Wissenschaftliche Gesellschaft für Produktionstechnik

Laser tracker placement optimization for highly flexible manufacturing systems

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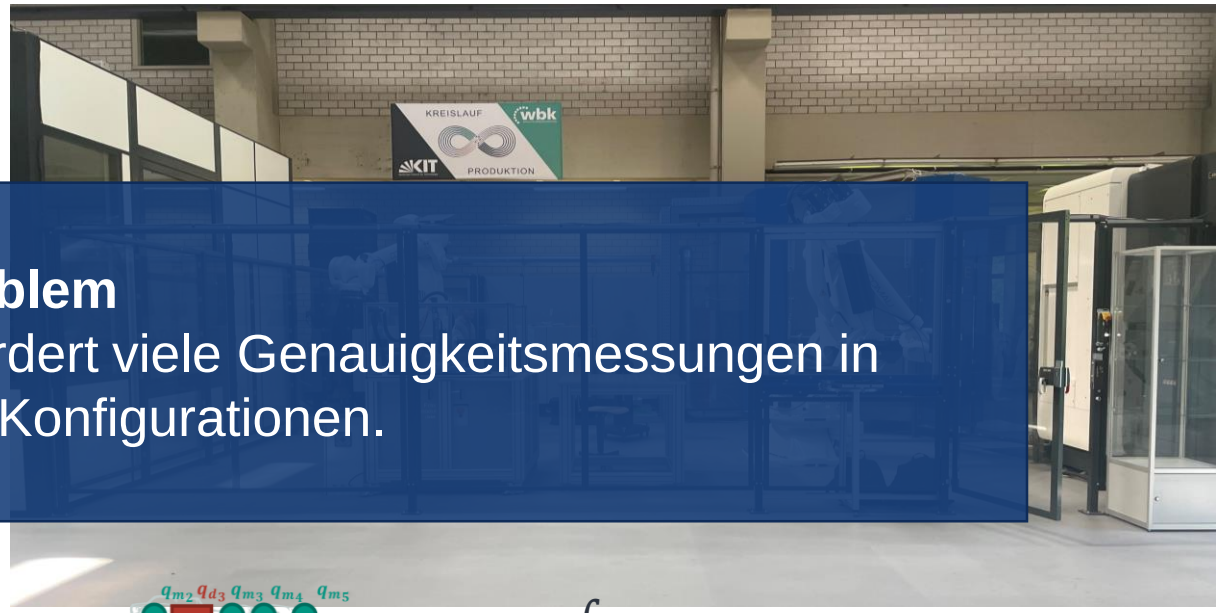
*Co-Erstauthoren

Motivation

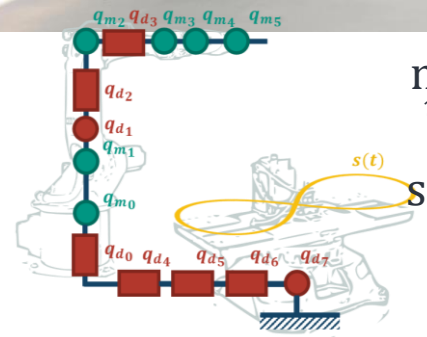
Modulares Achsensystem

Rekonfigurierbare Roboterzelle



Problem

Die Validierung dieser Systeme erfordert viele Genauigkeitsmessungen in verschiedenen Konfigurationen.



$$\min_{u,q} \int wL_D(p,q) + L_t(p,s)dt$$

$$\text{subj. to:} \quad \dot{p} = J(q)\dot{q}$$
$$\dot{q}_m = u$$
$$\dot{q}_d = 0$$

