

GEOREFEREREN

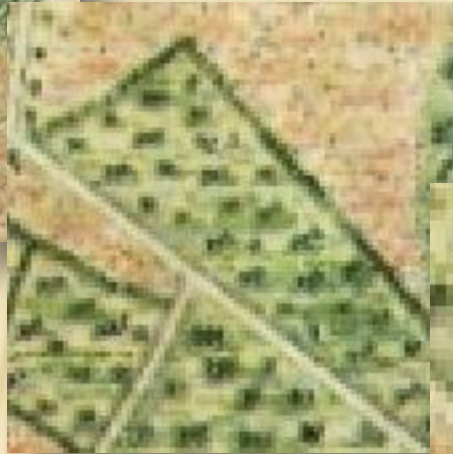
GEOREFEREREN

WAT ?

- + Ingescande kaarten
 - + Luchtfoto's
 - + Screenshots
 - + Historische kaarten
- } rasterbeelden

→ Positioneren door middel van toekennen van wereldcoördinaten

RASTERBEELDEN

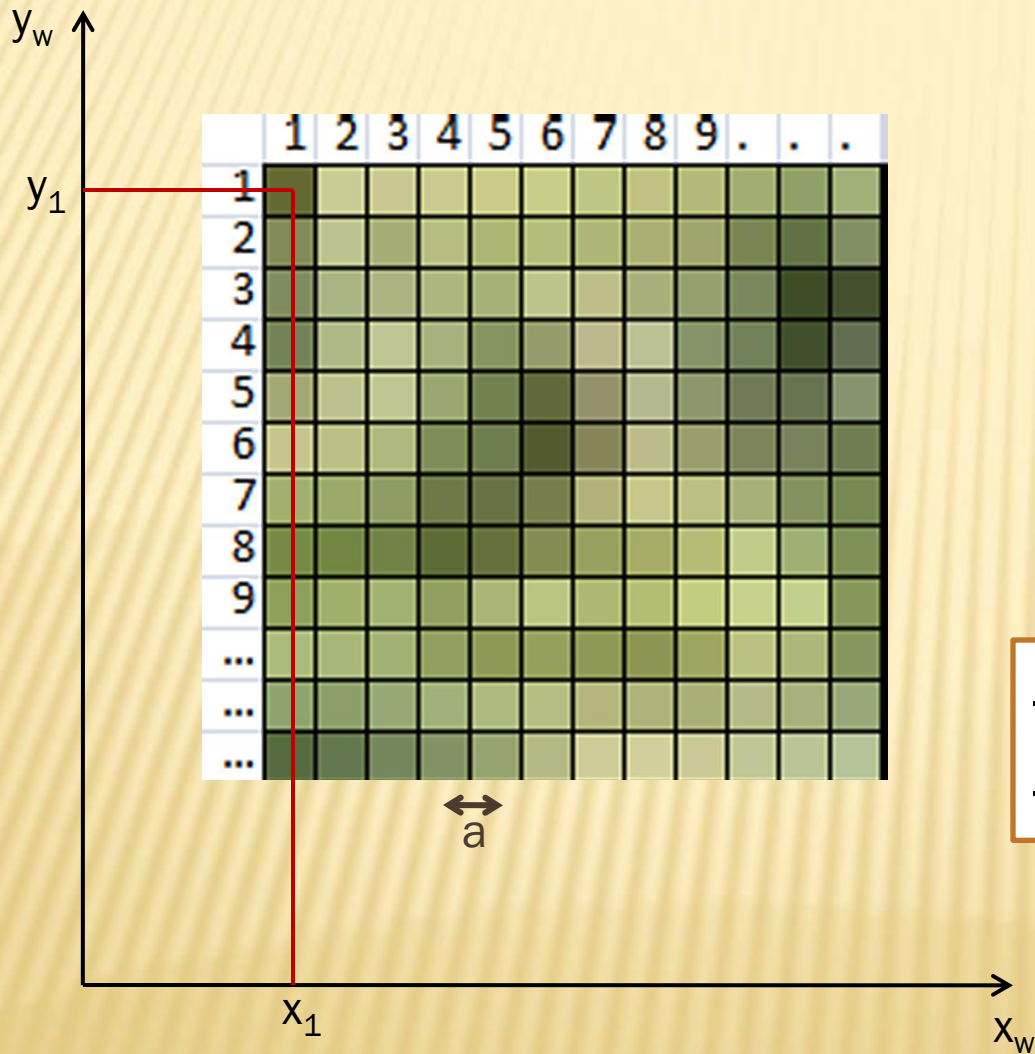


FORMULES

× Stel:

- + X- en y-coördinaat van linkerbovenhoek van afbeelding = (x_1, y_1)
- + Grootte van 1 pixel in realiteit = *a meter*
- + Wereldcoördinaten (x_w, y_w) gegeven in functie van de pixelcoördinaten (x_p, y_p) :
 - × $x_w = x_1 + a x_p$
 - × $y_w = y_1 - a y_p$

FORMULES



$$x_w = x_1 + a x_p$$

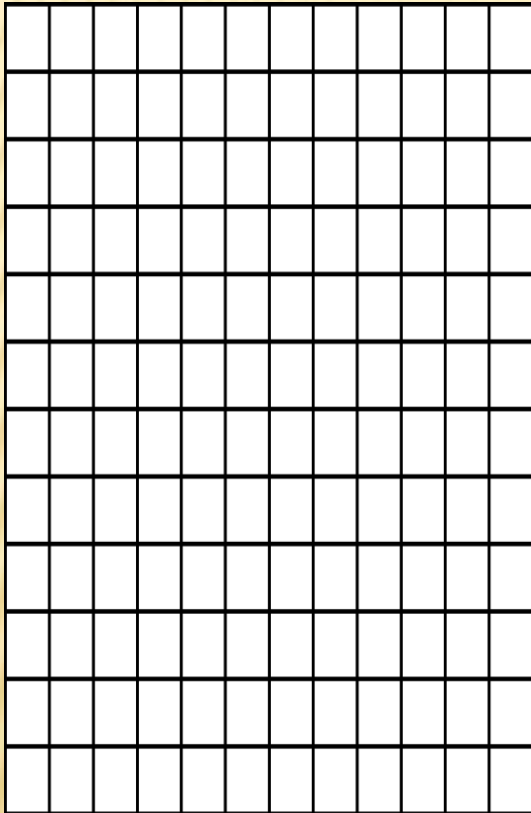
$$y_w = y_1 - a y_p$$

- Verschuiving over x en y
- 1 schaalfactor

FORMULE

- ✘ Opgesteld door de software
- ✘ Homologe punten
- ✘ Type formule (transformation type) door de gebruiker te bepalen
- ✘ Aantal punten nodig = afhankelijk van type formule (het aantal parameters)

