Master-Thesis

Methodical Approach for Analyzing Process Parameters and Optimizing Boundary Conditions in Multi-Axis Robot Programs

Status Update: Week 10 (13 weeks left)

04.12.2023 – 12.12.2023

Jan Nalivaika

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State of the Art Questions

Continuous-path mode ???
Changes: -
-
-
-

G-Code ??
Add / No Add

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Writing progress

70 pages → Ludwig ☺

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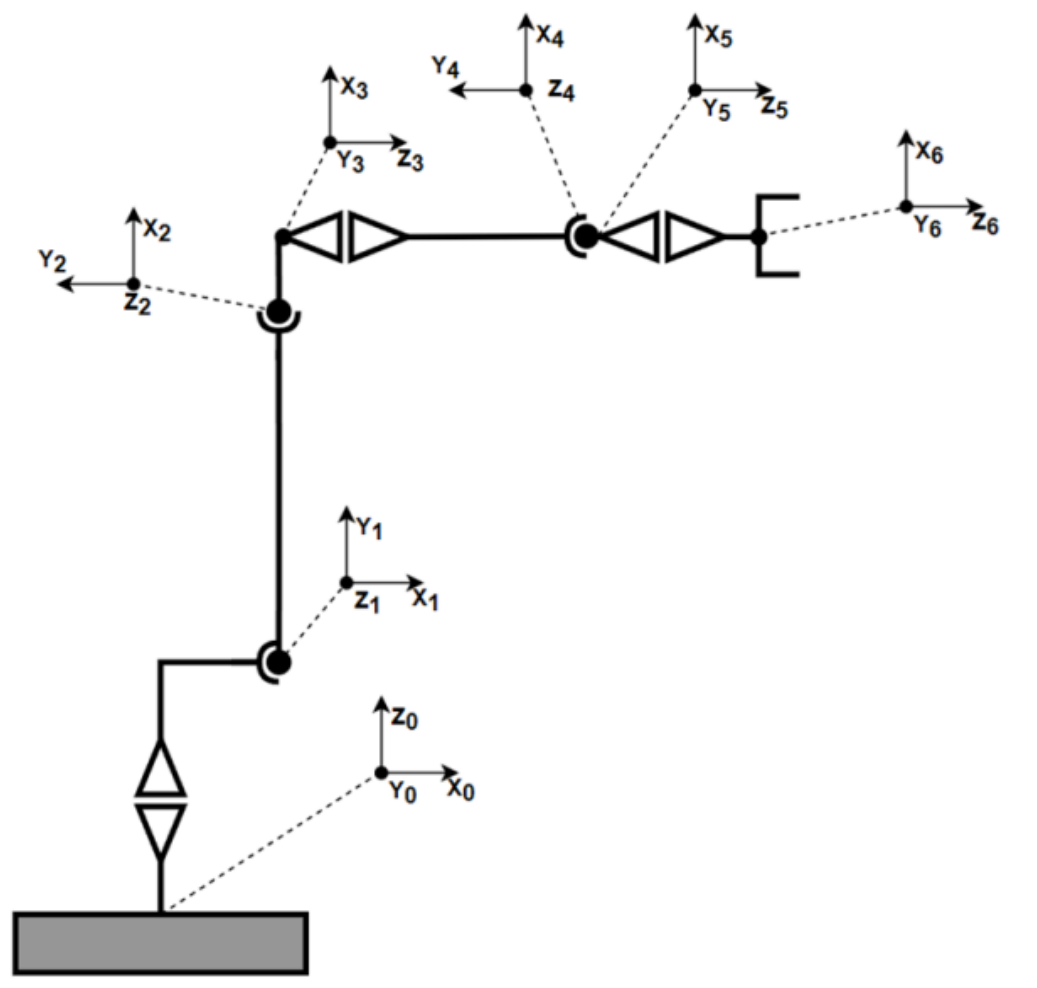
DH params



	$\theta°_h$	$\alpha°$	d(mm)	a(mm)
1st Joint	0	90	575	175
2nd Joint	90	0	0	890
3rd Joint	0	90	0	50
4th Joint	0	-90	1035	0
5th Joint	0	90	0	0
6th Joint	0	0	185	0

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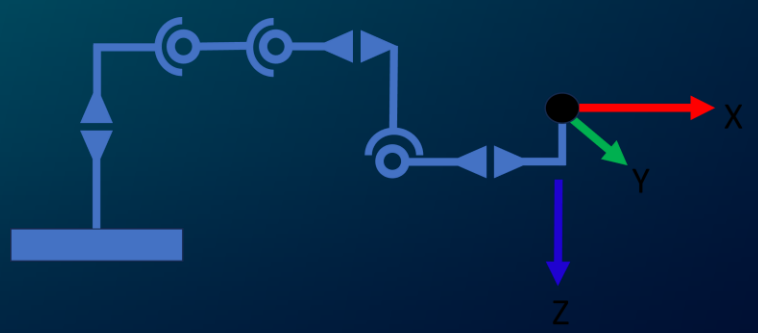
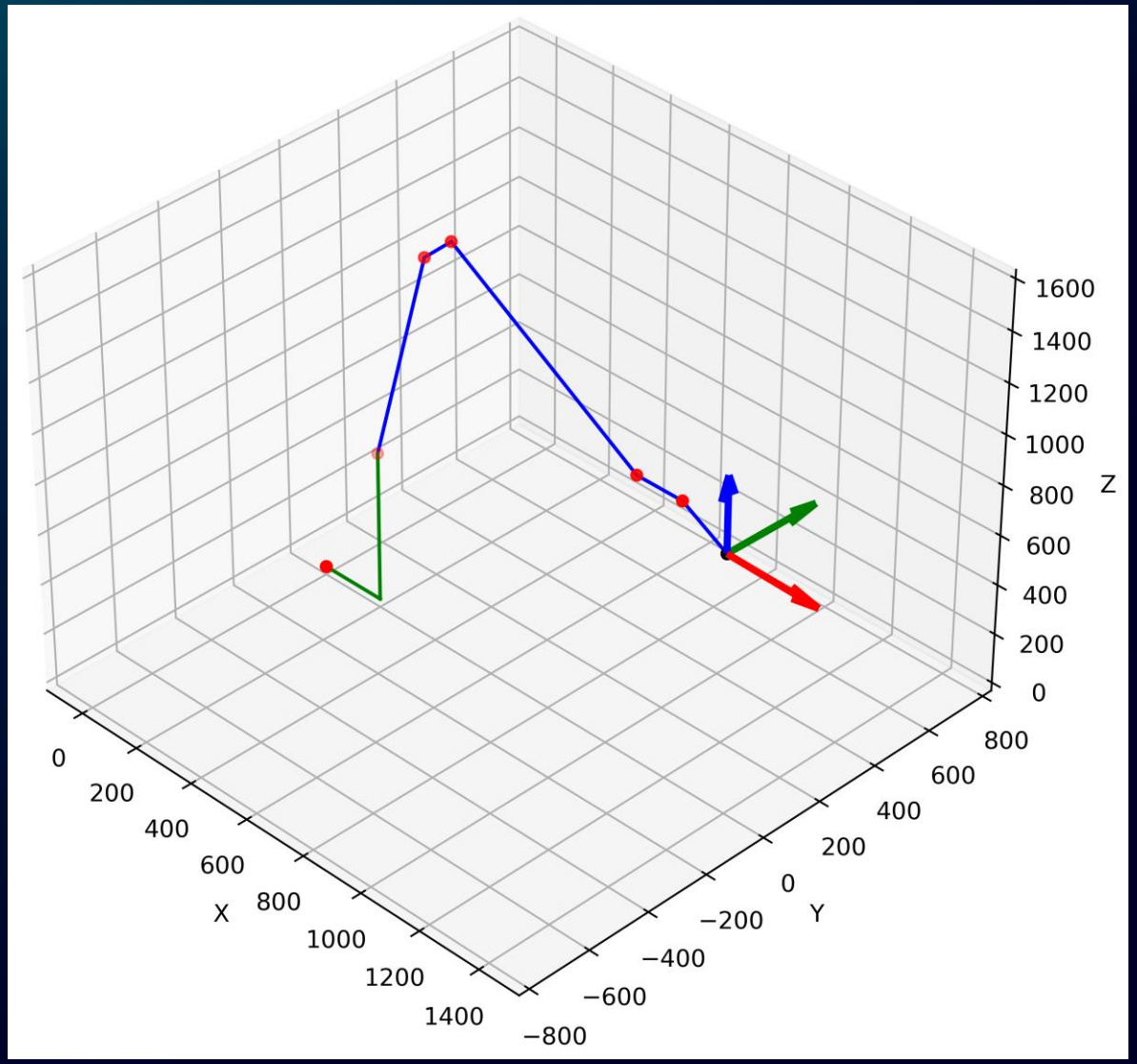
DH params

