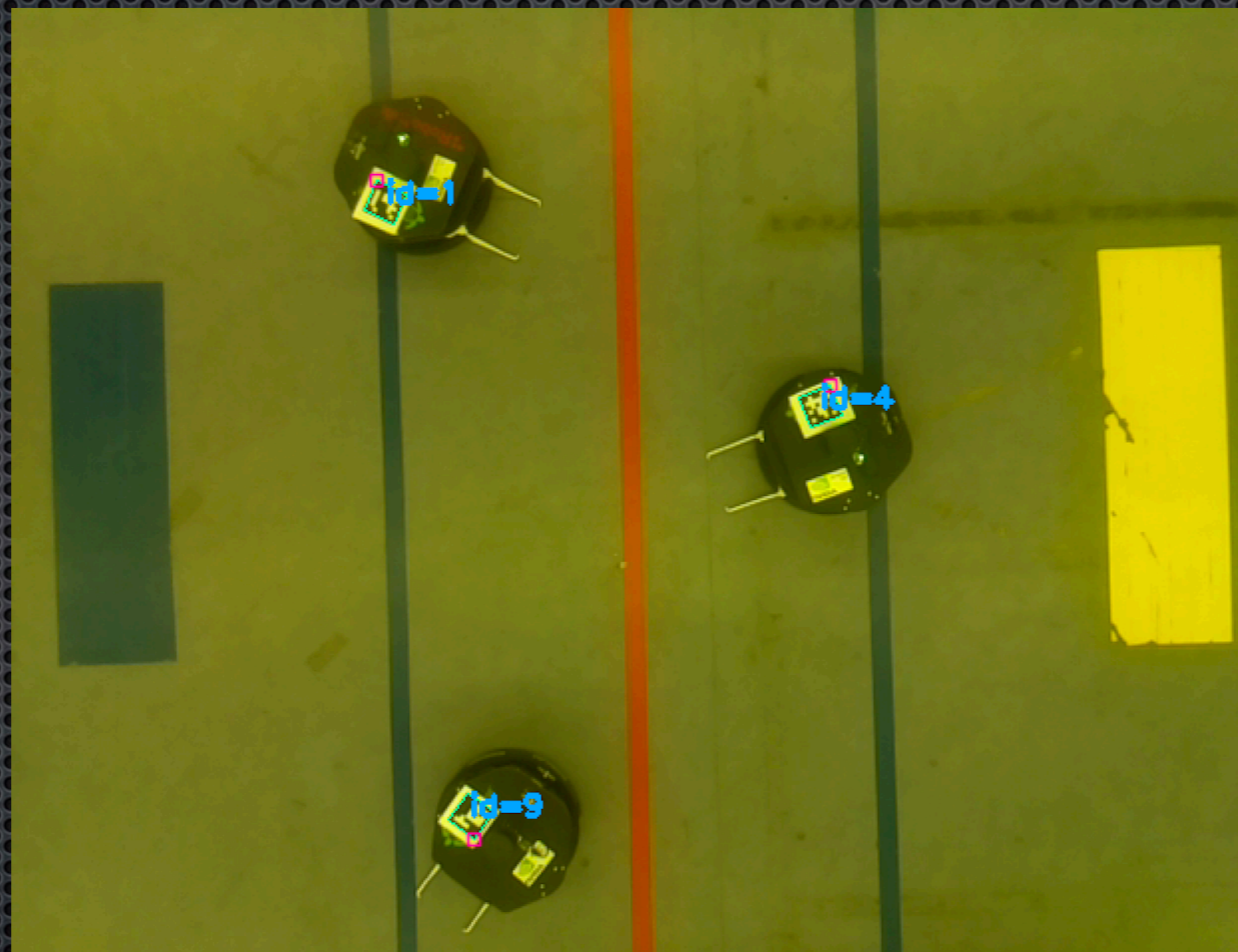


Ingenieurpraxis:

Thema :