FORMULES: LINEAR



$$x_w = x_1 + a x_p$$

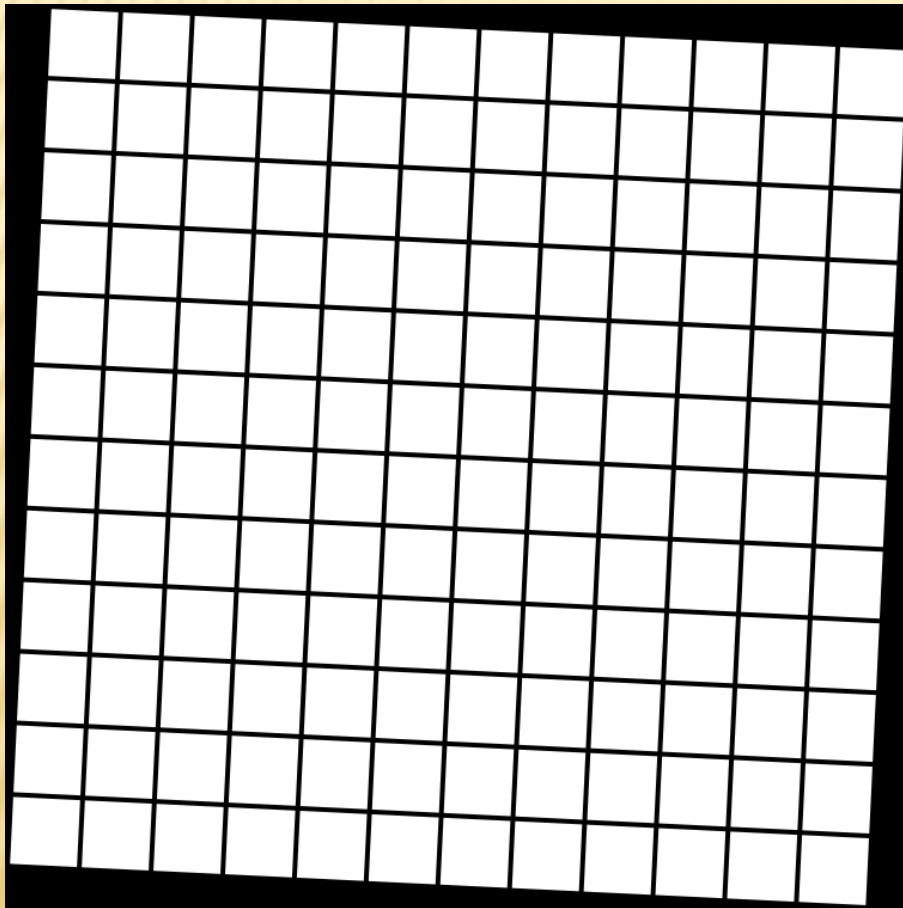
$$y_w = y_1 - b y_p$$

- Verschuiving over x en y
- 2 schaalfactoren

4 parameters

→ minstens 2 homologe punten

FORMULES: HELMERT



$$x_w = x_1 + a x_p + b y_p$$

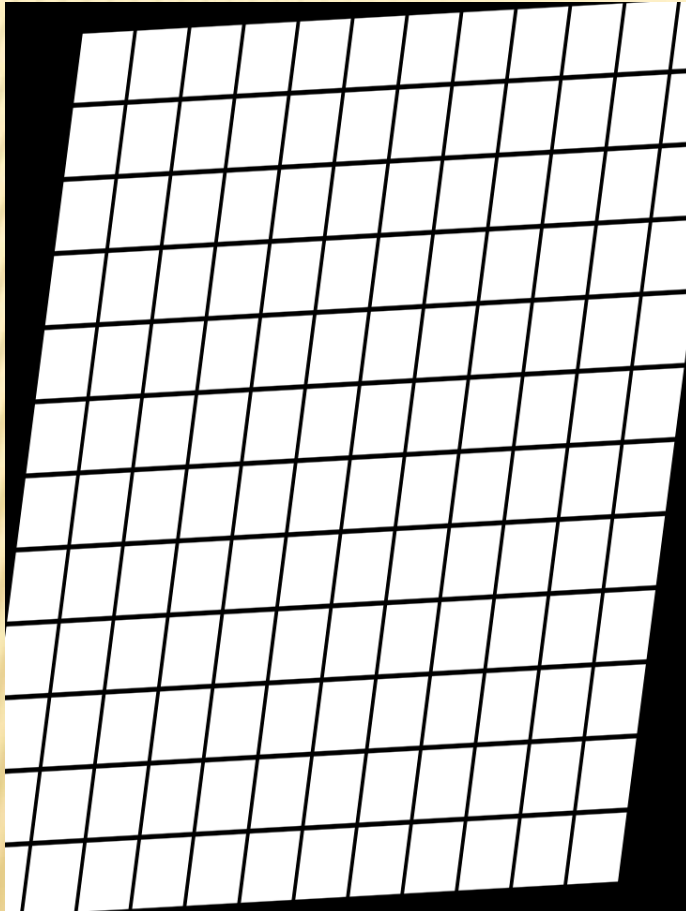
$$y_w = y_1 - a y_p + b x_p$$

- Verschuiving over x en y
- 1 rotatiefactor
- 1 schaalfactor

4 parameters

→ minstens 2 homologe punten

FORMULES: 1^E GRAADS POLYNOMIALE VERGELIJKING (POLYNOMIAL 1)