	Values
a	[200, 900, 150, 0, 150, 150]
alpha	[90, 0, 90, -90, 90, 0]
d	[600 0, 0, 800, 0, -100]

Table 4.1: DH-parameters for the modeled robot





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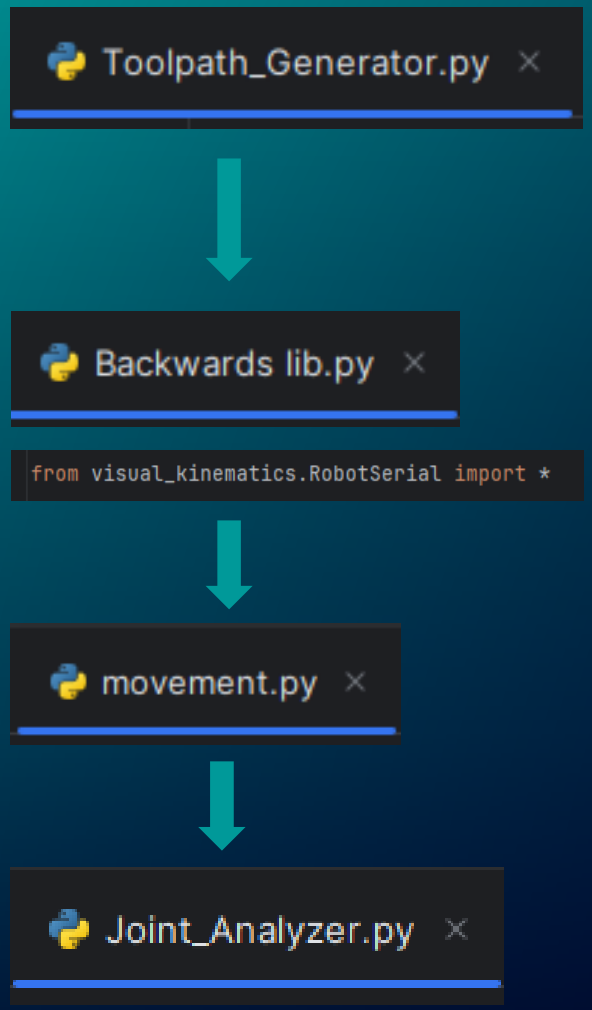
Progress:



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Progress:

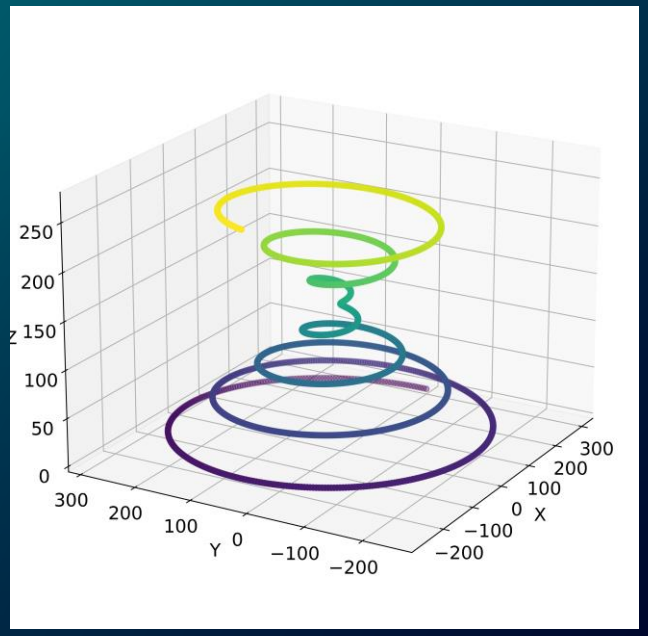
Toolpath_Generator.py

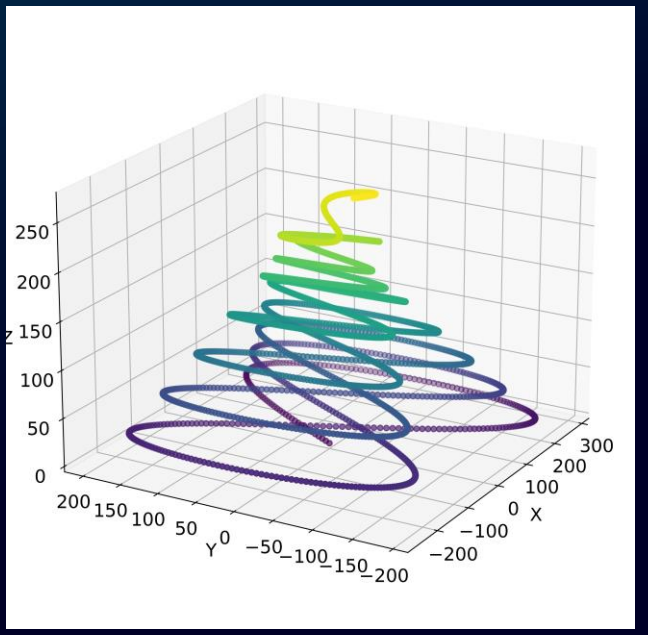
Backwards lib.py

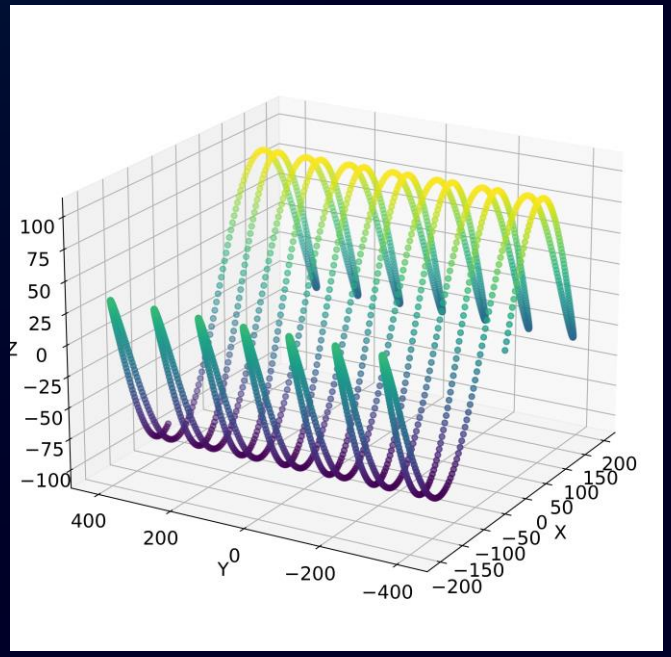
```
from visual_kinematics.RobotSerial import *
```