Turtlebot-Tracking



Motivation

Leistungskurs
C++

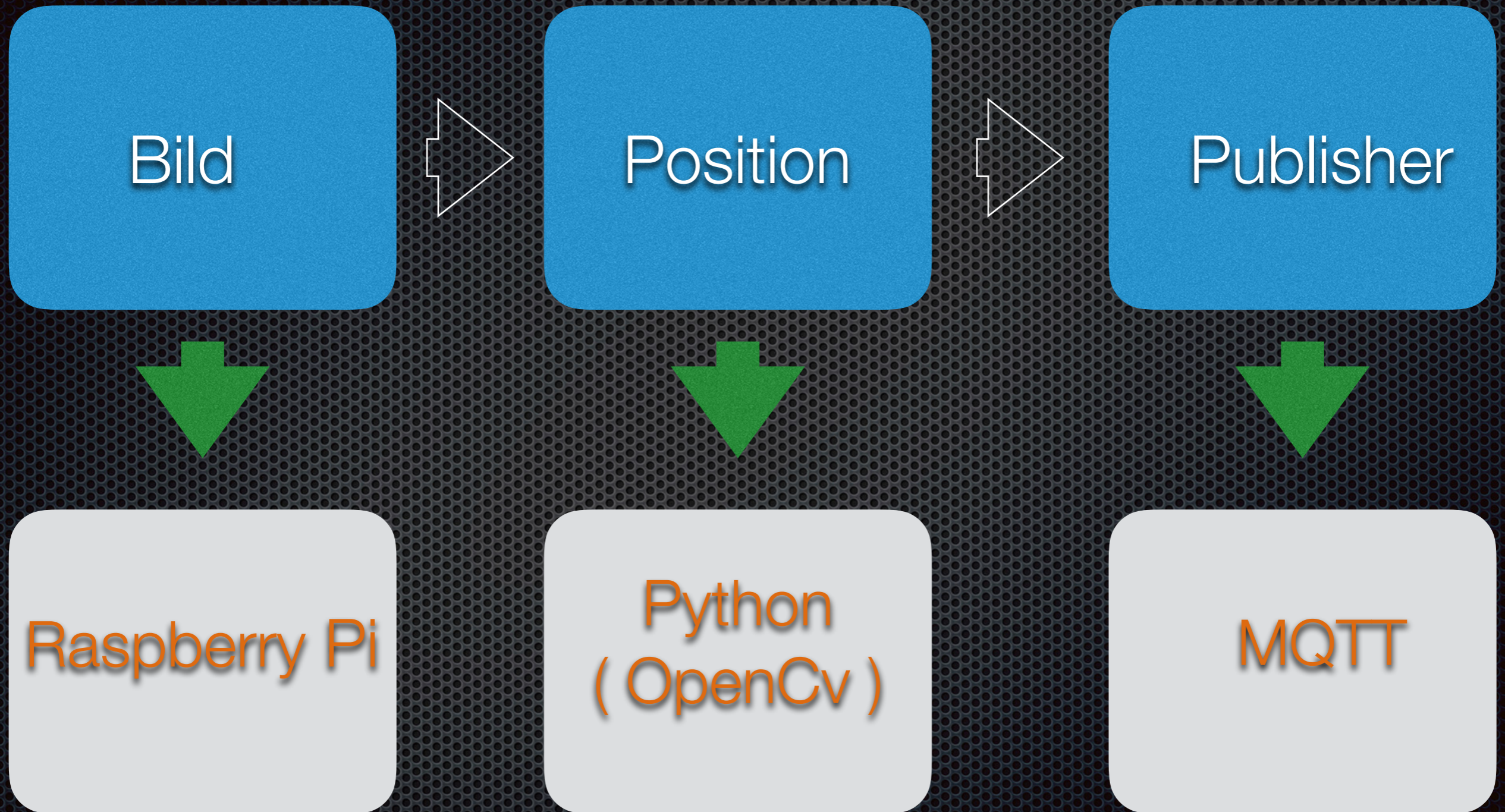