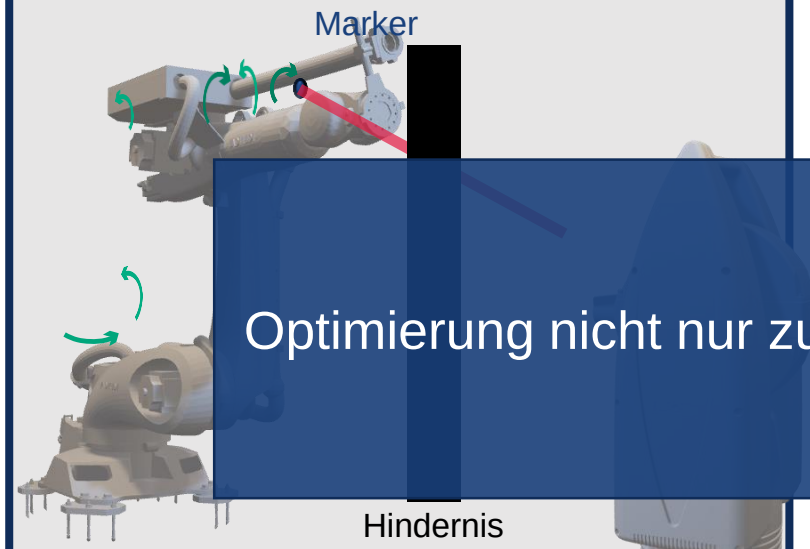
Motivation

Motivation

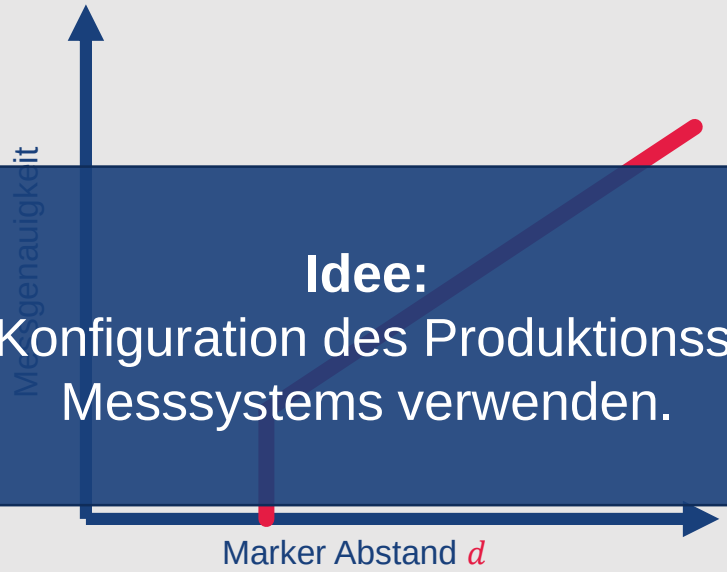

Das langwierige Setup eines Lasertrackers ist problematisch, da oft unklar ist, ob der Marker über die gesamte Testtrajektorie getrackt werden kann.

Worauf gilt es zu achten?

