δ, 2Δ

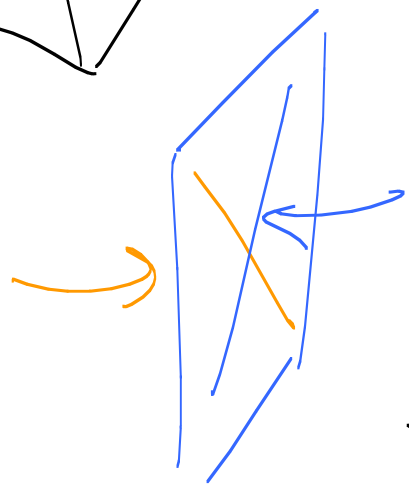
neplanární



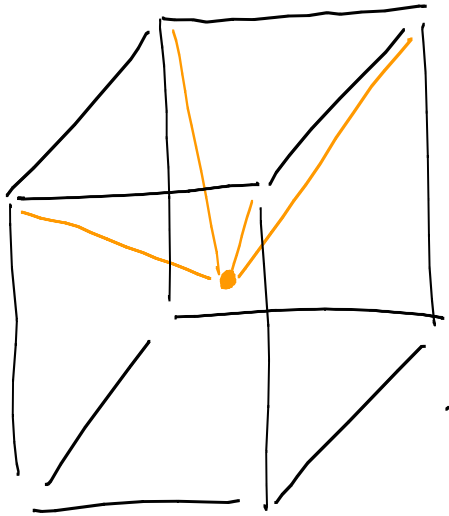
4≠

komplikace

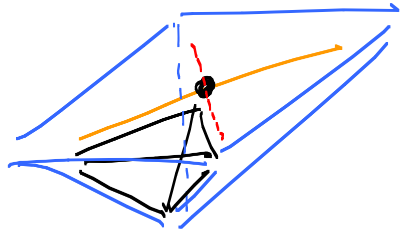




<u>MK3OP</u>

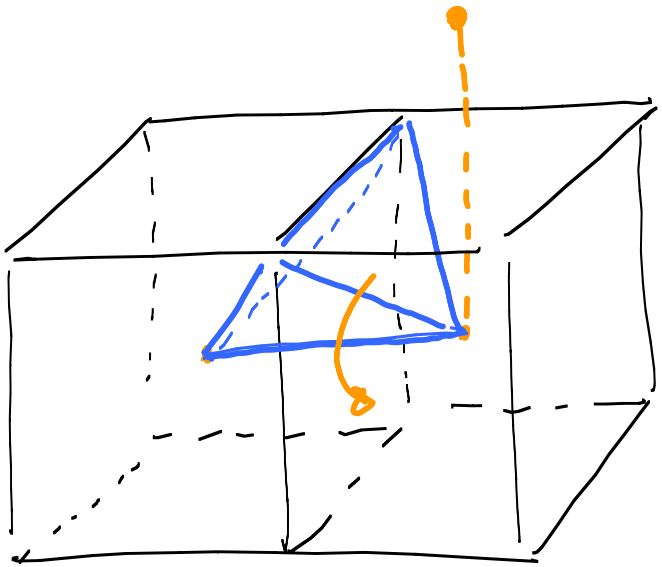


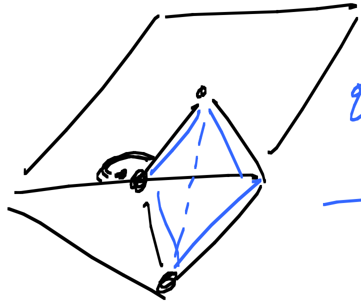
$\Rightarrow 12$



4 boký jehlan
„pyramida“
2 tetrahedry

$\Downarrow$
24





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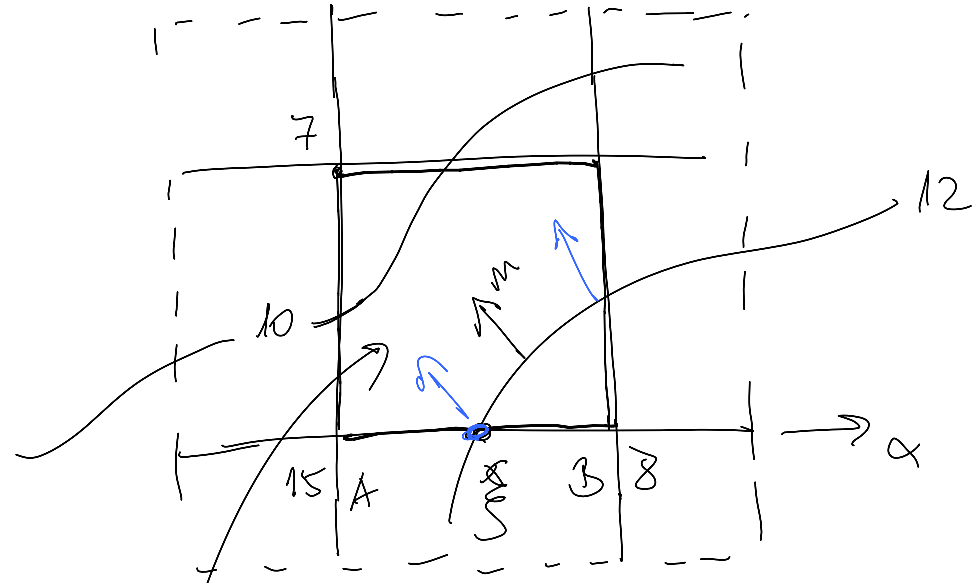
