RPCHI Final Presentation

Garching, 08. February 2023

Group B

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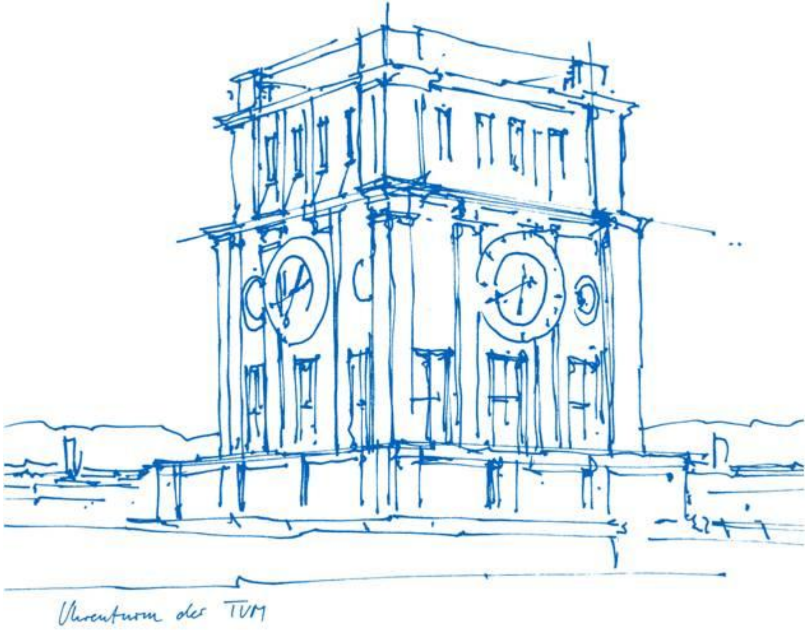
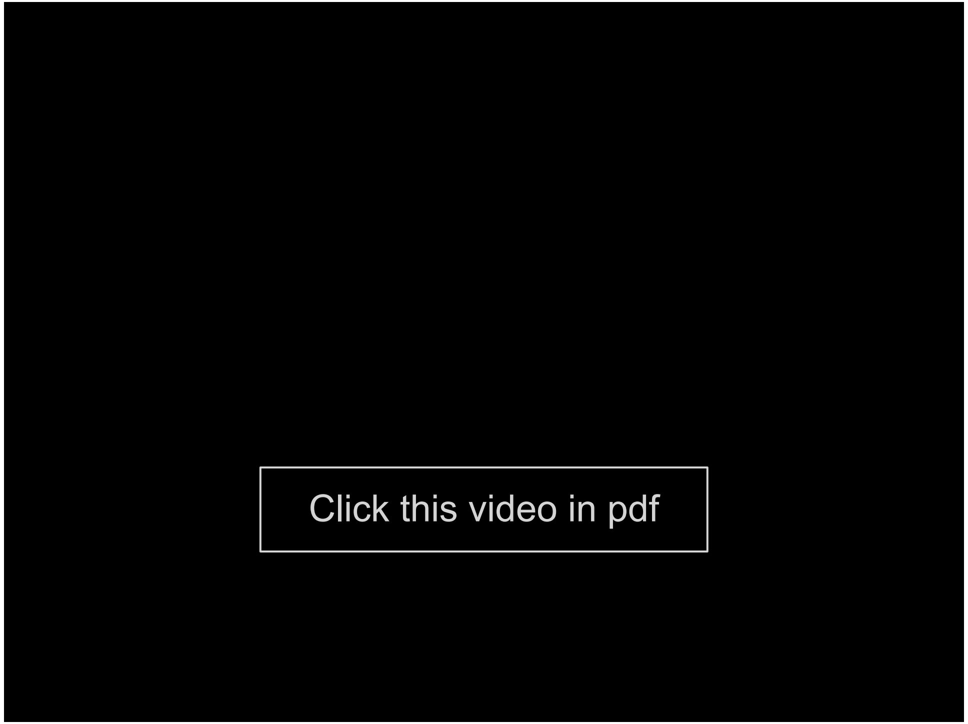


Contents

Null space



End position don’t change with other joints

The parameters are:

1. Stiffness=4000
2. Dampingx=0.9
3. Dampingy=0.3
4. Dampingz=0.9

Overcompensation of joint control

If damping parameters are small and you give the robot arm a vibration, the robot will provide more energy than it really need to keep the position of the end of the robot arm.

Break condition

It is very important in human-robot interaction, because the robot can stop immediately when the collision happens.