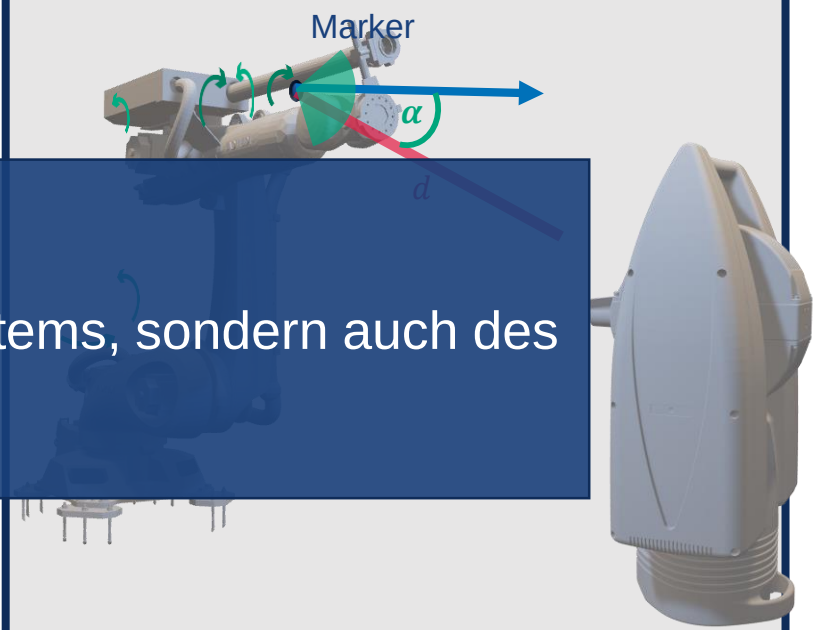
Sichtlinie



Messabstand

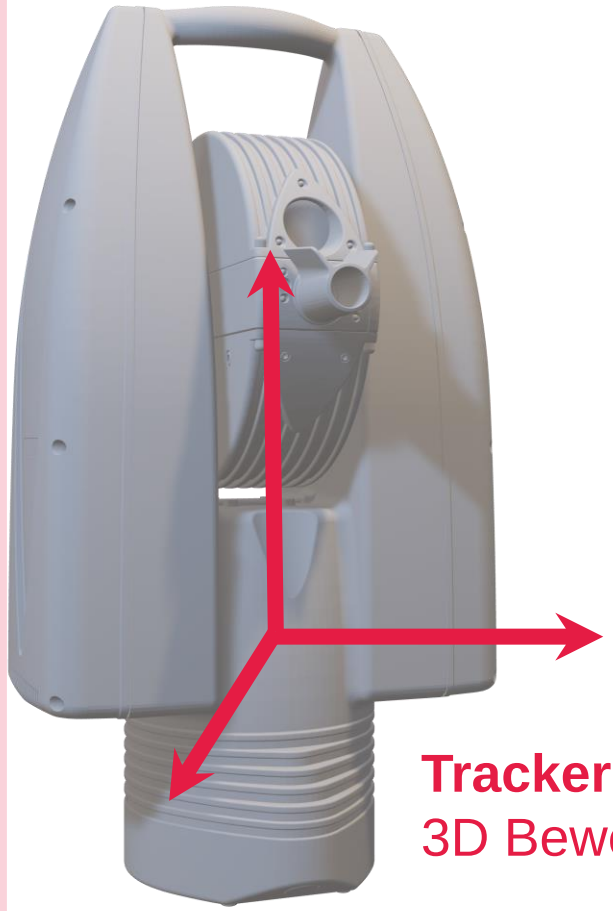


Einfallswinkel