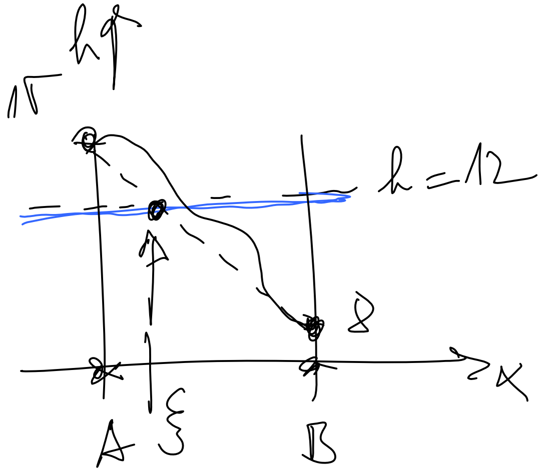
tetrahedry stejné
„Cubic Lattice“

Volumetrická
data
„Volume“





normála

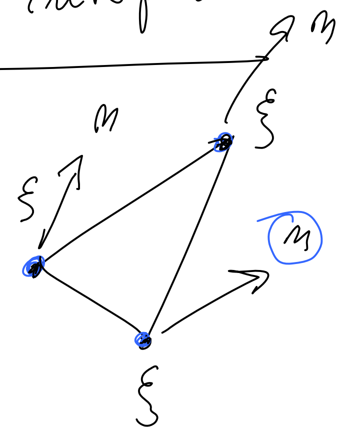
P ≡ $F(x,y)=0$ $\quad E^2 \Rightarrow$ isočára

$F(x,y,z)=0$ $\quad E^3 \Rightarrow$ isoplocha

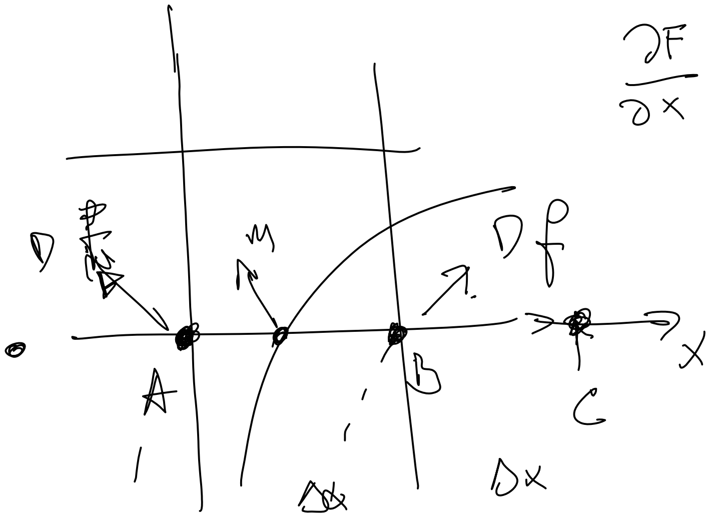
$$n_F \doteq DF(x) \left[\frac{\partial F}{\partial x}, \frac{\partial F}{\partial y}, \frac{\partial F}{\partial z}\right]$$