movement.py

Joint_Analyzer.py







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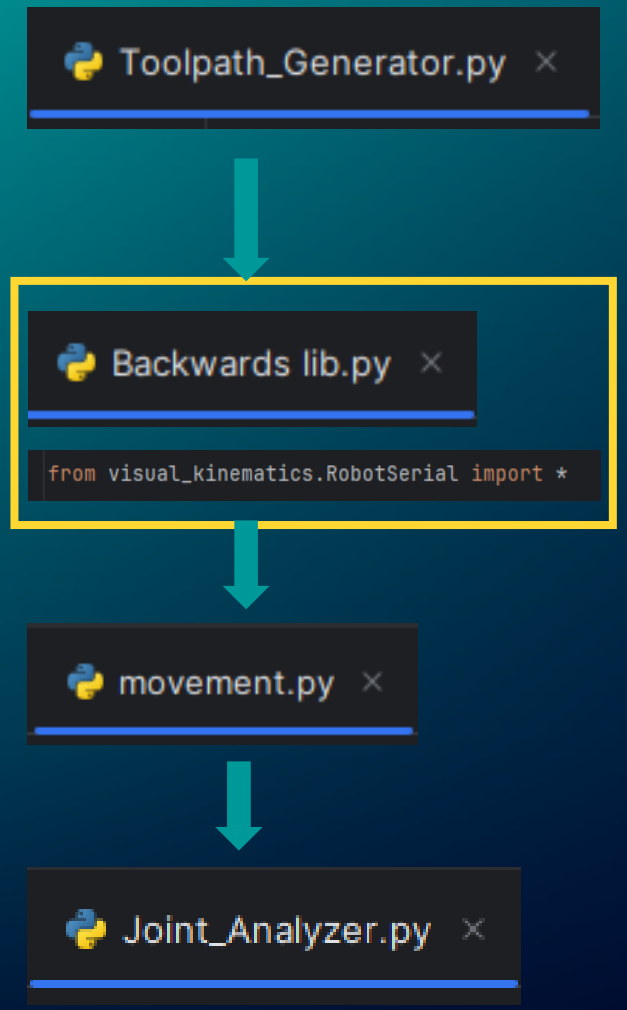
Progress:




```
DONE: path_2_rot_0_tilt_-1_C_-8   TIME: 47.0s
Started
DONE: path_2_rot_0_tilt_-1_C_-7   TIME: 42.0s
Started
DONE: path_2_rot_0_tilt_-1_C_-6   TIME: 33.0s
Started
DONE: path_2_rot_0_tilt_-1_C_-5   TIME: 42.0s
Started
DONE: path_2_rot_0_tilt_-1_C_-4   TIME: 36.0s
Started
DONE: path_2_rot_0_tilt_-1_C_-3   TIME: 36.0s
Started
DONE: path_2_rot_0_tilt_-1_C_-2   TIME: 33.0s
Started
DONE: path_2_rot_0_tilt_-1_C_-1   TIME: 34.0s
Started
DONE: path_2_rot_0_tilt_-1_C_0   TIME: 34.0s
Started
DONE: path_2_rot_0_tilt_-1_C_1   TIME: 42.0s
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DONE: path_2_rot_0_tilt_-1_C_2   TIME: 34.0s
Started
DONE: path_2_rot_0_tilt_-1_C_3   TIME: 33.0s
Started
DONE: path_2_rot_0_tilt_-1_C_4   TIME: 29.0s
Started
DONE: path_2_rot_0_tilt_-1_C_5   TIME: 27.0s
Started
DONE: path_2_rot_0_tilt_-1_C_6   TIME: 30.0s
Started
```


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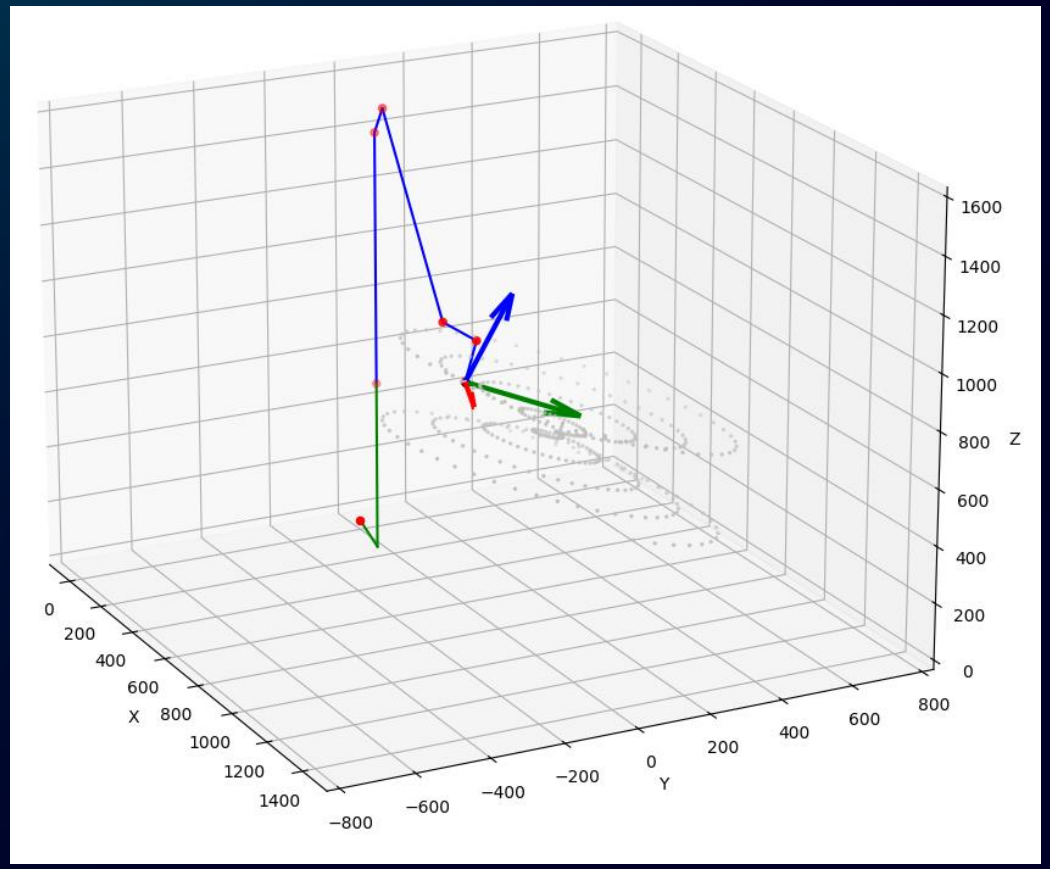
Joint_Analyzer.py

Show cool video here



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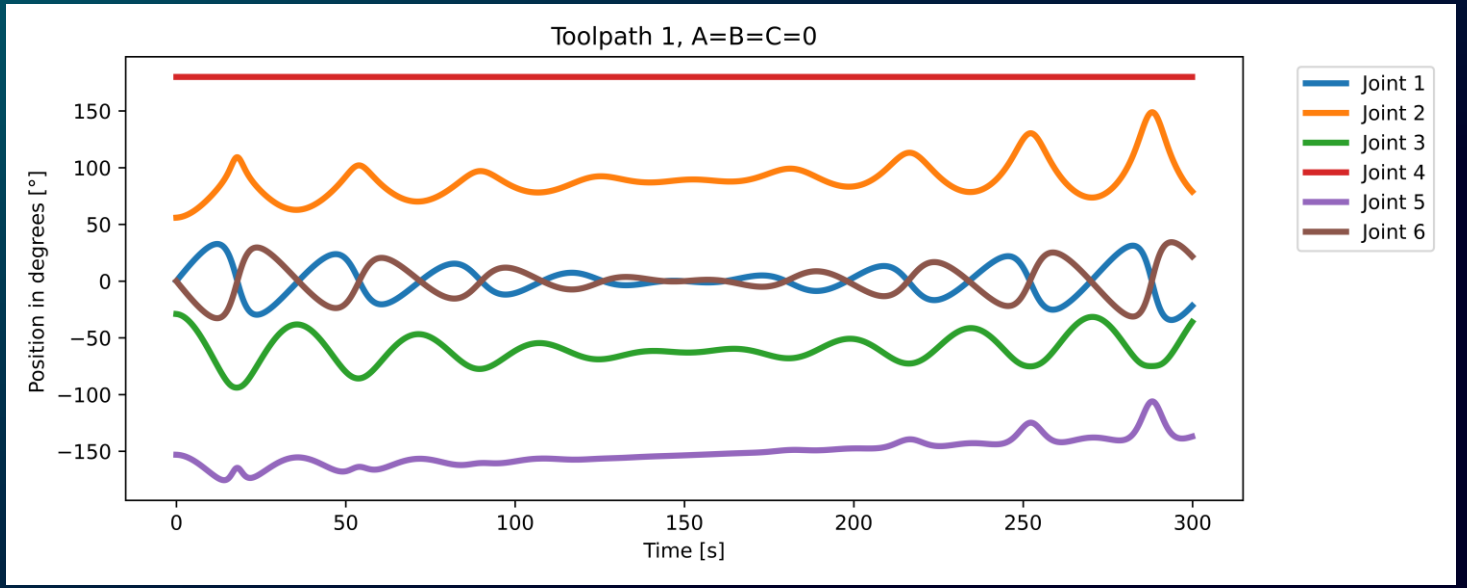