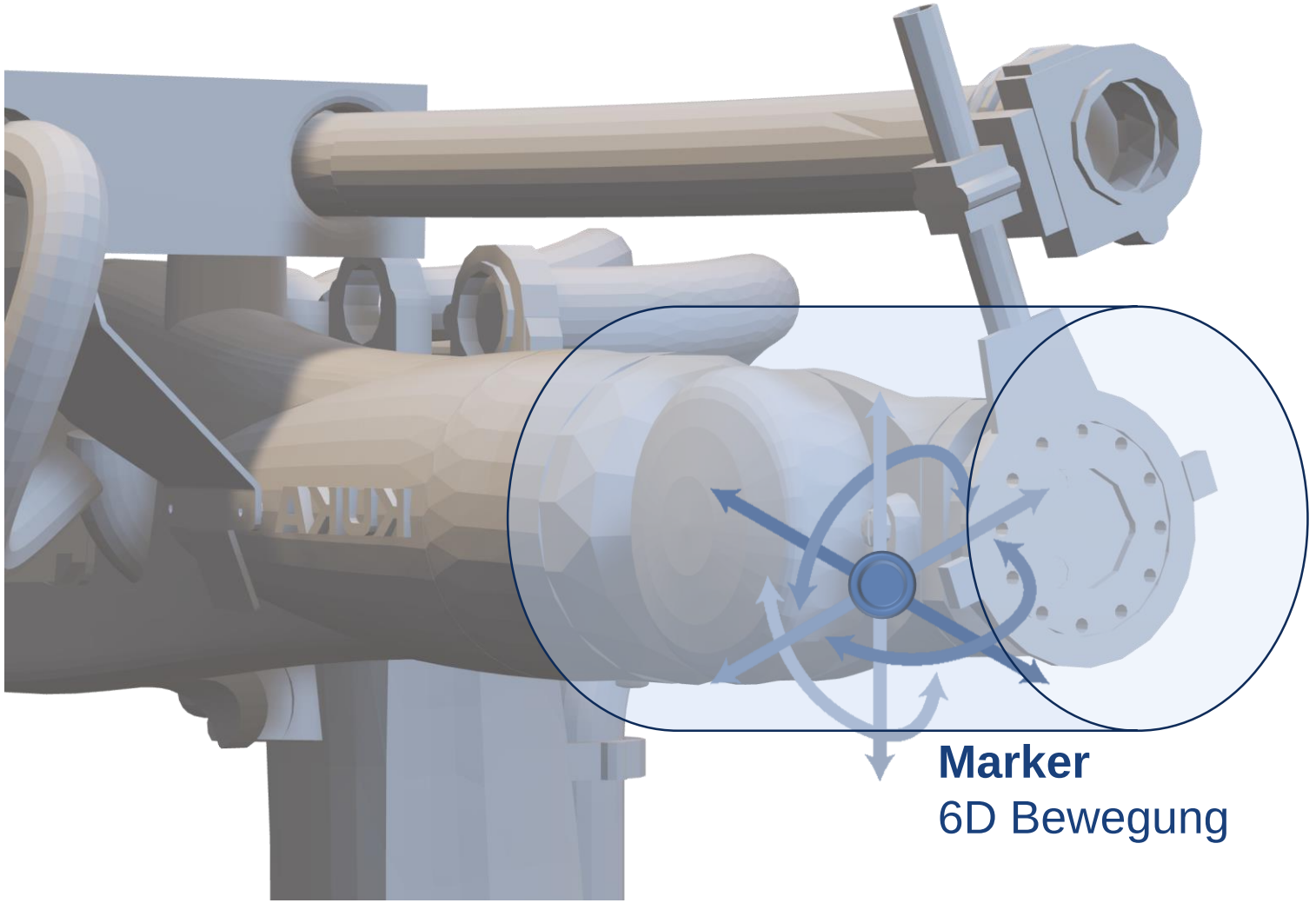


Idee:
Optimierung nicht nur zur Konfiguration des Produktionssystems, sondern auch des Messsystems verwenden.