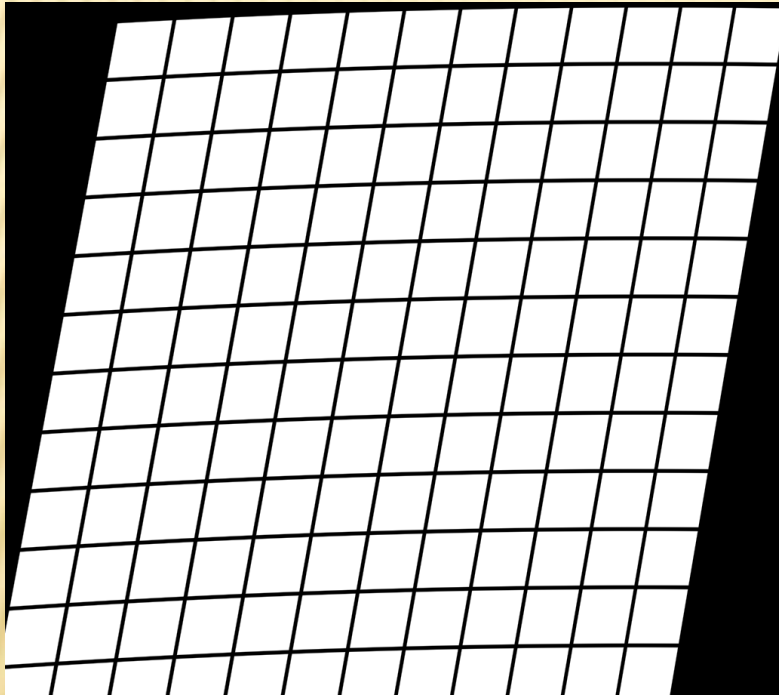
$$x_w = x_1 + a x_p + b y_p$$
$$y_w = y_1 - c y_p + d x_p$$

- Verschuiving over x en y
- 2 rotatiefactoren
- 2 schaalfactoren

6 parameters

→ minstens 3 homologe punten

FORMULES: 2^E GRAADS POLYNOMIALE VERGELIJKING (POLYNOMIAL 2)



$$x_w = x_1 + a x_p^2 + b y_p^2 + c x_p + d y_p + e$$

$$x_p y_p$$

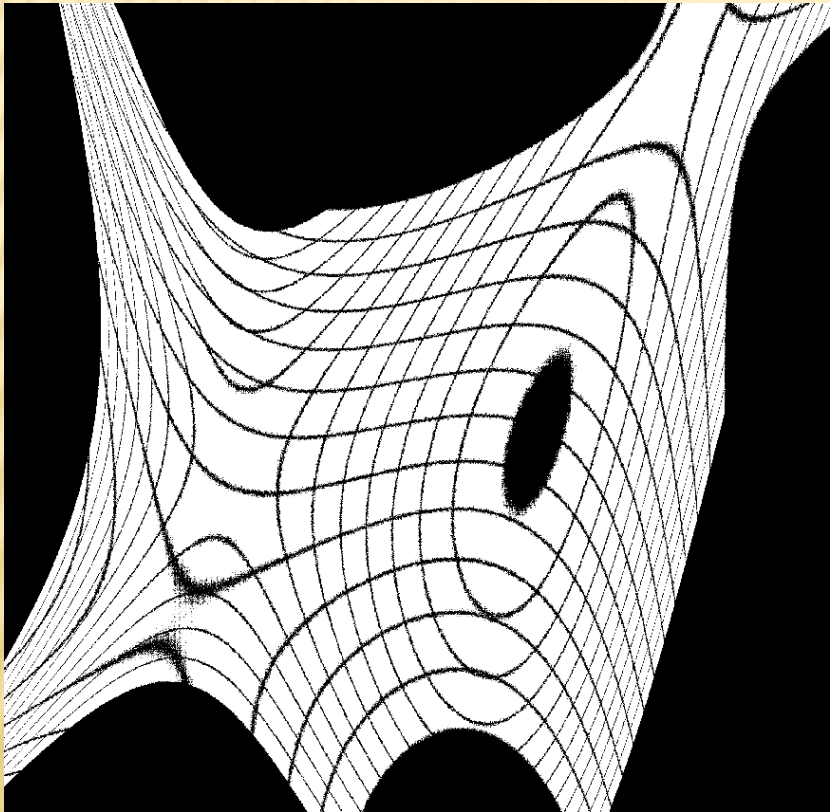
$$y_w = y_1 + f x_p^2 + g y_p^2 + h x_p + i y_p + j$$

