



## **Code Structure**

+stone\_in\_front: bool

+ready\_callback()
+start\_callback()

# +robo\_number: int +node\_name: string +pub\_topic: string +sub\_topic: string +robo\_move: RoboMove +move\_a\_stone() +publishFinished() +pick\_a\_stone() +drop\_a\_stone() +try\_to\_reach()

```
RoboMove
 +spoint1: RoboPoint
 +point1: RoboPoint
 +spoint2: RoboPoint
 +point2: RoboPoint
RoboPoint
 +x: int
 +y: int
 +z: int
 +w: int
```

```
Turtlebot

+move_to_arm_2()
+move_to_arm_1()
+fine_positioning()
+marker_can_be_seen()
```



#### **Instance Structure**

#### RoboArm1: RoboArm

robo\_number = 1
node\_name = "roboarm1"
pub\_topic = "/pub\_topic\_robo\_arm\_1"
sub\_topic = "/sub\_topic\_robo\_arm\_1"
robo\_move = RoboMove1

#### RoboMove1: RoboMove

spoint1 = RoboPoint(x=220, y=-40, z=174, w=90) point1 = RoboPoint(x=220, y=-40, z=168, w=90) spoint2 = RoboPoint(x=110, y=160, z=168, w=60) point2 = RoboPoint(x=110, y=160, z=46, w=60)

#### RoboArm2: RoboArm

robo\_number = 2
node\_name = "roboarm2"
pub\_topic = "/pub\_topic\_robo\_arm\_2"
sub\_topic = "/sub\_topic\_robo\_arm\_2"
robo\_move = RoboMove2

#### RoboMove2: RoboMove

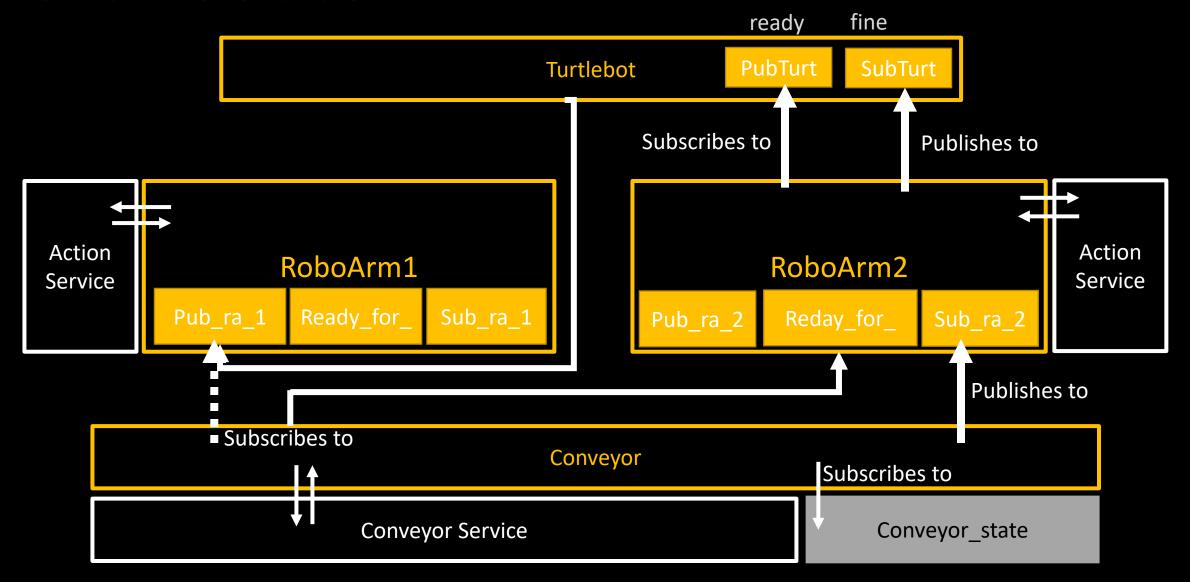
spoint1 = RoboPoint(x=220, y=-40, z=174, w=90) point1 = RoboPoint(x=220, y=-40, z=168, w=90) spoint2 = RoboPoint(x=110, y=160, z=168, w=60) point2 = RoboPoint(x=110, y=160, z=46, w=60)