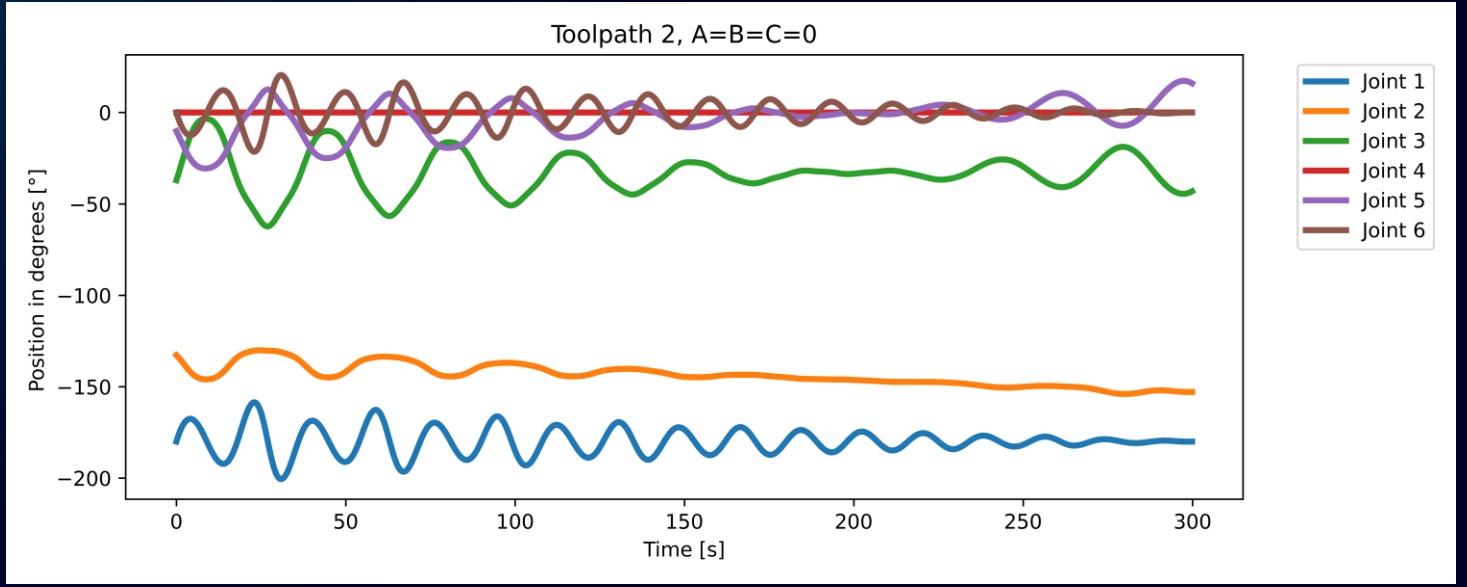

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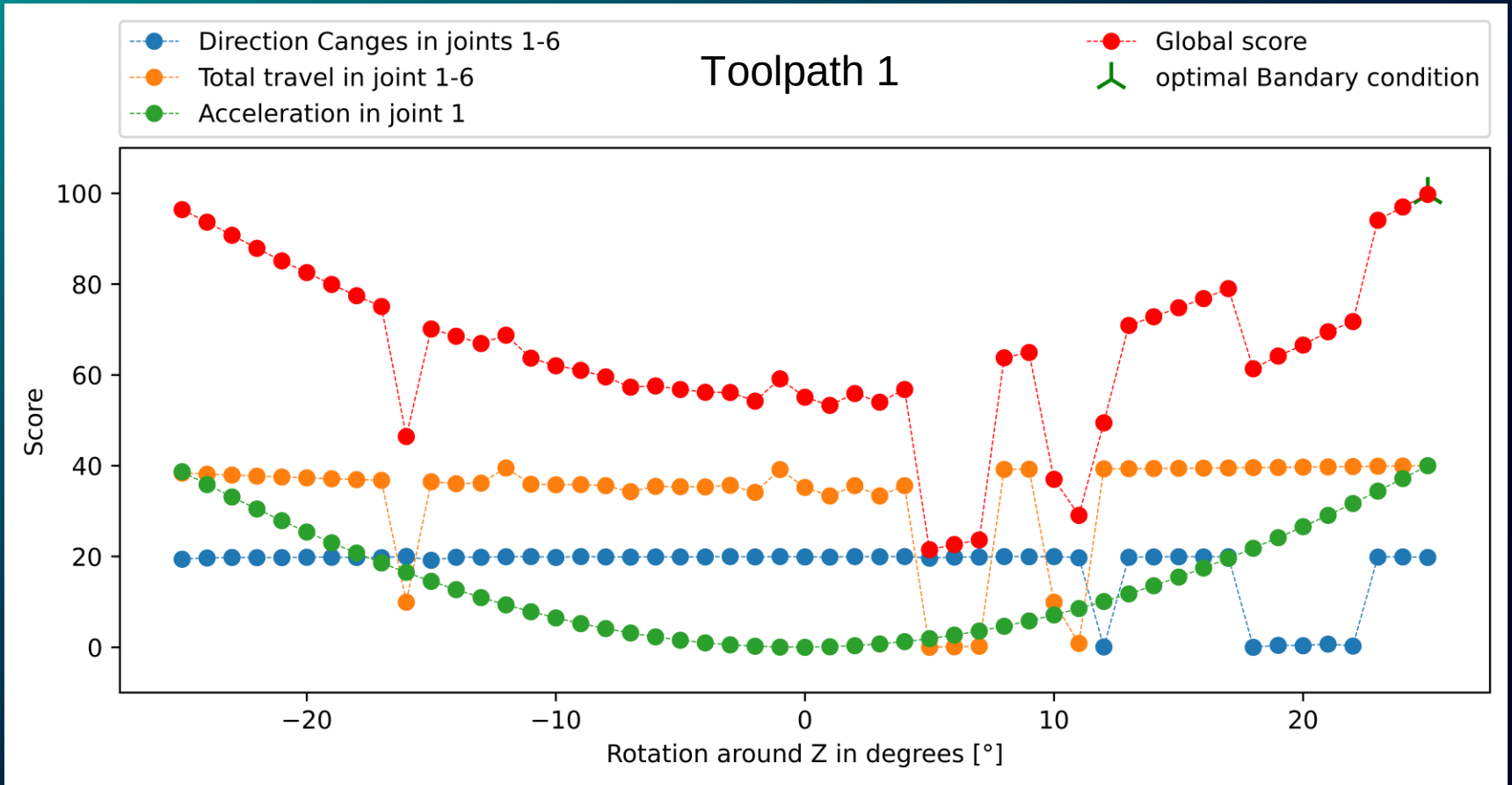
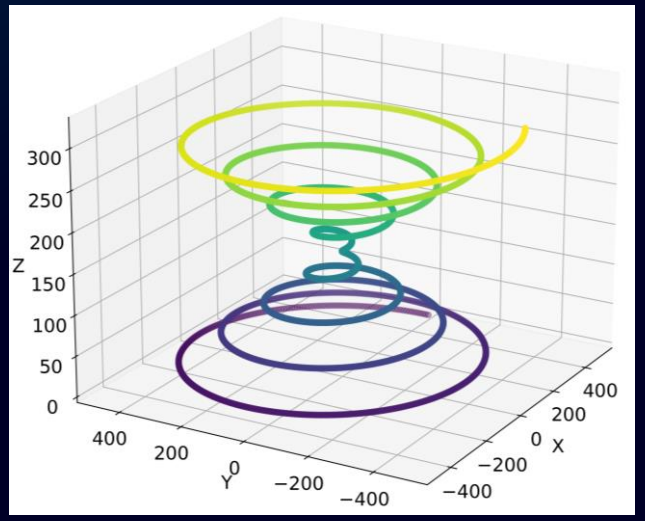
Results:





Process parameters	Importance Factor
Direction changes in joints 1-6	0.2
Total travel in joints 1-6	0.4
Acceleration in joint 1	0.4