- Verschuiving over x en y
- Kromming (parabool)

12 parameters

→ minstens 6 homologe punten

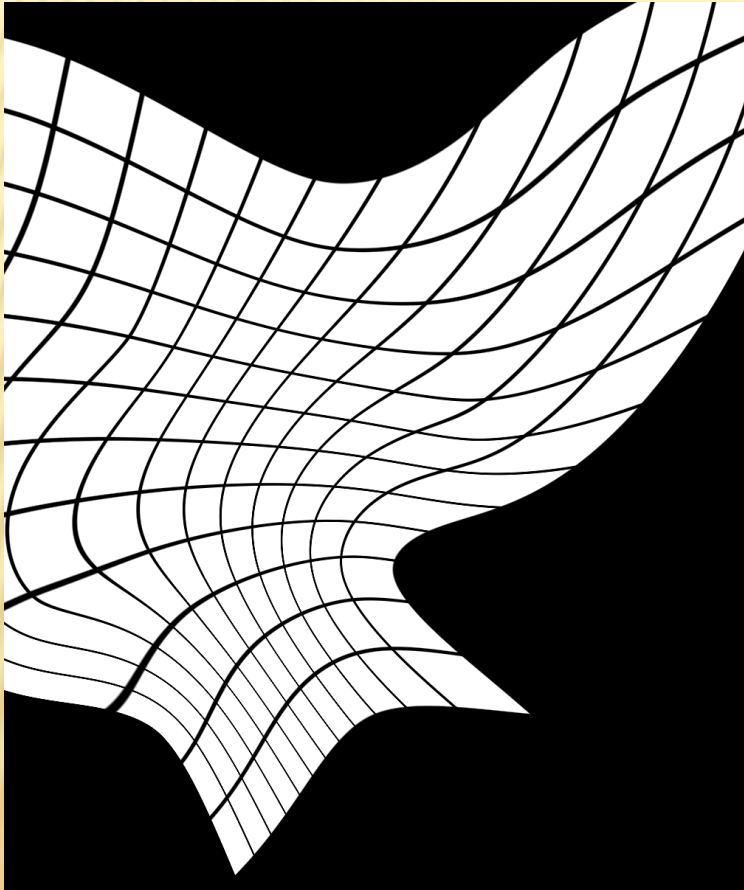
FORMULES: 3^E GRAADS POLYNOMIALE VERGELIJKING (POLYNOMIAL 3)



- Verschuiving over x en y
- Geavanceerde krommingen
(3^e graads)