The parameter createJointTorqueCondition(0.2)

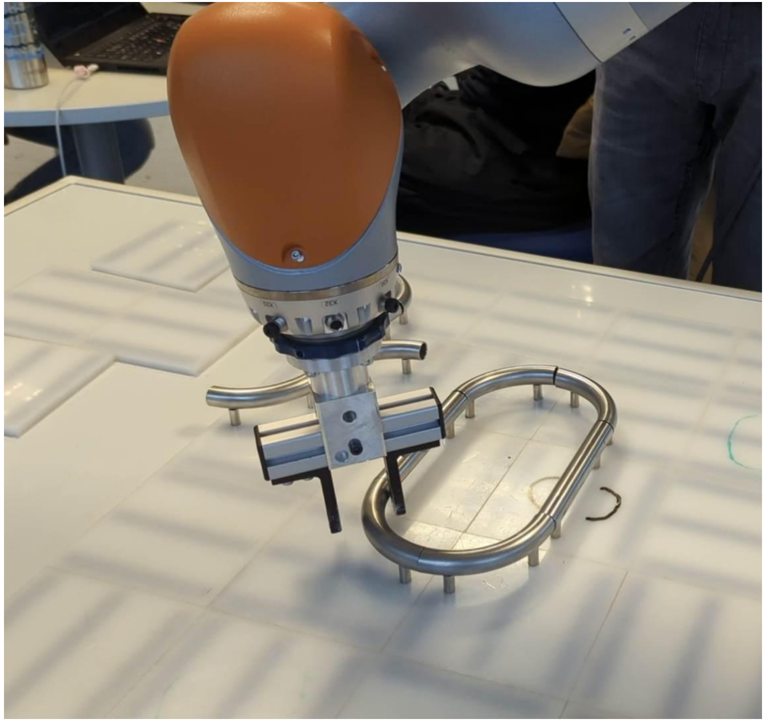
Wireloop

Goal:

- creating an application that moves the tool along the wireloop

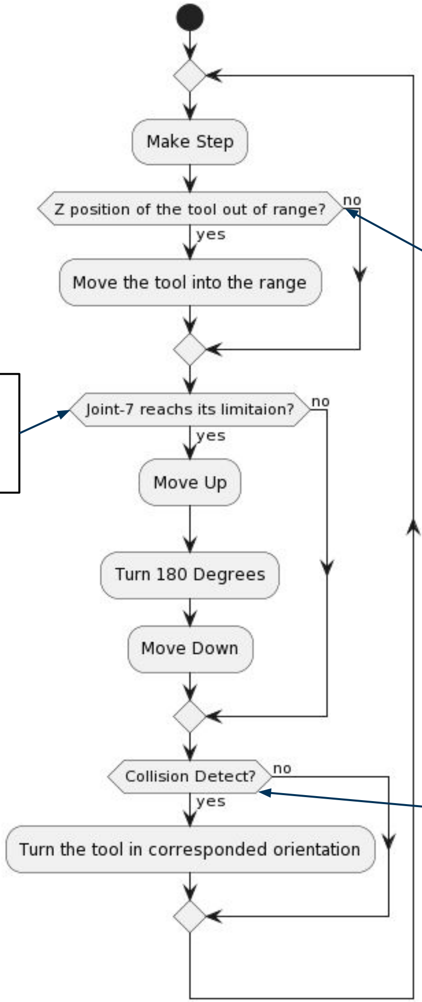
Cognition methods:

- reacting to collisions
- measuring contact forces (Torque)



Wireloop - Flowchart

```
robot.getCurrentJointPosition().get
(JointEnum.J7)
```



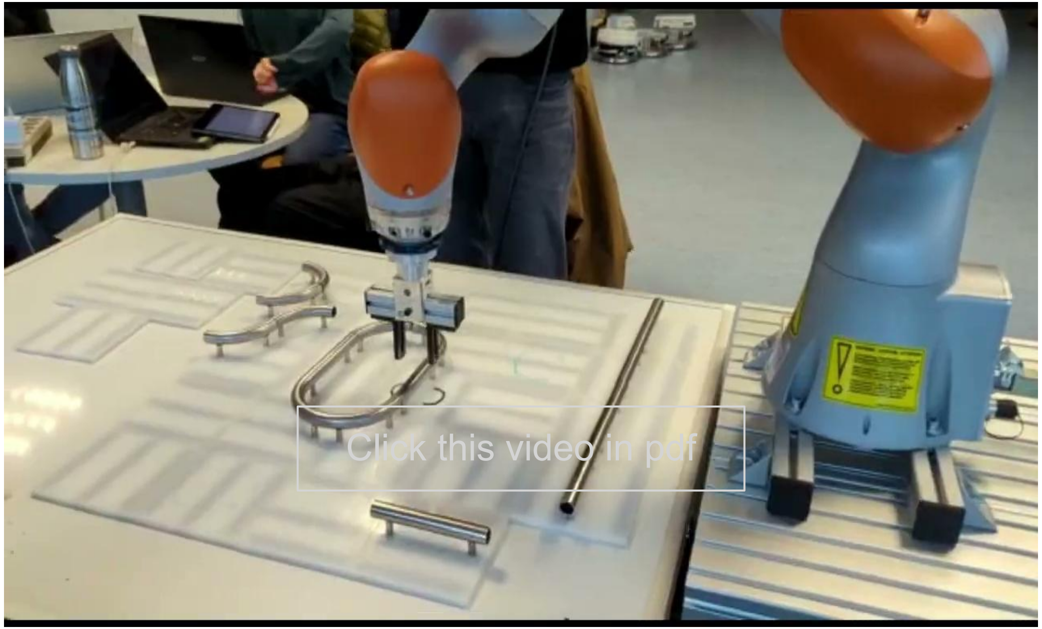

```
robot.getCurrentCartesianPosition(toolFr
ame).getZ()
```

```
ICondition cond =
SunriseConnector.createJointTorqueCondition
(0.02);
mcc =
tool.move(motion.setCartVelocity(highCartVe
l).breakWhen(cond))
if (mcc.hasFired(cond))
```