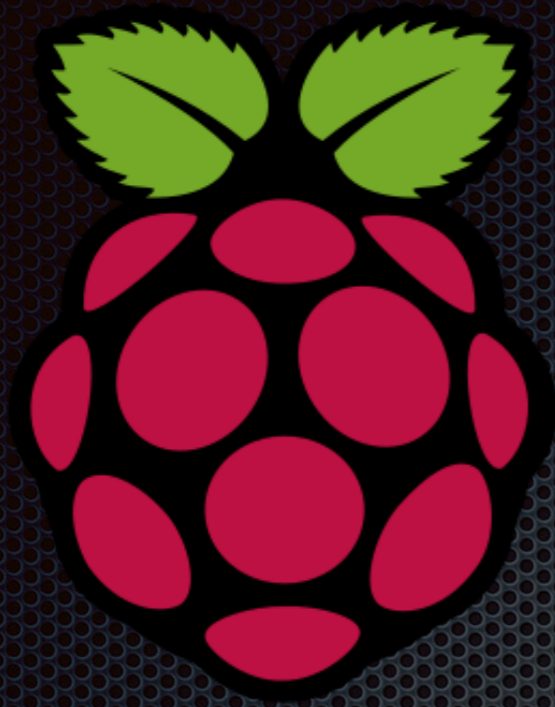
Hockey



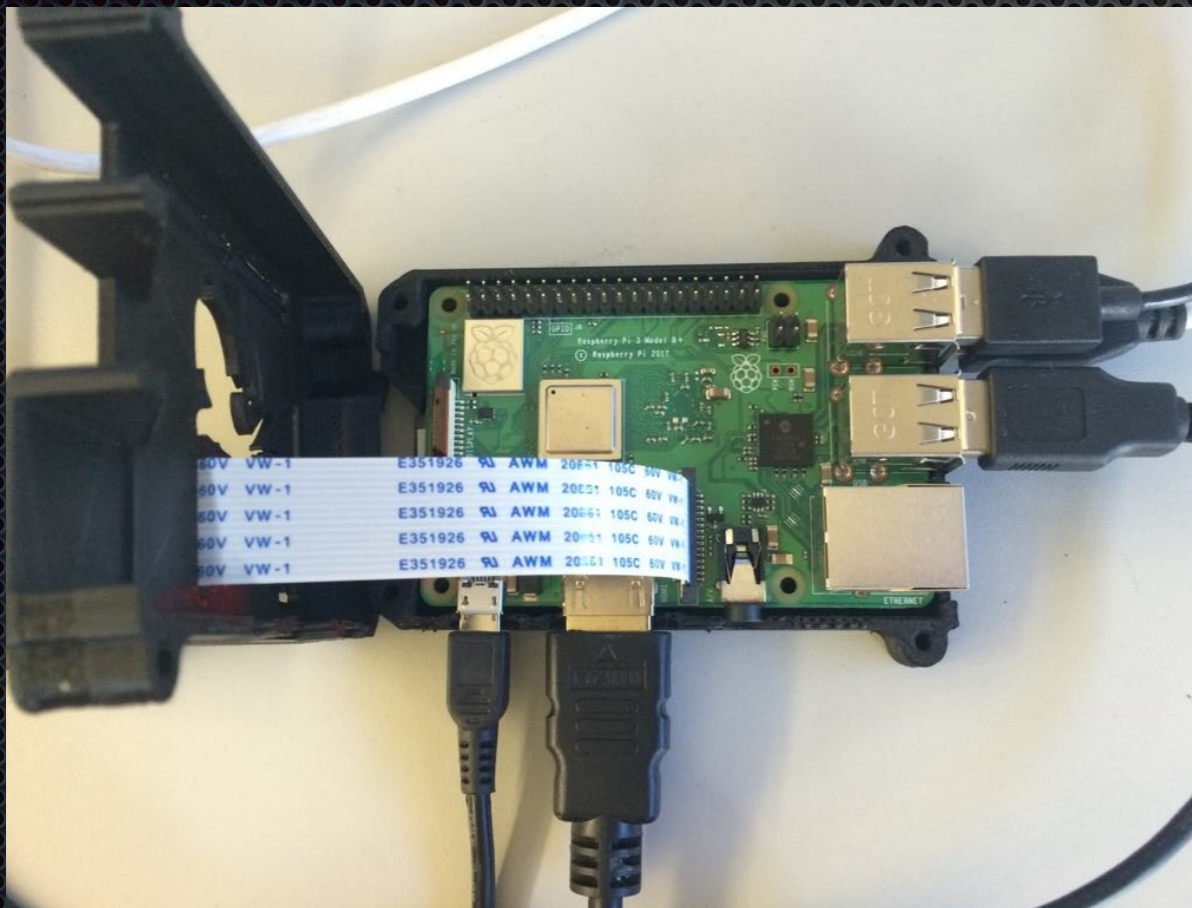
Lokalisierung
?