Modellierung des Optimierungsproblems

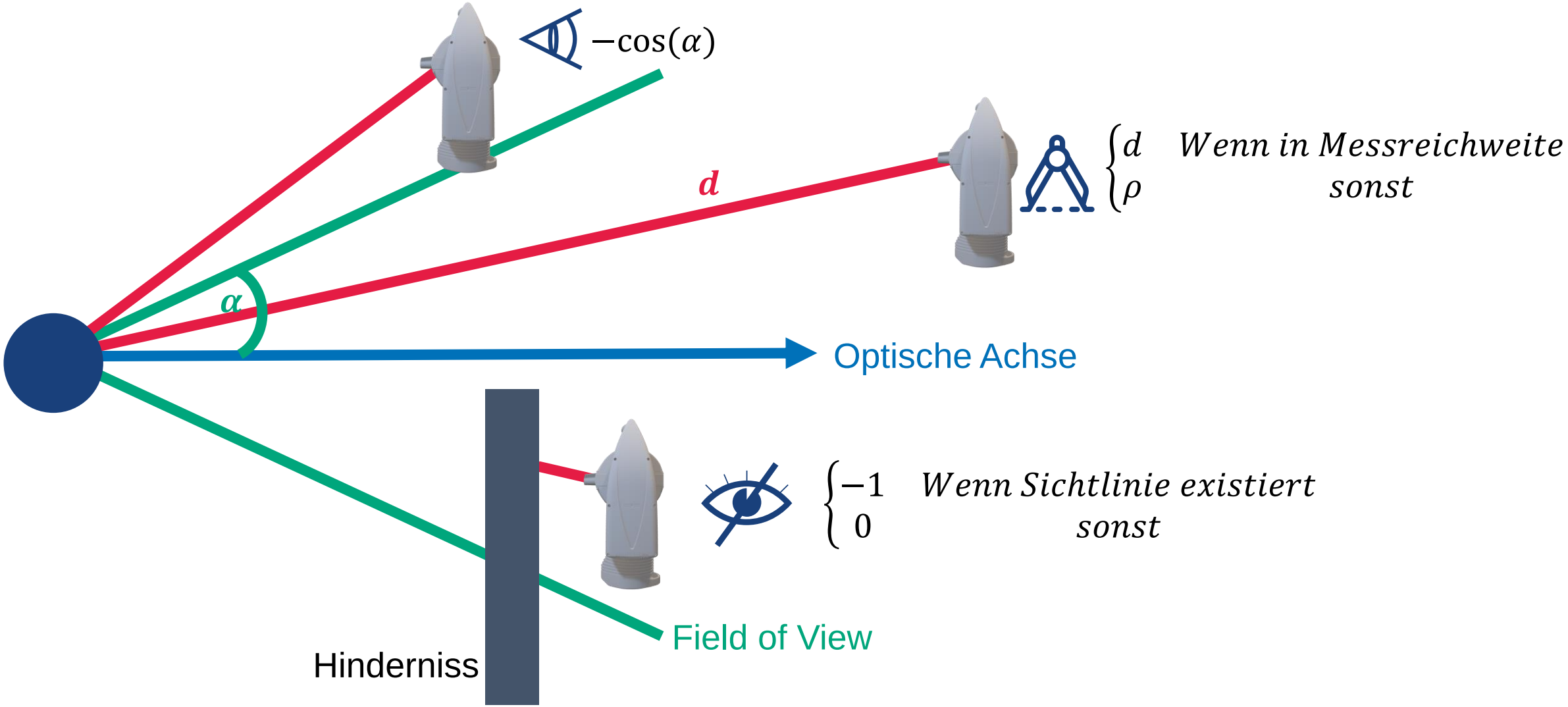


Tracker
3D Bewegung



Marker
6D Bewegung

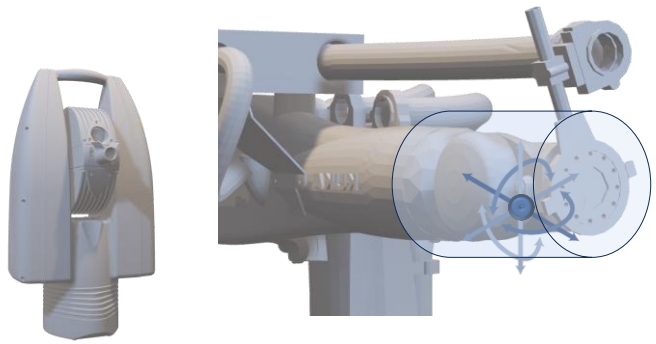
Modellierung des Optimierungsproblems