Wireloop

Discussion

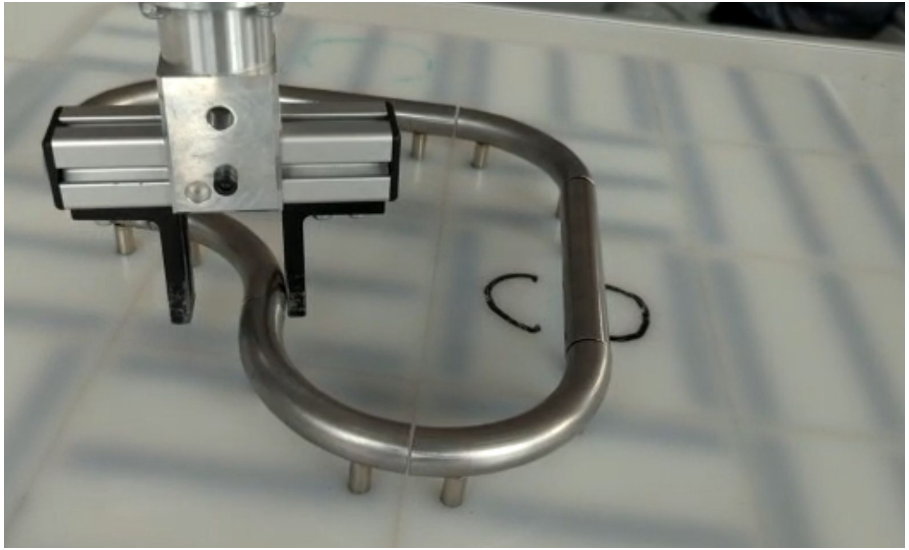
1. Show the video
2. Impedence control
   a. + force of resistance to external motions
   b. + Good for large Compliance
   c. - Bad positioning accuracy



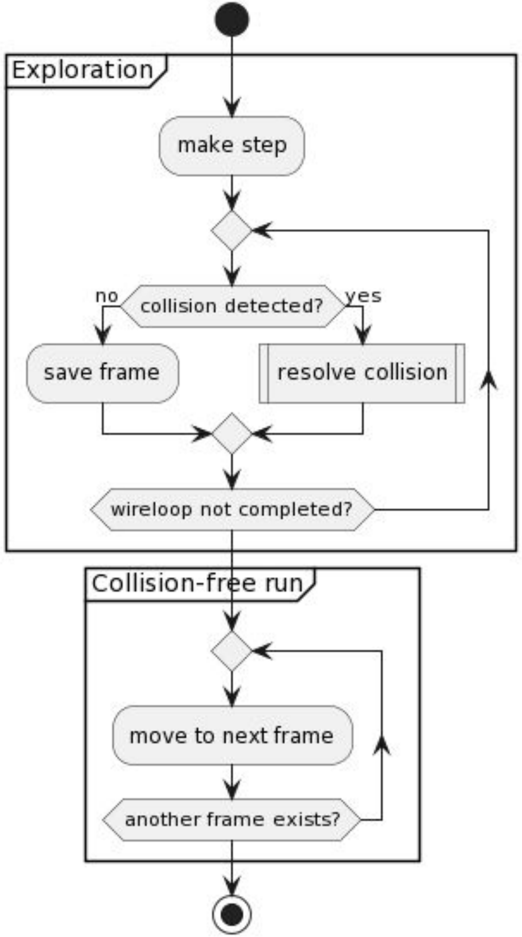
Wireloop Exploration

Goal:

1. explore the wireloop with collisions
2. repeat the loop collision-free

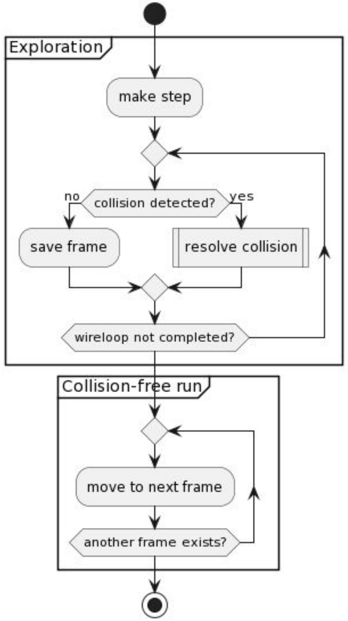


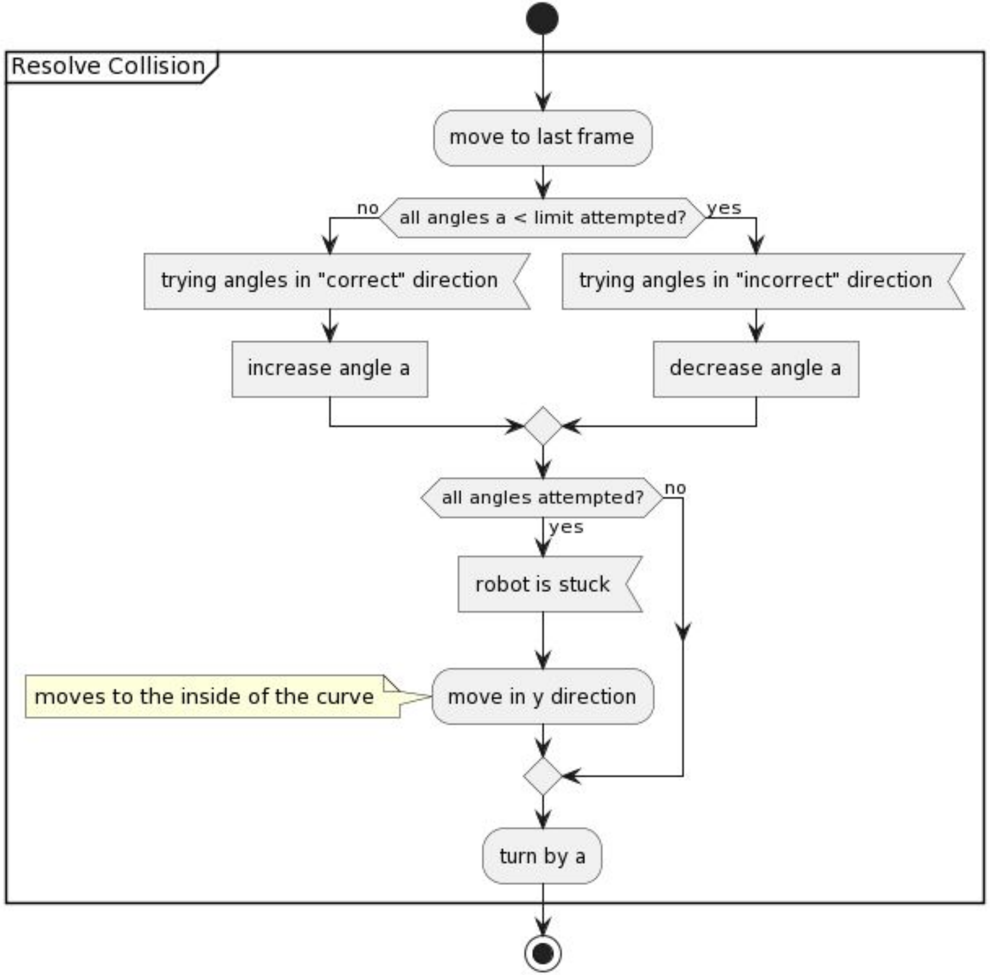
Method I



Exploration
make step
no
collision detected?
yes
save frame
resolve collision
wireloop not completed?
Collision-free run
move to next frame
another frame exists?

Method II


Exploration
make step
collision detected?
no
yes
save frame
resolve collision
wireloop not completed?
Collision-free run
move to next frame
another frame exists?


Resolve Collision
move to last frame
all angles a < limit attempted?
no
yes
trying angles in "correct" direction
trying angles in "incorrect" direction
increase angle a
decrease angle a
all angles attempted?
no
yes
robot is stuck
moves to the inside of the curve
move in y direction
turn by a

Method Assessment

+ simple
+ no a priori knowledge of track or its parts needed
+ self-recovery included
+ only collision-free frames are saved
- slow exploration
- rough movement between recorded frames

Demonstration

The End