Conveyor: Conveyor



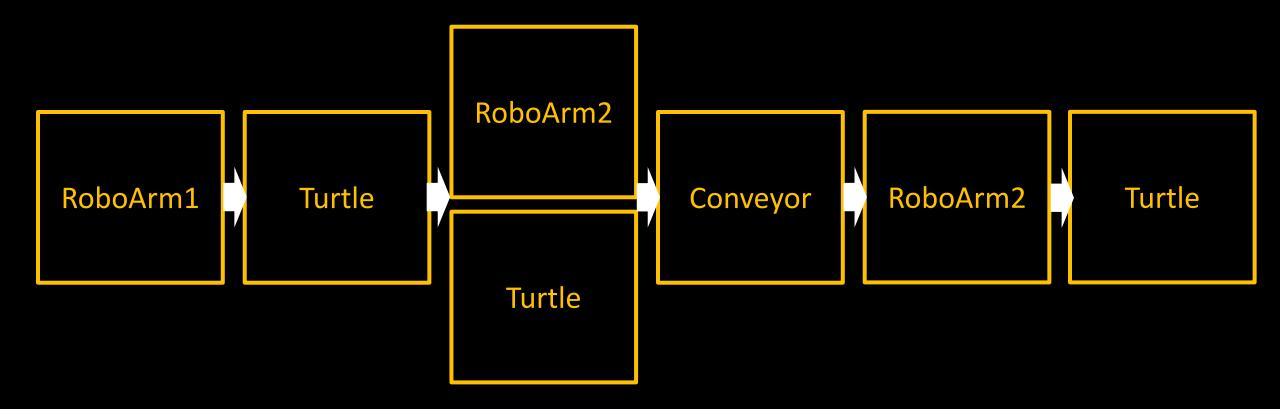


## **Communication Structure**



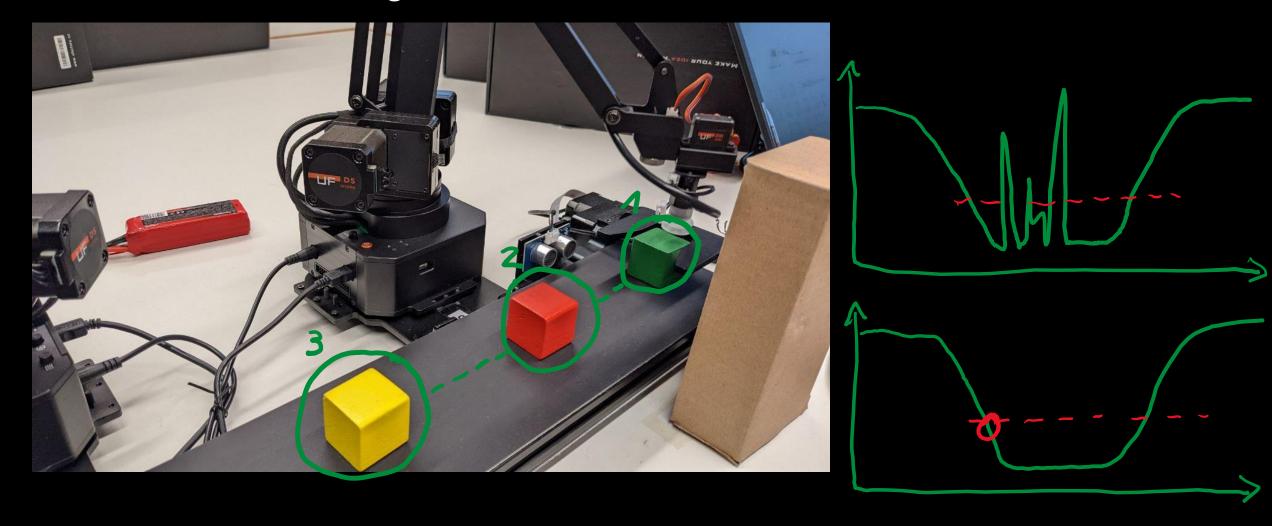


## The program flow



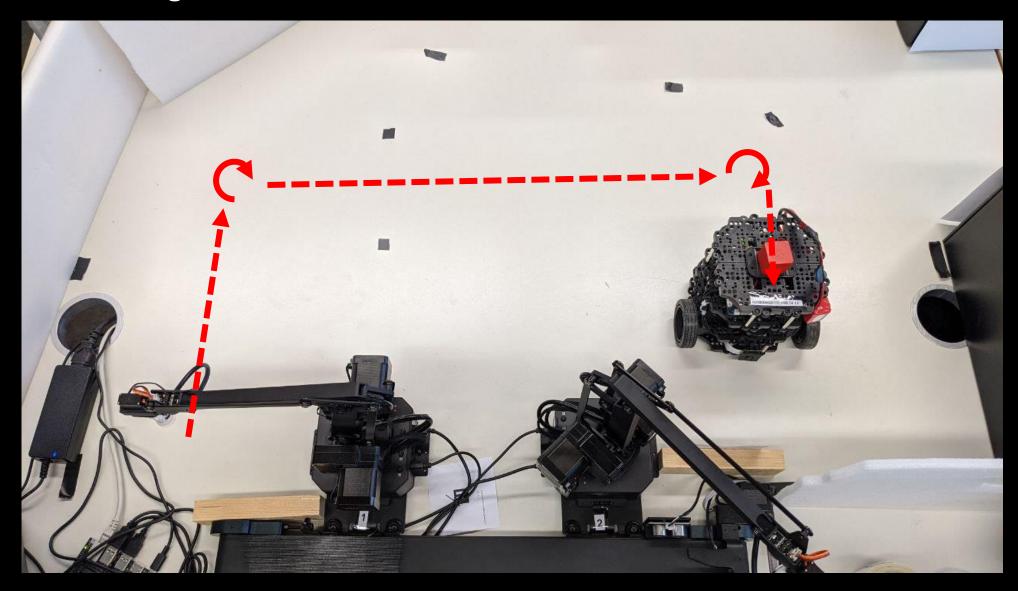


# **Stone Detection and Picking**



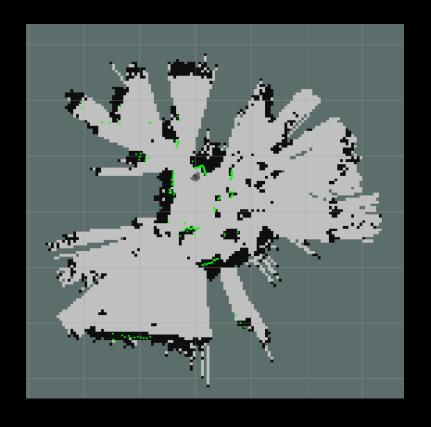


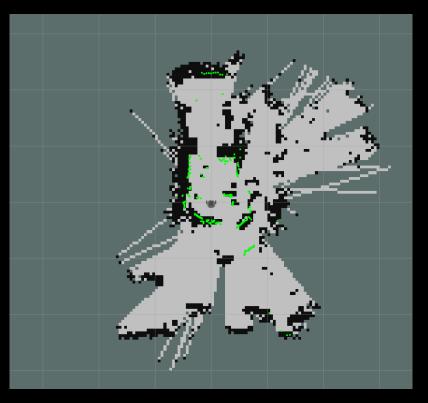
# **Autonomous Navigation**

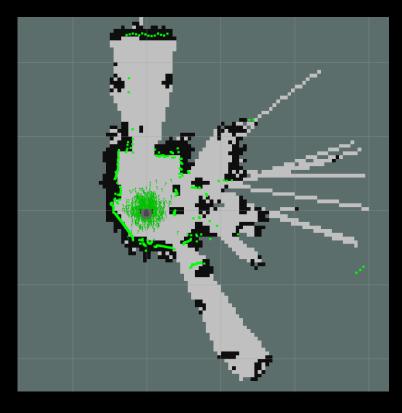




# Map

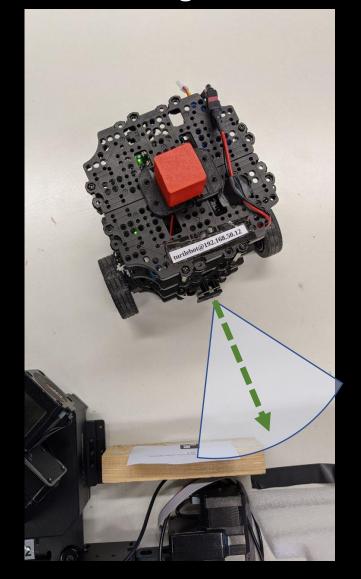