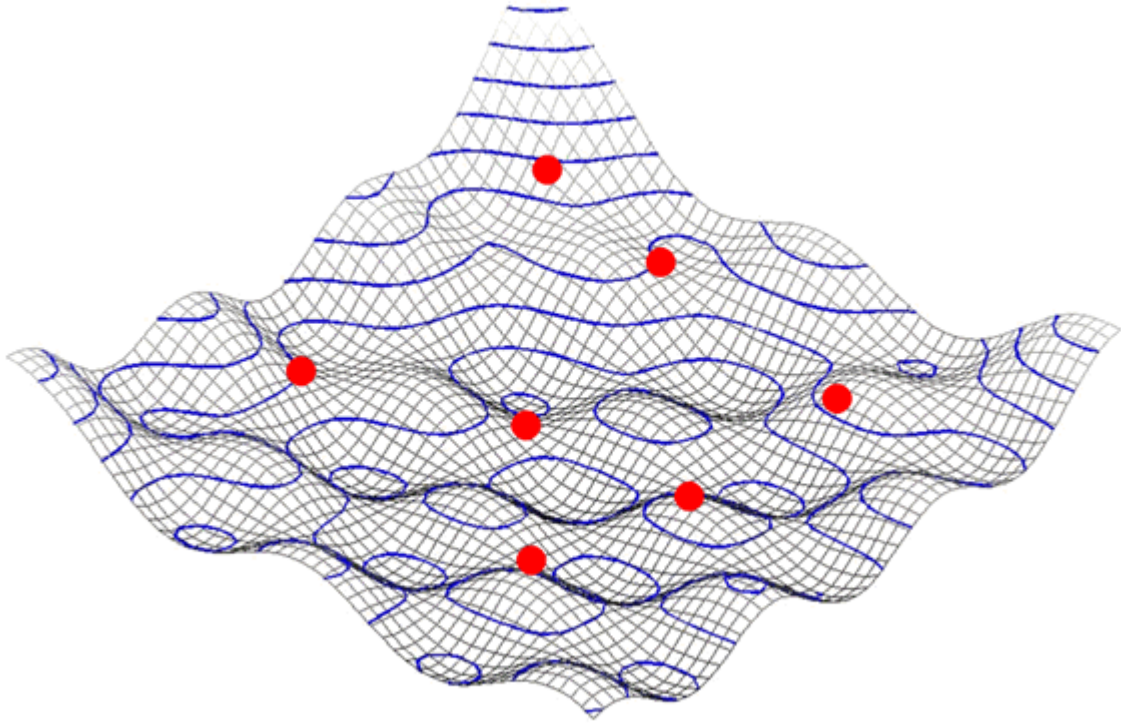


Modellierung des Optimierungsproblems

$$\max \int_{t_0}^{t_f} + + \, dt$$

$$s.t.$$

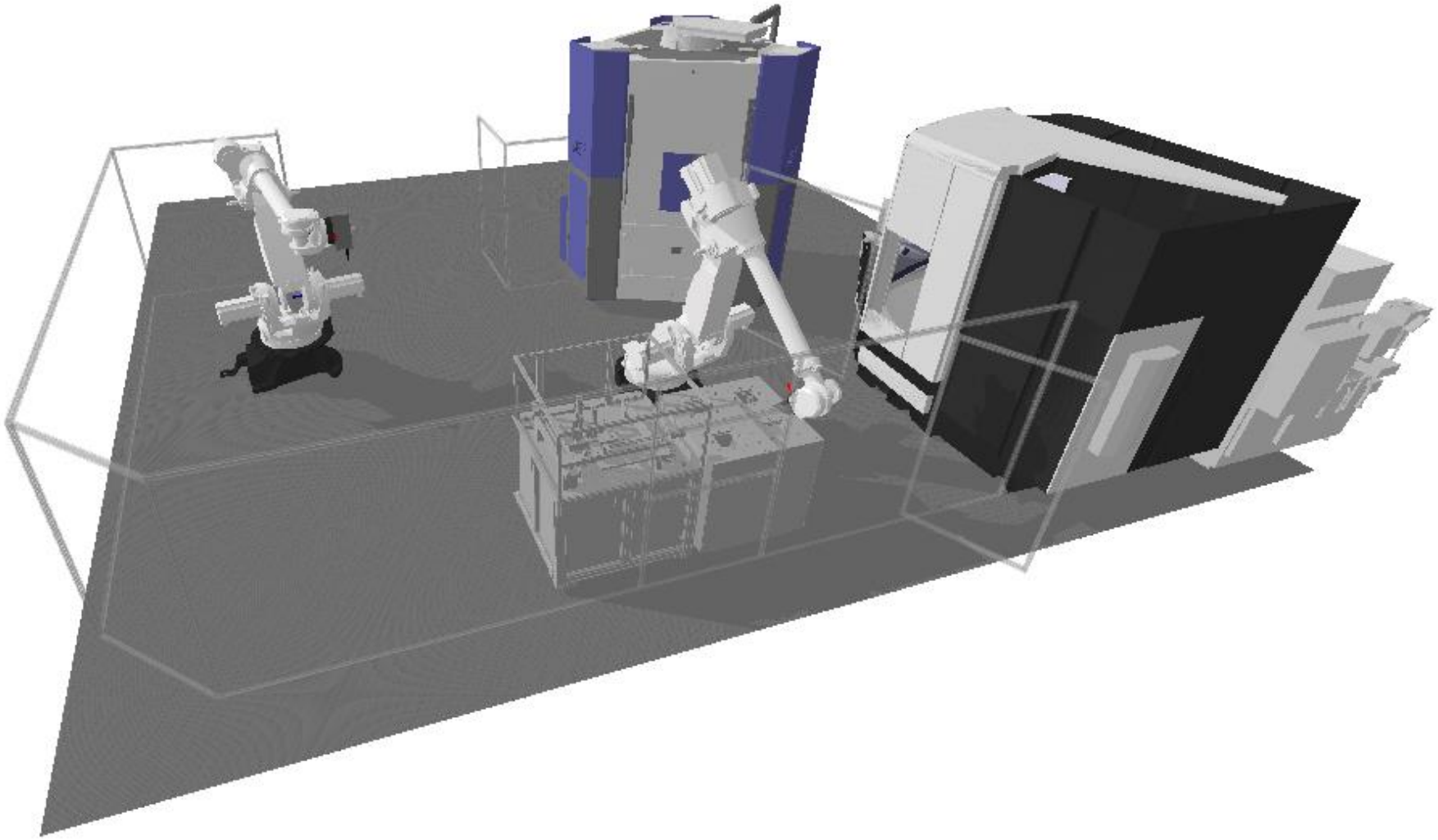