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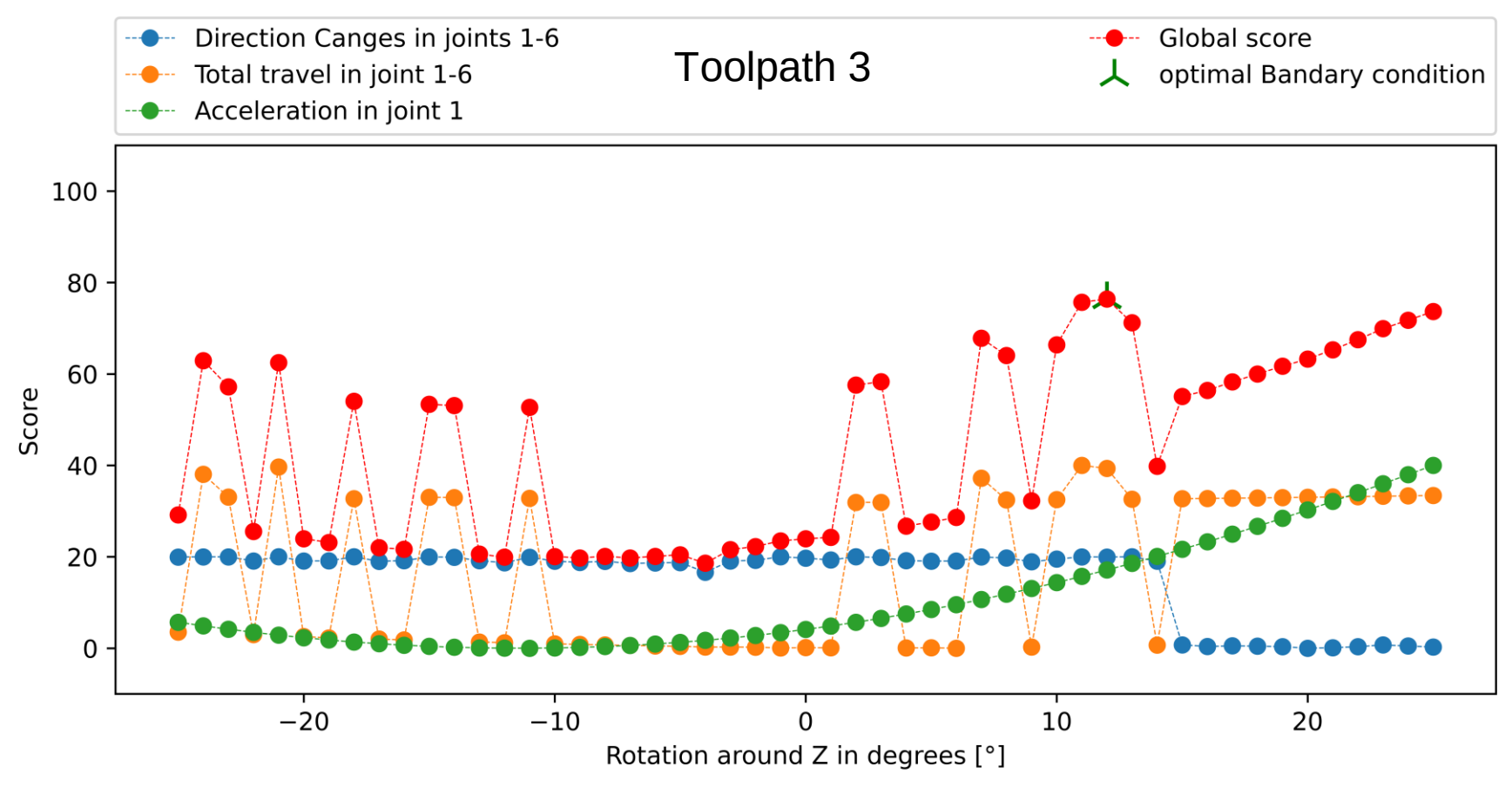
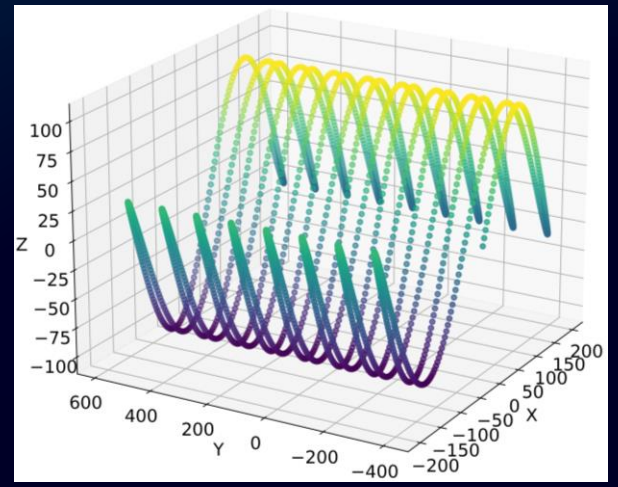
Results:





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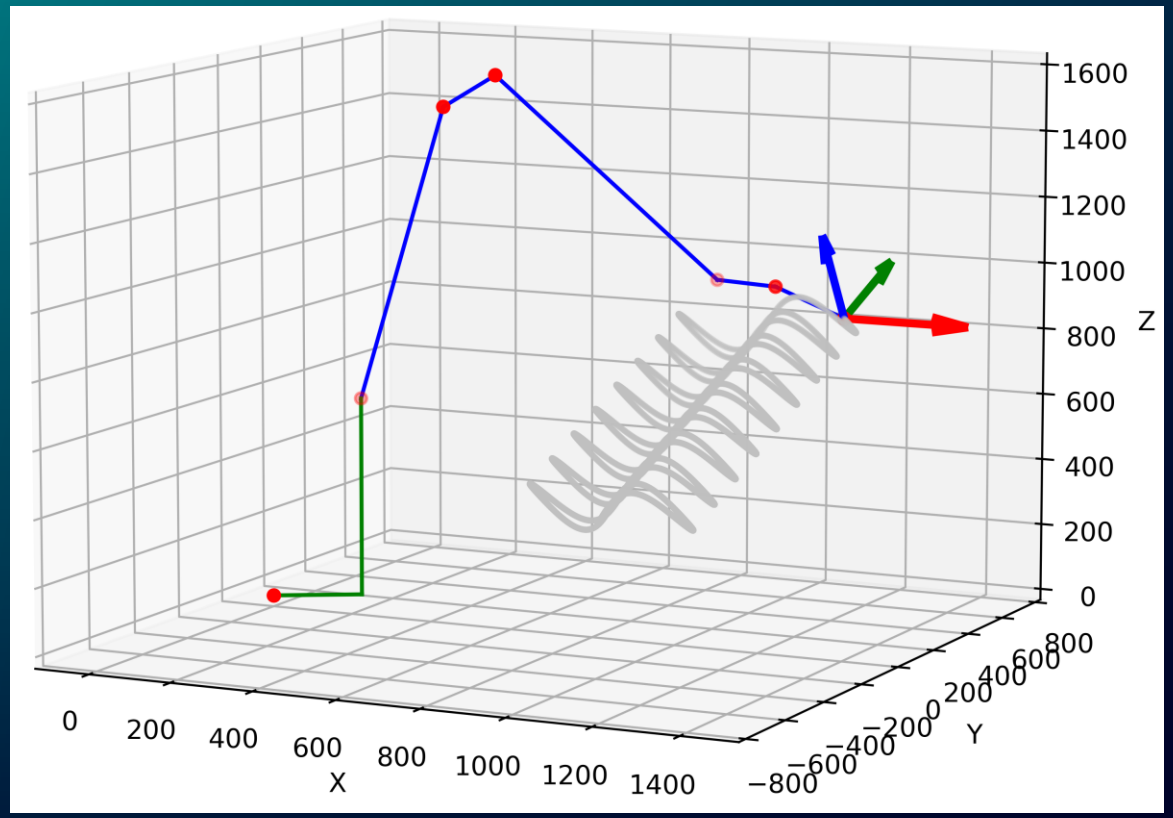
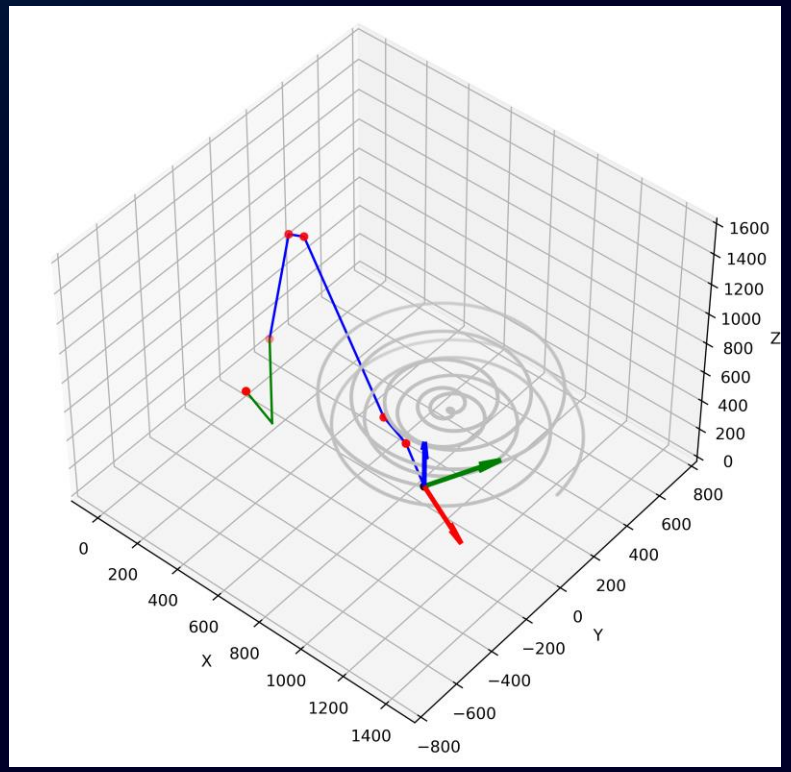
2 DoF