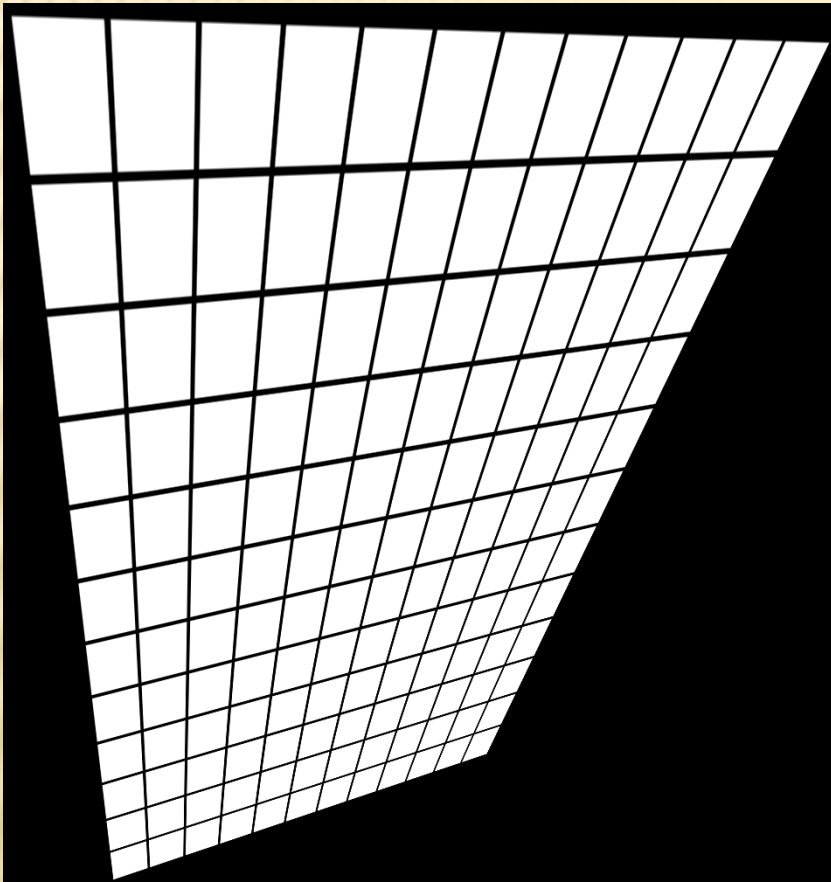
→ minstens 10 homologe punten

FORMULES: THIN PLATE SPLINE



- 'Trekken en sleuren'
- spline

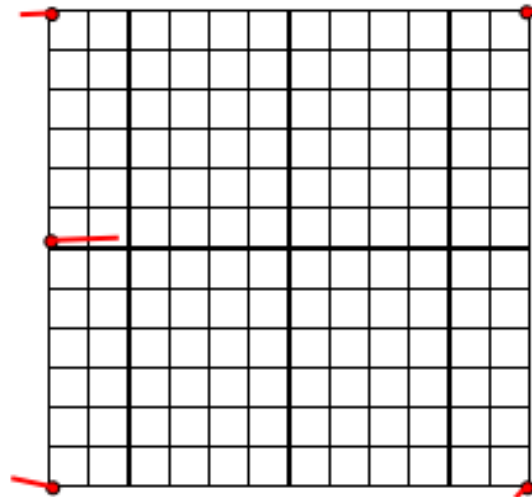
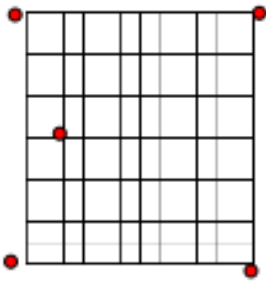
FORMULES: PROJECTIEVE



- projectieve transformatie

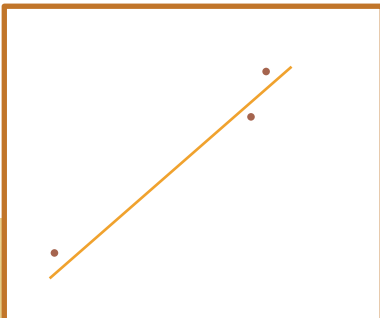
→ minstens 4 homologe punten

FOUTEN



GCP table

| on/off | id | srcX | srcY | dstX | dstY | dX[pixels] | dY[pixels] | residual[pixels] |
|-------------------------------------|----|--------|--------|-----------|------------|------------|------------|------------------|
| <input checked="" type="checkbox"/> | 0 | 1.46 | 4.37 | 610269.00 | 6523365.00 | -42.89 | 1.93 | 42.94 |
| <input checked="" type="checkbox"/> | 1 | 2.91 | 721.09 | 610267.56 | 6523280.31 | -57.72 | -12.28 | 59.01 |
| <input checked="" type="checkbox"/> | 2 | 719.63 | 1.46 | 610352.82 | 6523365.58 | 14.27 | 0.05 | 14.27 |
| <input checked="" type="checkbox"/> | 3 | 721.09 | 721.09 | 610349.93 | 6523277.13 | -13.92 | 14.10 | 19.81 |
| <input checked="" type="checkbox"/> | 4 | 0.00 | 348.16 | 610284.32 | 6523324.25 | 100.26 | -3.79 | 100.33 |



