Titel

Namen

TECHNISCHE
UNIVERSITÄT
DARMSTADT

REGELUNGSMETHODEN
UND ROBOTIK

Distortion example

$$x = x_d + (x_d - x_c)(1 + K_1 r^2 + K_2 r^4) + P_1 \left(r^2 + 2(x_d - x_c)^2 \right) + 2P_2(x_d - x_c)(y_d - y_c)$$

$$y = y_d + (y_d - y_c)(1 + K_1 r^2 + K_2 r^4) + 2P_1(x_d - x_c)(y_d - y_c) + P_2 \left(r^2 + 2((y_d - y_c)^2 \right)$$

Radial distortion:

$K_n = n^{th}$ radial distortion coefficient

Tangential distortion:

$P_n = n^{th}$ tangential distortion coefficient

$(x_d, y_d) =$ distorted imaage point as projected on image plane

$(x, y) =$ undistorted imaage point as projected on image plane

$(x_c, y_c) =$ distortion center

$$r = \sqrt{(x_d - x_c)^2 + (y_d - y_c)^2}$$

Distortion example

$$x = x_d + (x_d - x_c)(1 + K_1 r^2 + K_2 r^4) + P_1 \left(r^2 + 2(x_d - x_c)^2 \right) + 2P_2(x_d - x_c)(y_d - y_c)$$

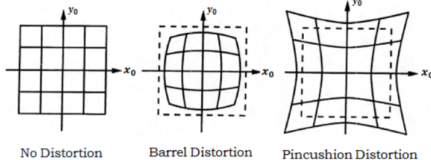$$y = y_d + (y_d - y_c)(1 + K_1 r^2 + K_2 r^4) + 2P_1(x_d - x_c)(y_d - y_c) + P_2 \left(r^2 + 2((y_d - y_c)^2 \right)$$

Radial distortion:

Tangential distortion:

Abbildung: radial distortions
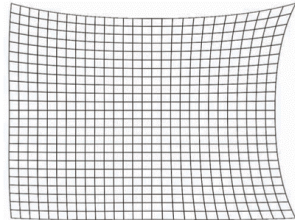
Abbildung: first order tangential distortion

pixel size detection

pixelSize = 1:

pixelSize = 8:

REGELUNGSMETHODEN UND ROBOTIK
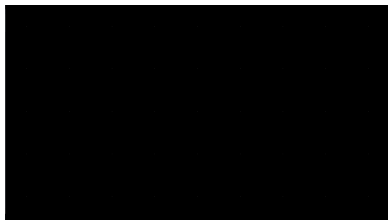
Center point estimation

FOV
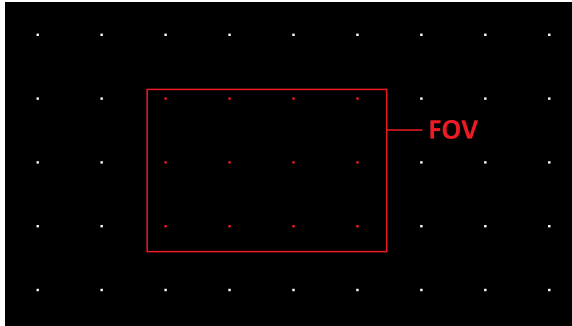
$$\mathbf{x}_c = \frac{\sum_{k=1}^{n} \mathbf{x}_k}{n}$$

n : number of seen pixels

$\mathbf{x}_k$: position of seen pixel

REGELUNGSMETHODEN UND ROBOTIK

Results

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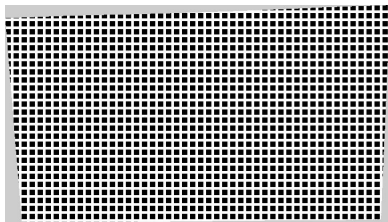
Ground truth:

Abbildung: all white lines that we're drawn and seen on the screen

Mapped Image:
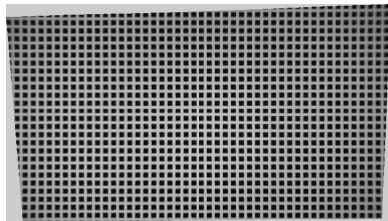
Abbildung: the seen lines after they were mapped by the algorithm

REGELUNGSMETHODEN UND ROBOTIK

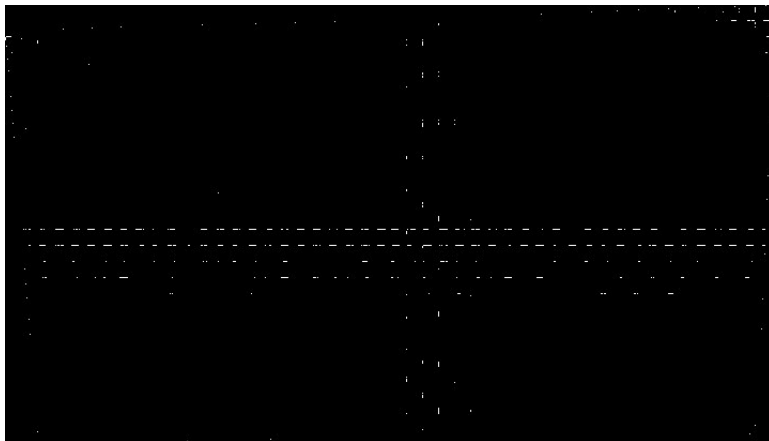## Comparison

Substraction of ground truth and mapped image

Abbildung: difference of both images
824 of 290,191 pixels do not fit