Tilt the toolpath



+

Rotation around Z



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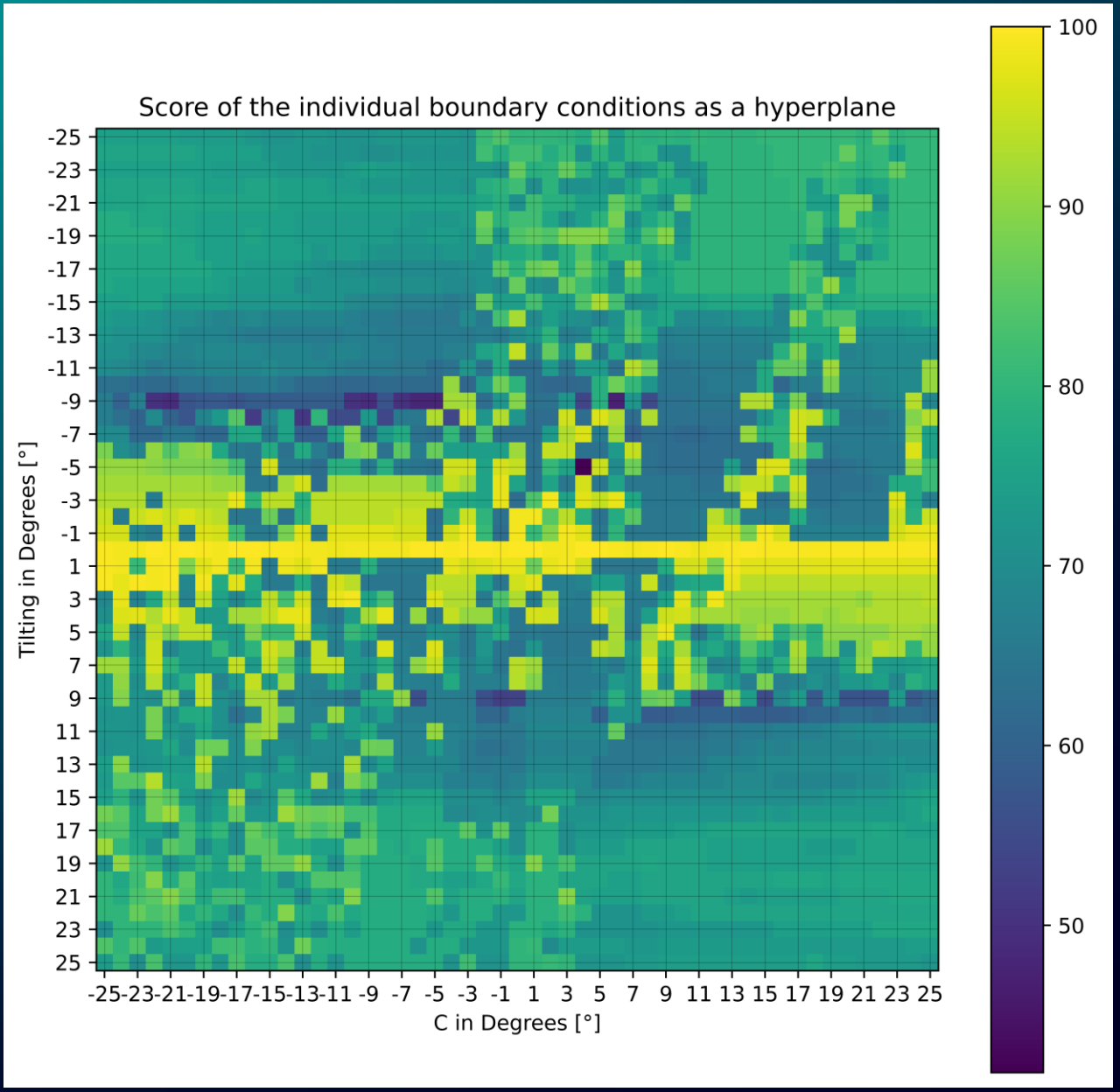

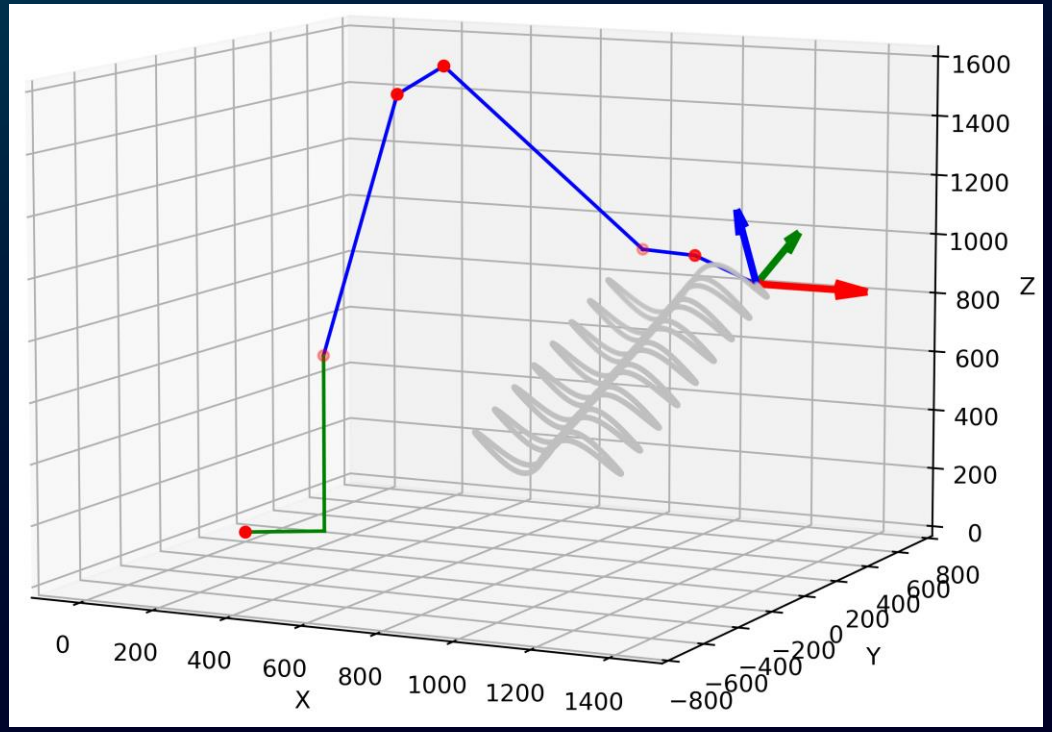

Process parameters	Importance Factor
Direction changes in joints 2+3+5	0.3
Direction changes in joints 1	0.25
Acceleration in joint 4	0.25
Velocity in joint 6	0.2