FOUTEN

- ✗ Fout in kaart
- ✗ Fout in homologe punten
- ✗ Ander coördinaatsysteem

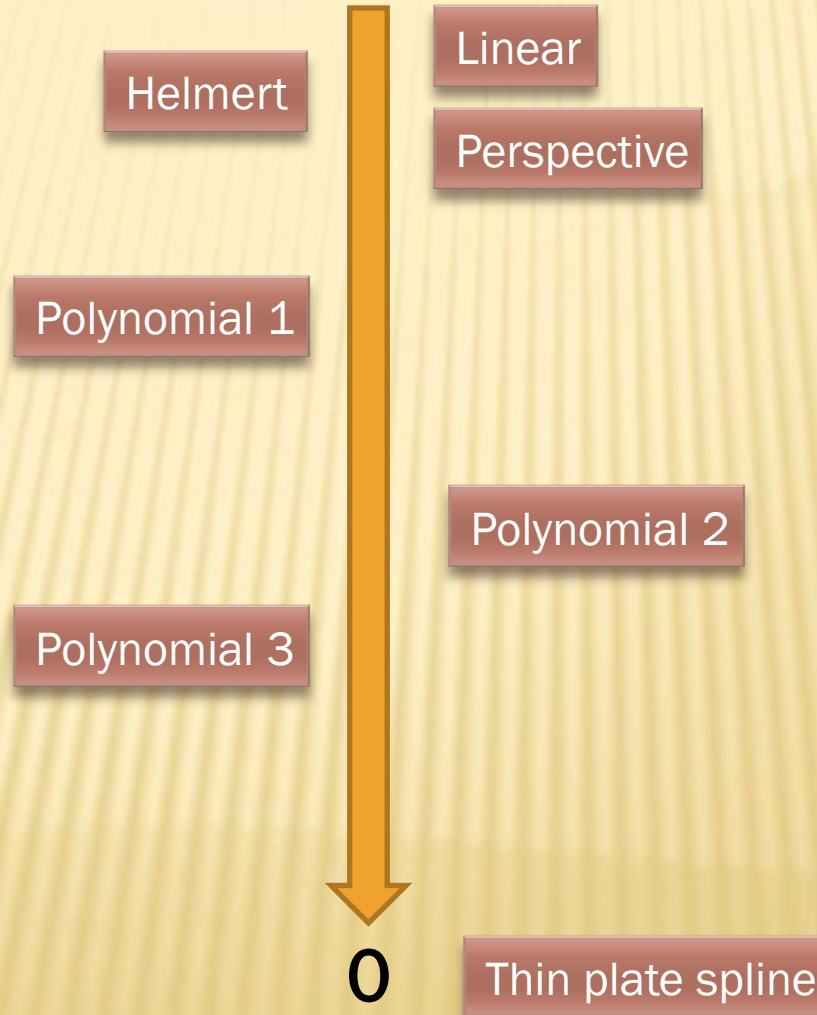
- ✗ Grote fouten 'uitvinken' ?

- ✗ Zo klein mogelijke total RMS
- ✗ 0 is niet perfect !

- ✗ Geen buiten de aangeduide punten

FOUTEN

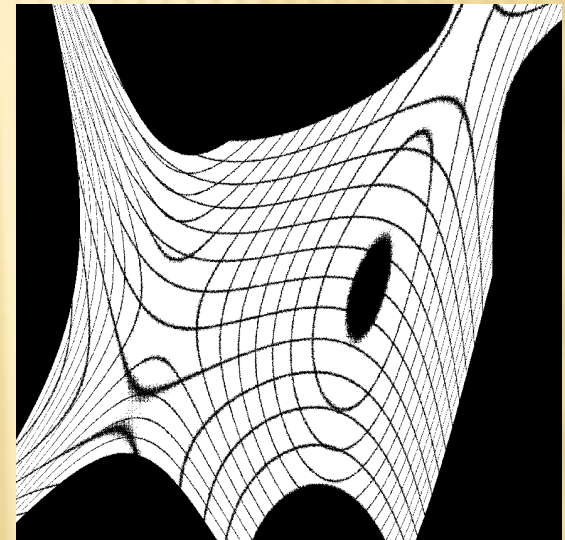
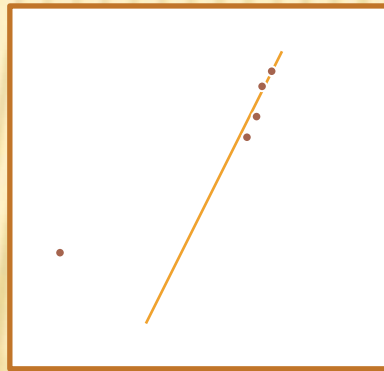
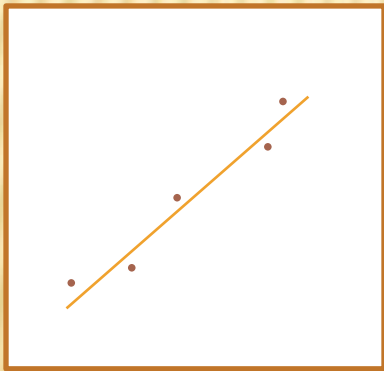
GROOT



KEUZE HOMOLOGE PUNTEN

✘ Over de volledige kaart (randeffecten!)