Partikelschwarmoptimierung

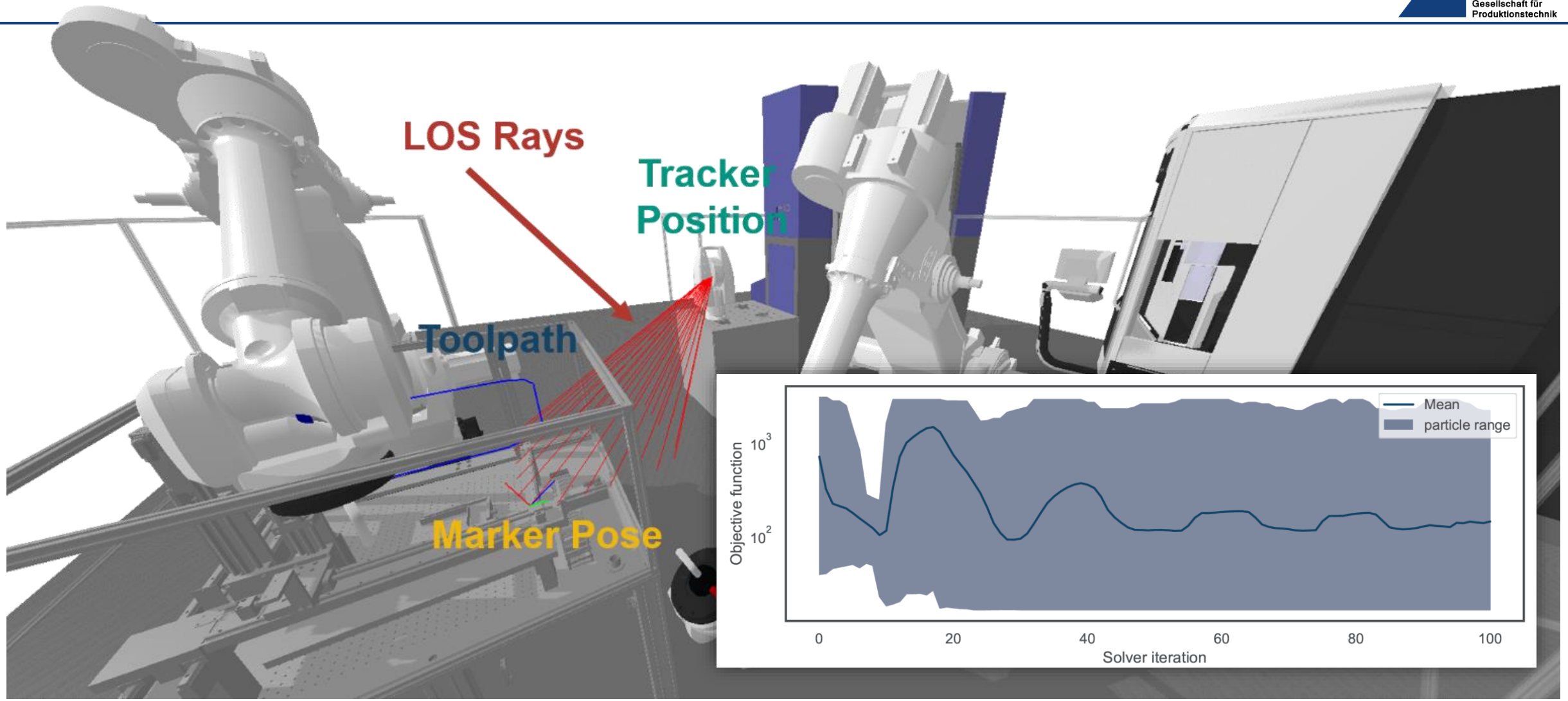
https://medium.com/@mamady94/a-tutorial-on-optimization-algorithms-the-example-of-particle-swarm-optimization-981d883be9d5