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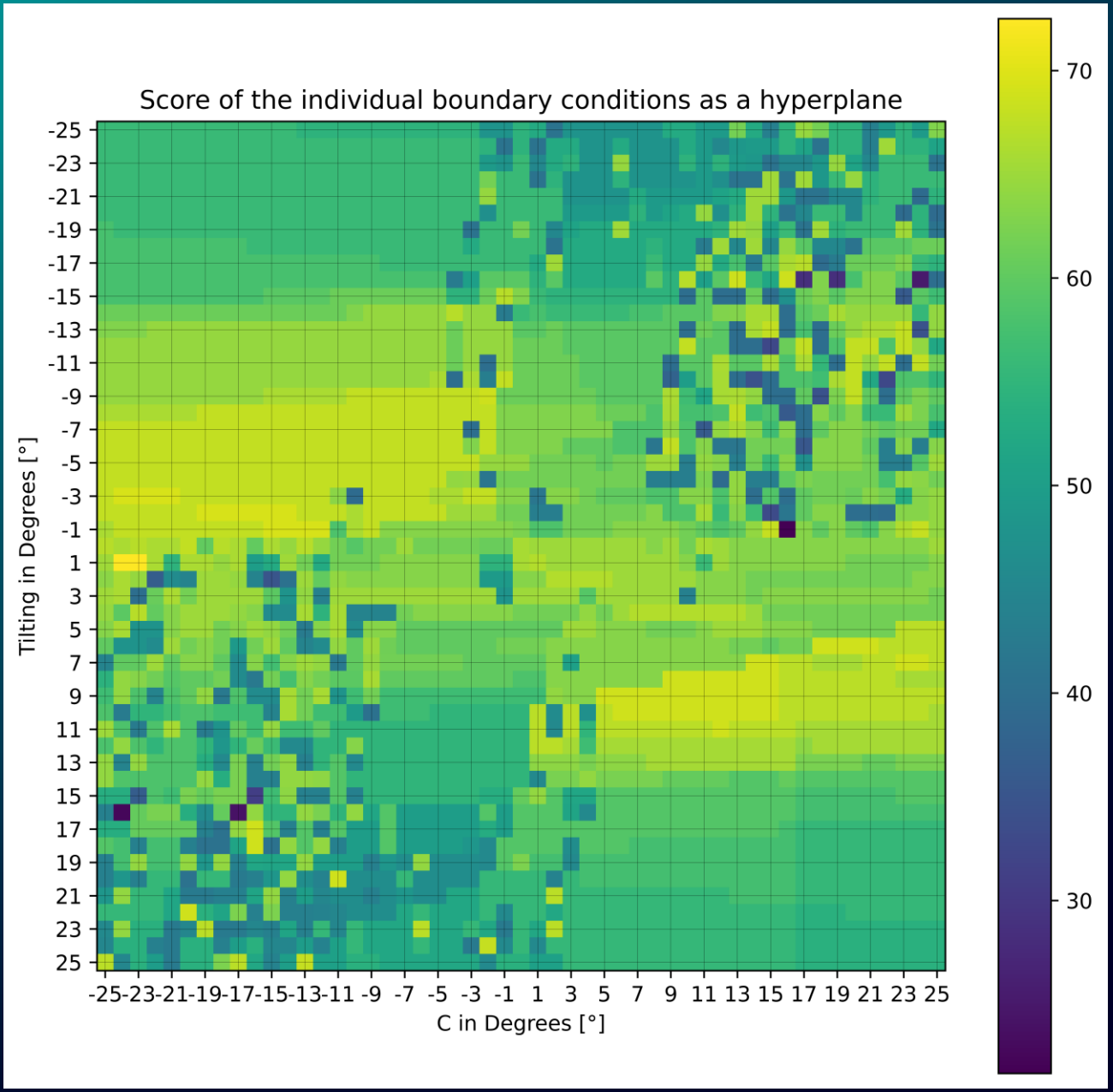

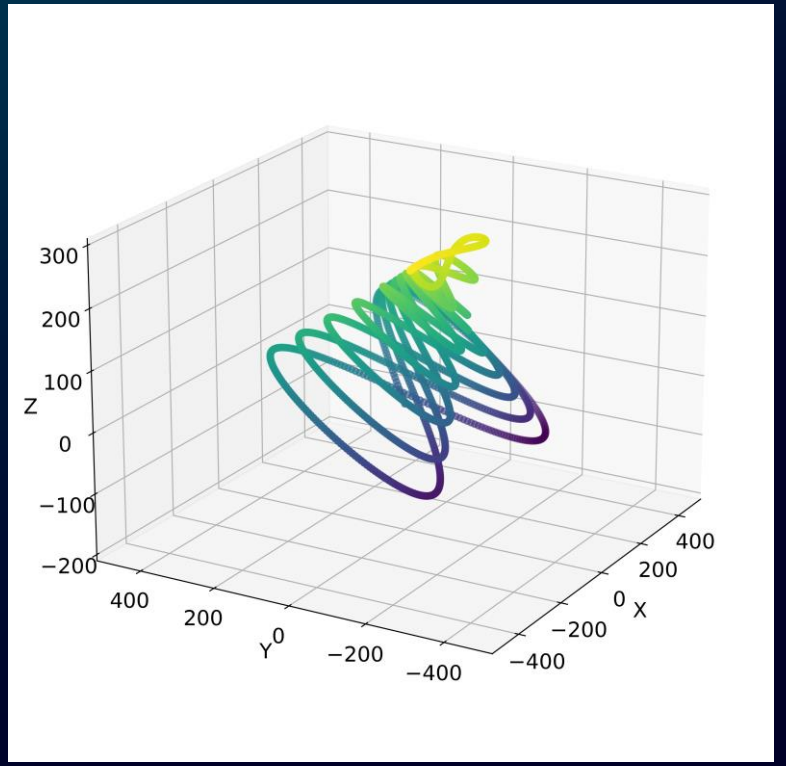

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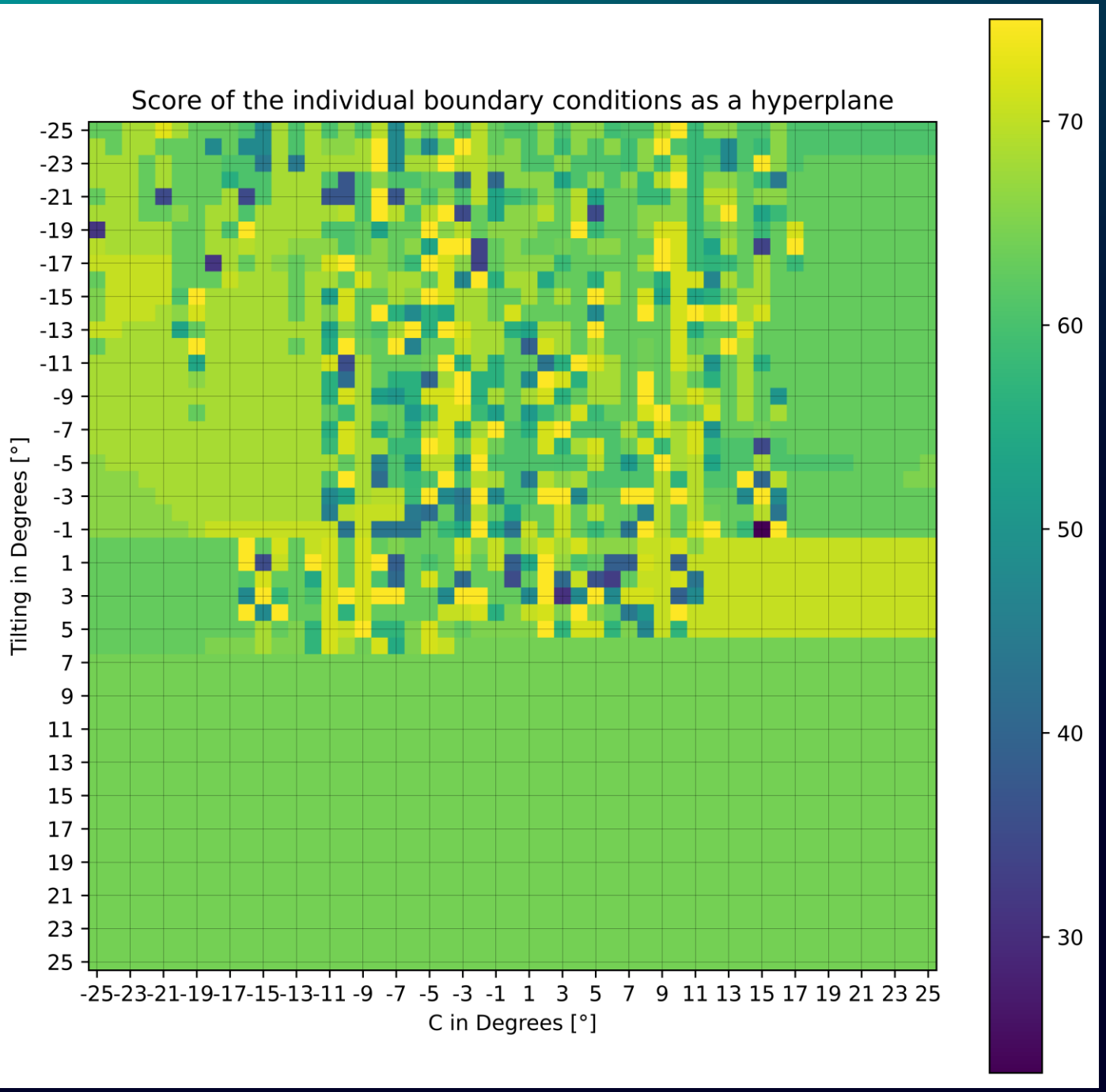