✘ Evenredig verspreid

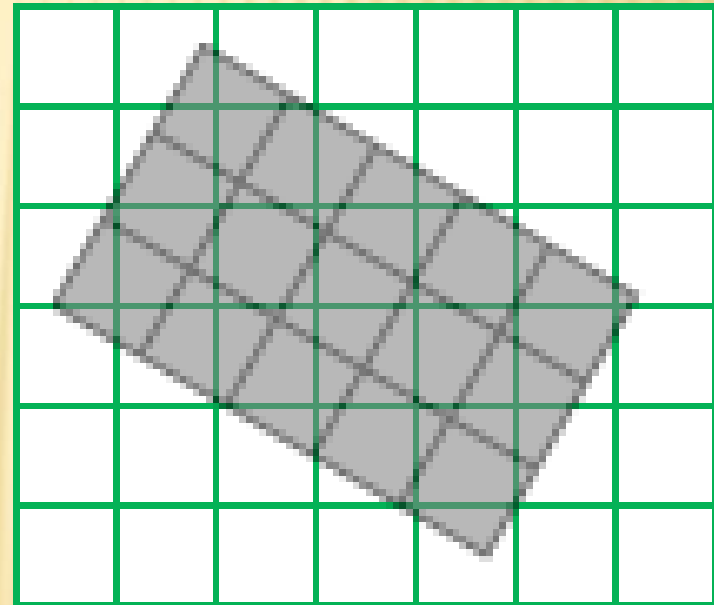
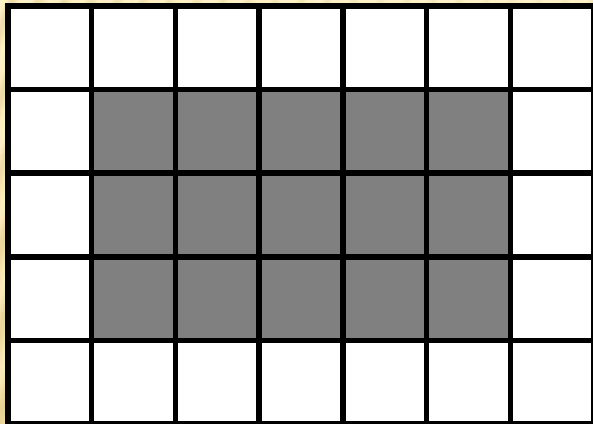


✘ 'Genoeg'

KEUZE FORMULE

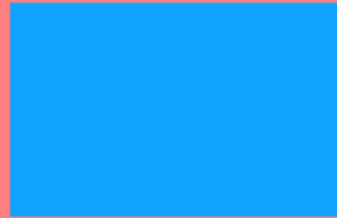
- ✘ Afhankelijk van het coördinaatsysteem
- ✘ Afhankelijk van de nauwkeurigheid
- ✘ Afhankelijk van opname beeld
 - + Scanner
 - + Foto
 - + Digitale output

RESAMPLINGMETHODE

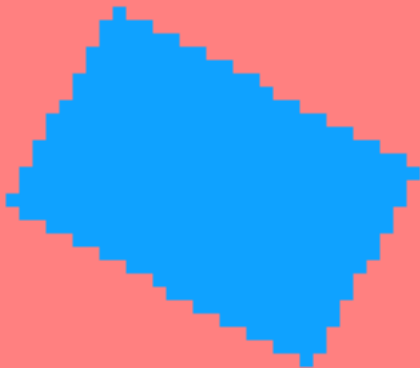


RESAMPLINGMETHODE

Origineel



Nearest neighbour



Linear, cubic,