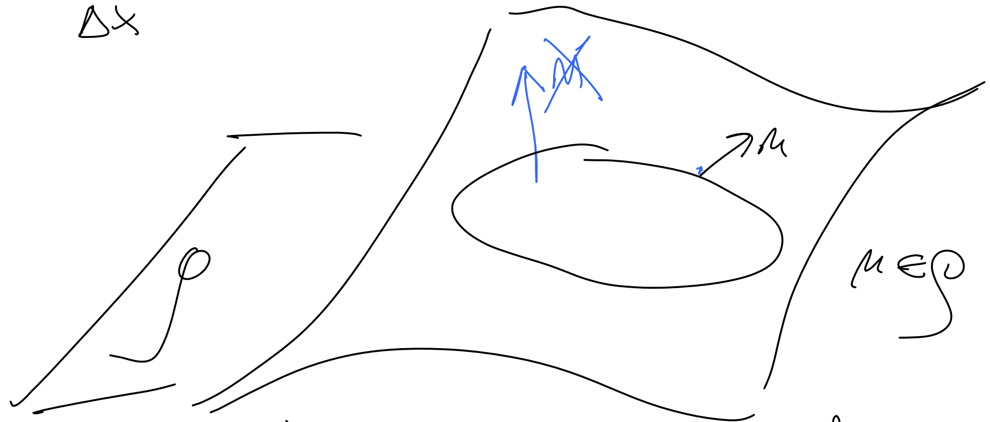
$$\quad n_x \quad n_y \quad n_z$$

lineární interpolace



$$\frac{\partial F}{\partial x} = \frac{F(x+\Delta x) - F(x)}{\Delta x}.$$



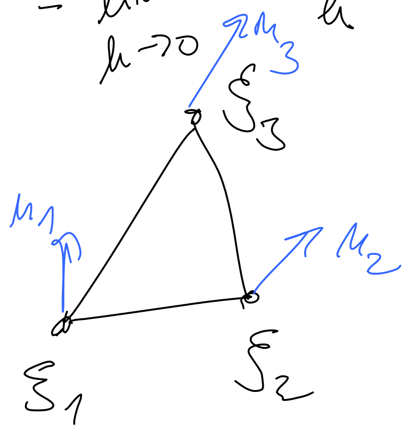


$$DF_A = \frac{F(x_B) - F(x_A)}{\Delta x} \; ; \; DF_B = \frac{F(x_C) - F(x_B)}{\Delta x}$$

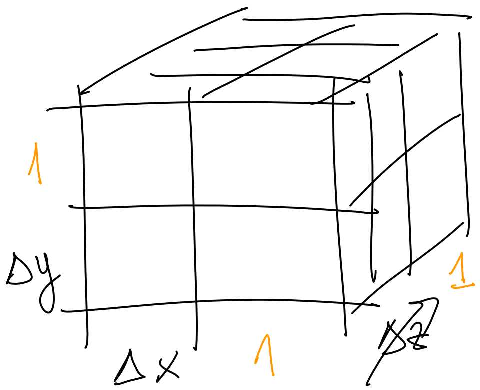
$$\frac{df(x)}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

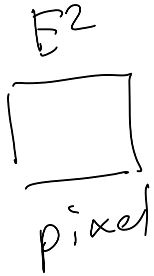
n_ξ -- lin. interpolace

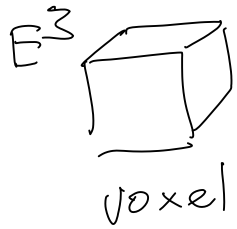
DF_A, $\cancel{D}F_B$



MK 30P







$\Delta x \neq \ldots \quad \Delta y = \ldots \quad \Delta z \ldots$

$$[\xi, \eta, \zeta]$$

$$\bar{n} = [k_x \;\; l_y \;\; k_z]$$

n_x, n_y, n_z

$\Rightarrow$ eliminace operace dělení

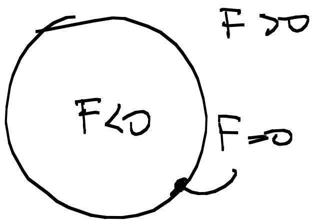
Optimalizace

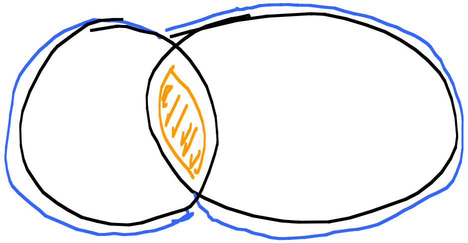
Computer Solid Geometry

CSG

$F(x,y,z) = 0$

$F(x) = 0$





$F_1 \cup F_2 = \min\{F_1, F_2\}$

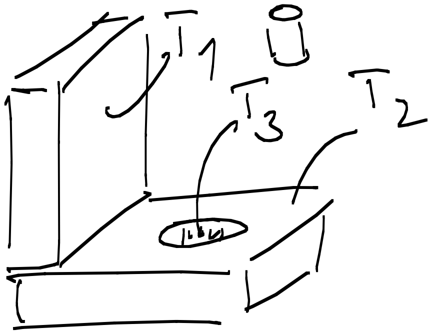
$(F_1 \cup F_2)(x) = \min\{F_1(x), F_2(x)\}$

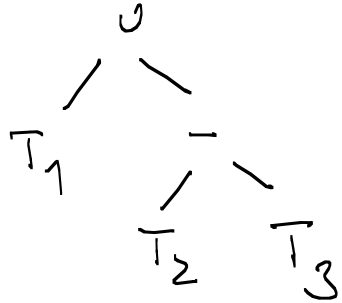
$F_1 \cap F_2 = \max\{F_1, F_2\}$

průnik, sjednocení, rozdíl, doplněk

doplněk $\underbrace{\neg F = -F}$

CSG strom





Komplikace – Extrakce povrchu $\Rightarrow$ Δ sítě **APG/kW**

– Optimalizace stromu

Co příště – parametrický popis $x(t) = ---$