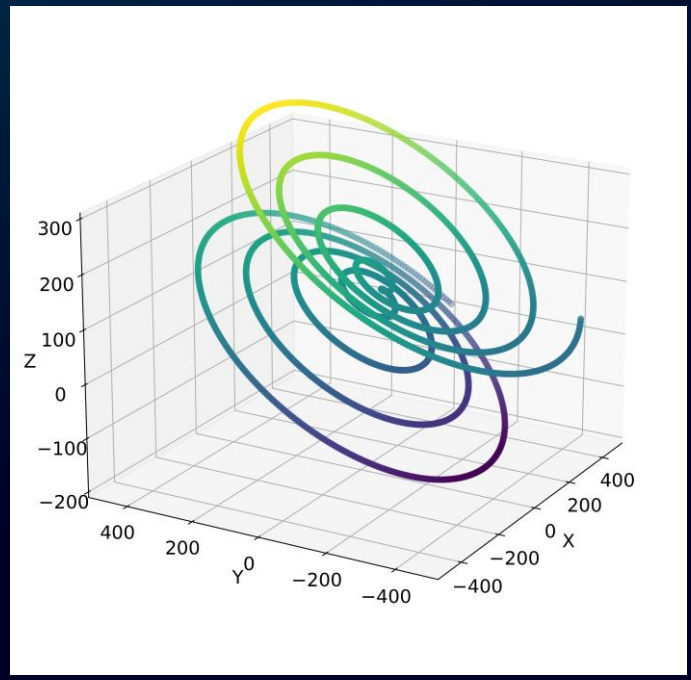

Process parameters	Importance Factor
Direction changes in joints 2+3+5	0.3
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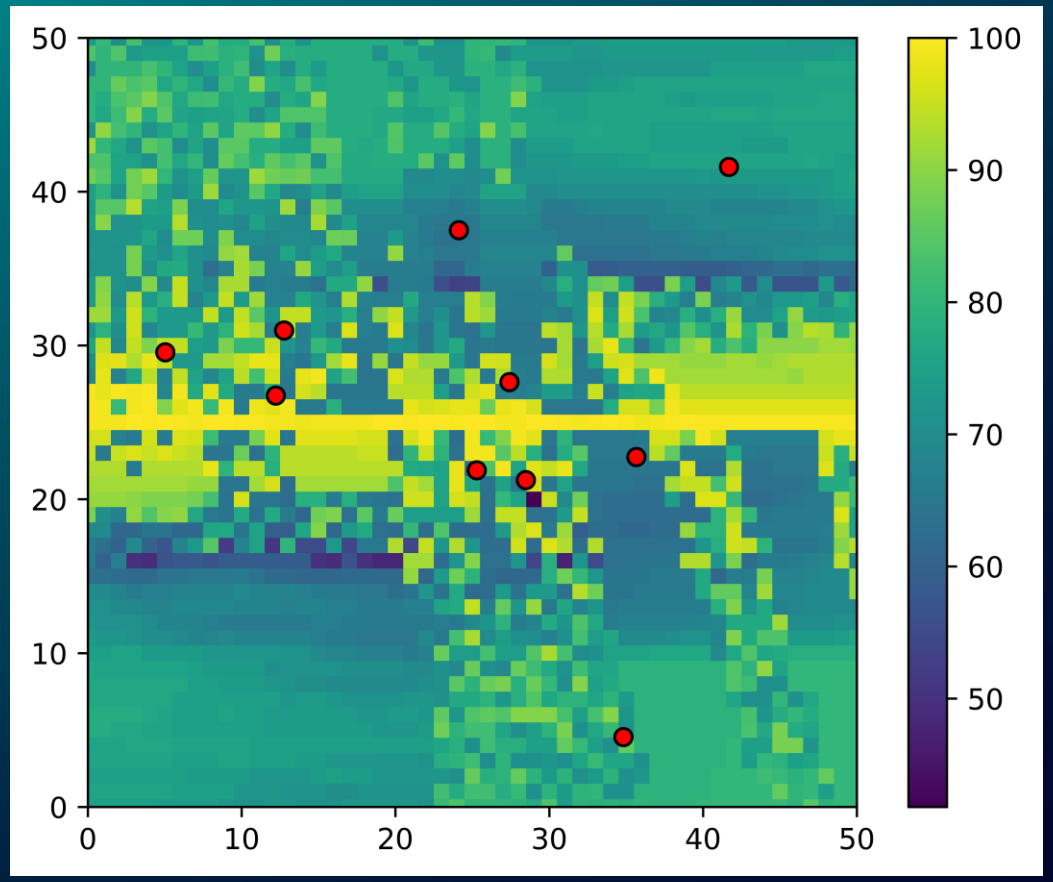
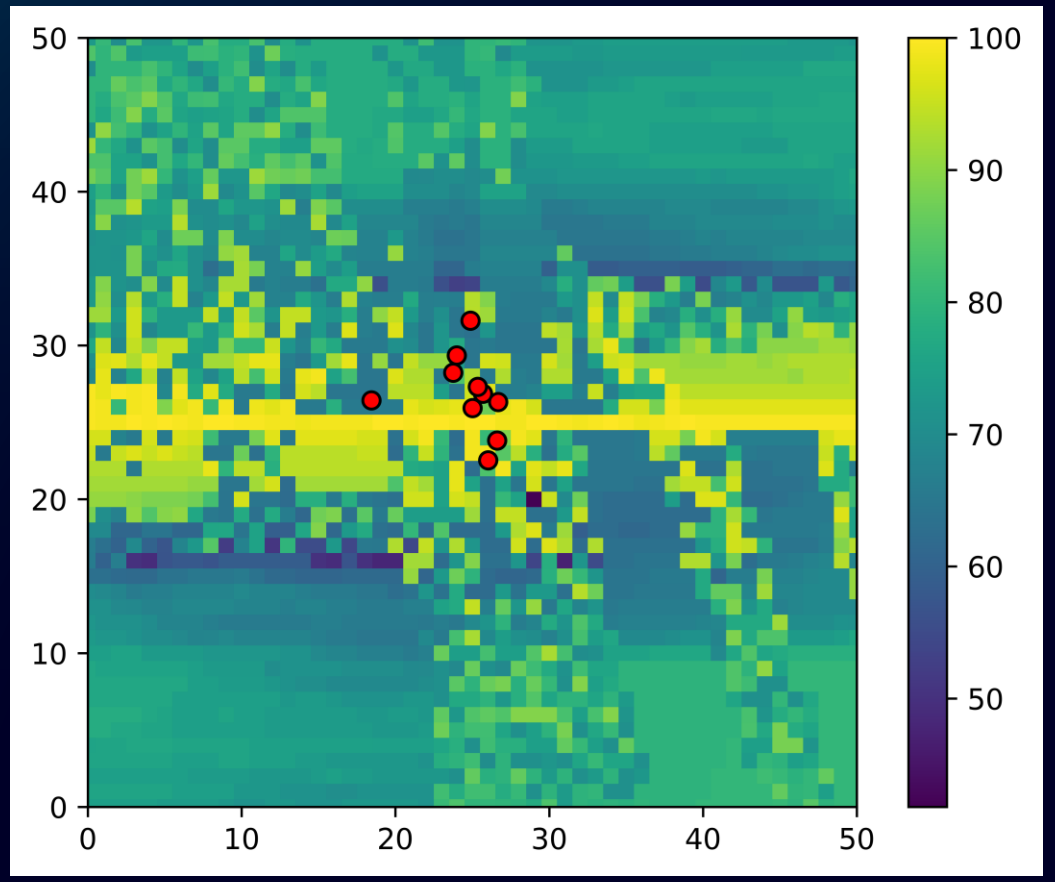
Swarm optimization:





!!! Show cool video here !!!

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Problems + ToDo + Questions

Problem:
- Berechnung dauert ewig (Multithread?)
- Swarm not working
- Nicht sicher ob die Berechnung der Matrix korrekt ist
- Explizit die Werte anschauen (Sprung in score)

ToDo:
- Swarm weiter testen
- Berechnung prüfen
- Größerer wertebereich
- Gröbere Werkzeugbahn

Questions:
- paper ?

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85748 Garching at Munich

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E-mail ludwig.siebert@iwb.tum.de

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Christmas planning

DATE:	Ludwig	Marius	Jan
08.12			☺
15.12			☺
22.12			☺
29.12	X		☺
05.01			☺
12.01			☺
19.01			X
26.01			X
02.02			☺

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