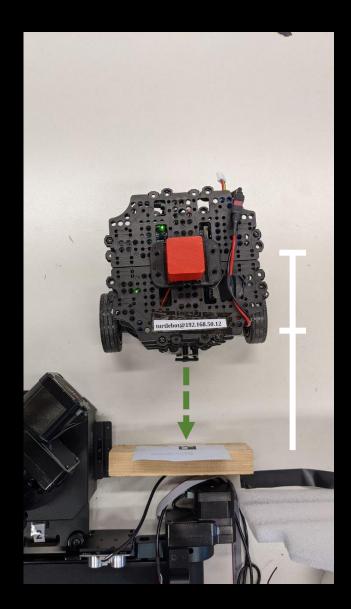


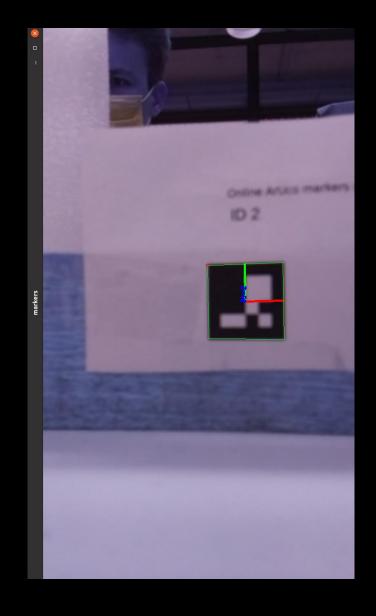




# **Fine Positioning**









### **Difficulties:**

- Precision of Sensors at all (Ultrasonic Sensor, Lidar)
- Limited Calculation Power
- Limited Communication Capacity

"Wer misst misst Mist."

## **Possible Improvements:**

- Using not just Publisher and Subscriber but more Services i.e.
- Implement adjustment algorithms to current sensor data