Plan :





Raspberry Pi 3



-> Raspberry Pi im C++ Raum

Lokalisierung im Spielfeld

The image shows a Thonny IDE window with a Python script named `endprojekt.py`. The script defines two functions: `coordinates` and `angle`. The `coordinates` function takes a point and returns its normalized coordinates. The `angle` function calculates the angle between two points. The script also initializes a camera and prints the positions and rotation angles of four robots.

```
names = { 1 : 'ROBOT 1', 4: 'ROBOT 2', 5: 'ROBOT 3', 9:'ROBOT 4'}
```

```
def coordinates(point):  
    xi = int (point[0])  
    yi = int (point[1])  
    x = int ( xi - 320)  
    y = int(240 - yi)  
    return (x,y)
```

```
def angle(p1, p2):  
    (x1, y1) = coordinates(p1)  
    (x2, y2) = coordinates(p2)  
    t = (y2 - y1) / (x2 - x1)  
    a = np.arctan(t)  
    a = np.degrees(a)  
    return a
```

```
# Inizialisierung und Referenz  
camera = PiCamera()  
camera.resolution = (640, 480)  
camera.framerate = 32  
rawCapture = PiRGBArray(camera, size=(640, 480))
```

```
# Warm up Camera  
time.sleep(0.1)
```

The shell output shows the following data:

```
[[[451., 362.]], dtype=float32]]  
[[4]  
[5]  
[9]  
[1]]  
[[344.0, 304.0], [184.0, 265.0], [328.0, 186.0], [464.0, 354.0]]  
[[350.0, 318.0], [191.0, 252.0], [316.0, 176.0], [472.0, 367.0]]  
[[30, -78), (-129, -12), (-4, 64), (152, -127)]  
ID 1 = ROBOT 2 has position: (24, -64) . Rotation = -66.80140948635182 degrees.  
ID 2 = ROBOT 3 has position: (-136, -25) . Rotation = 61.69924423399363 degrees.  
ID 3 = ROBOT 4 has position: (8, 54) . Rotation = -39.8055710922652 degrees.  
ID 4 = ROBOT 1 has position: (144, -114) . Rotation = -58.3924977537511 degrees.
```

The Frame window shows a top-down view of a game field with four robots (ID 1, 2, 3, 4) and two obstacles (dark green and yellow rectangles). The robots are represented by small icons with their IDs and rotation angles.

The terminal window shows the SSH connection details and the execution of the `thonny` command.

Koordinaten und Rotationswinkel jedes Turtlebots werden bestimmt.

MQTT

The image shows a Thonny IDE window on the left and an MQTT Explorer window on the right. The IDE window displays the following Python code in `endprojekt.py`:

```
Connected = False

client = mqtt.Client("Turtletrack")
client.username_pw_set(user, password=password)
client.on_connect = on_connect
client.connect(broker_address, port=port)

client.loop_start()

while Connected != True:
    time.sleep(0.1)

try:
    r = ''
    i = 0
    while True:
        r = input('Precise ROBOT: ')
        if r == 'STOP' :
            break
        for j in range(len(ids)):
            if ids[j] == names_inv[r]:
                i = j
        msg = 'Position : ' + str(listofcoordinates[i]) + '. R
        client.publish("Turtlebots", msg)
```

The Shell window shows the following output:

```
[[5]
[4]
[9]]
[[384.0, 234.0], [484.0, 187.0], [359.0, 158.0], [301.0, 226.0]]
[[396.0, 245.0], [475.0, 200.0], [351.0, 171.0], [293.0, 238.0]]
[(76, -5), (155, 40), (31, 69), (-27, 2)]
Connected to broker
Precise ROBOT: ROBOT 1
Precise ROBOT: ROBOT 3
Precise ROBOT: ROBOT 2
Precise ROBOT: ROBOT 4
Precise ROBOT: ROBOT 1
```

The MQTT Explorer window shows the following subscriptions and messages:

- Topic: "python/test" Showing the last 5 messages — + Messages: 0/0
- Topic: "python/test" Showing the last 1 messages — + Messages: 0/1
 - # Time Topic QoS
 - 0 12:03:20 python/test 0
 - Message: Position : (64, 5). Rotation : -39.8055710922652 degrees.
- Topic: "Turtlebots" Showing the last 4 messages — + Messages: 0/12
 - # Time Topic QoS
 - 8 12:07:44 Turtlebots 0
 - Message: Position : (39, 82). Rotation : 58.3924977537511 degrees.
 - # Time Topic QoS
 - 9 12:07:48 Turtlebots 0
 - Message: Position : (-19, 14). Rotation : 56.309932474020215 degrees.
 - # Time Topic QoS
 - 10 12:07:54 Turtlebots 0
 - Message: Position : (64, 6). Rotation : -42.510447078000844 degrees.
 - # Time Topic QoS
 - 11 12:07:57 Turtlebots 0
 - Message: Position : (39, 82). Rotation : 58.3924977537511 degrees.

Durch die Eingabe eines Roboternamens wird die Position als Nachricht in unserem Topic veröffentlicht.