Simulationsumgebung

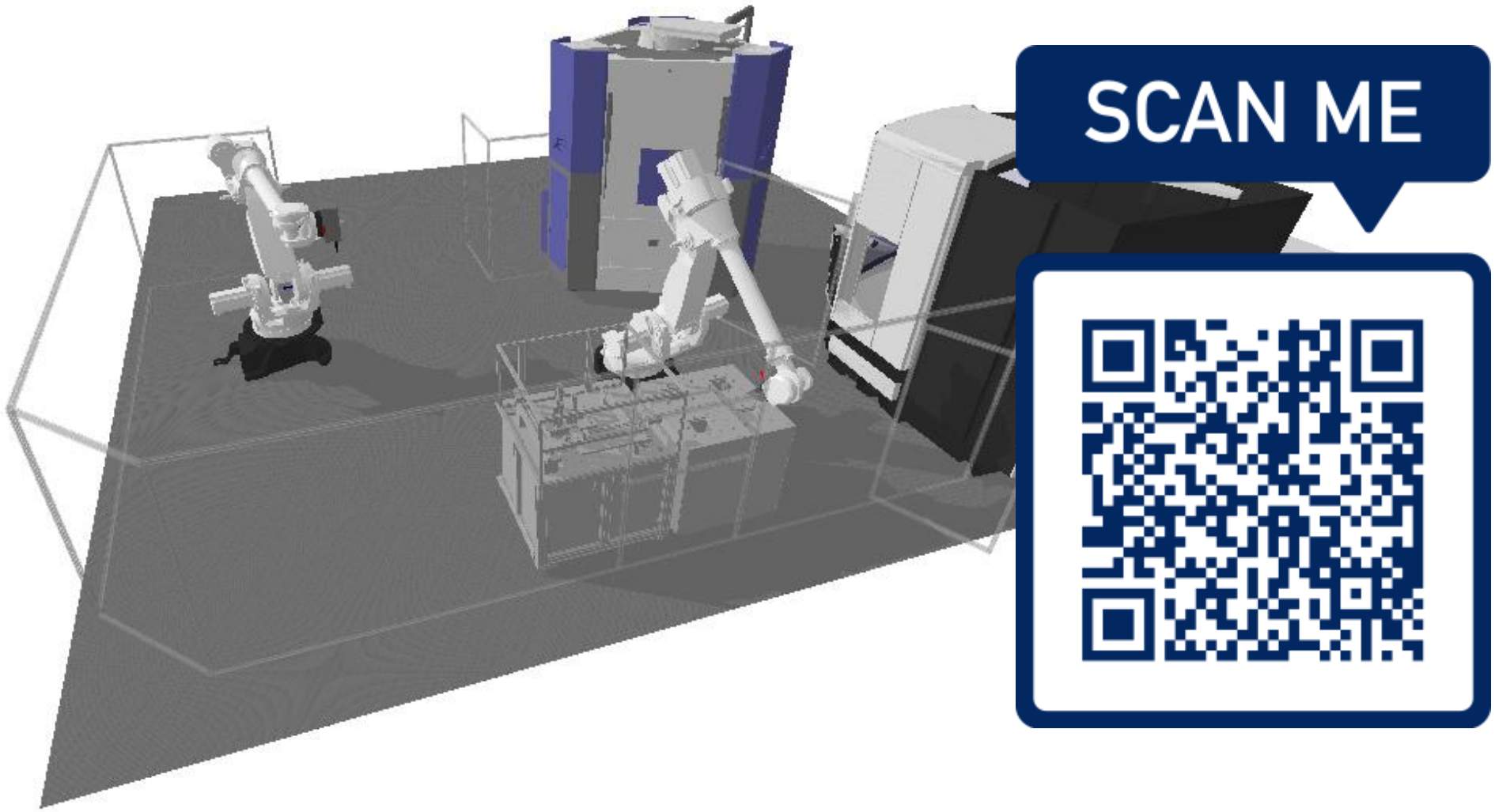


Pybullet Industrial

Ergebnisse


LOS Rays
Tracker Position
Toolpath
Marker Pose
Mean
particle range
Objective function
10^3
10^2
0
20
40
60
80
100
Solver iteration

Probiert es selbst aus:



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Vielen Dank für Ihre Aufmerksamkeit!

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