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DEVELOPMENT OF LOCAL POSITIONING SYSTEM FOR A PIPE-LESS PLANT

Automation & Robotics
Group Project SS18

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Abstract

Summary. Note that the abstract heading is unnumbered, it should remain so. To remove heading numbering use:

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\section*{}
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Contents

List of Figures

List of Tables

1 Introduction

Add your name to the file name

2 Pipeless Plant

2.1 Existing setup

2.2 Problems with the Existing Setup

..
zb

- Fish eye
- Sunlight..

3 Selection Process

About the 4 techniques..

3.1 Triangulation

Summary

Implementation

Pro and con

..

3.2 Pattern Recognition

Summary

Implementation

Pro and con

..

3.3 RFID

Summary

Implementation

Pro and con

..

3.4 Map-Based Localization

Summary

Implementation

Pro and con

..
example:

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Table 1: Should be a caption

4 Theoretical Background

4.1 Radio Frequency Identification

4.2 Trilateration[1]

Trilateration is a method to compute the intersecting point of three circles/spheres. For this, it is necessary to know the three center of the circles/spheres plus their corresponding radii. The basic idea is to use the description of sphere.

$$r^2 = (x - x_1)^2 + (y - y_1)^2 + (z - z_1)^2 \tag{1}$$

where ($P_n = (x_n, y_n, z_n)$) is the center of the sphere. To use equation 4.2 for the 2D indoor localization on a floor, a few assumption can be made. First of all, the z-component of all spheres can be neglected. Another assumption is that we define the origin of the first circle as the center of the coordinate system, the second along the x-axis with an distance (d) and the third shifted in x- (i) and y-direction (j).

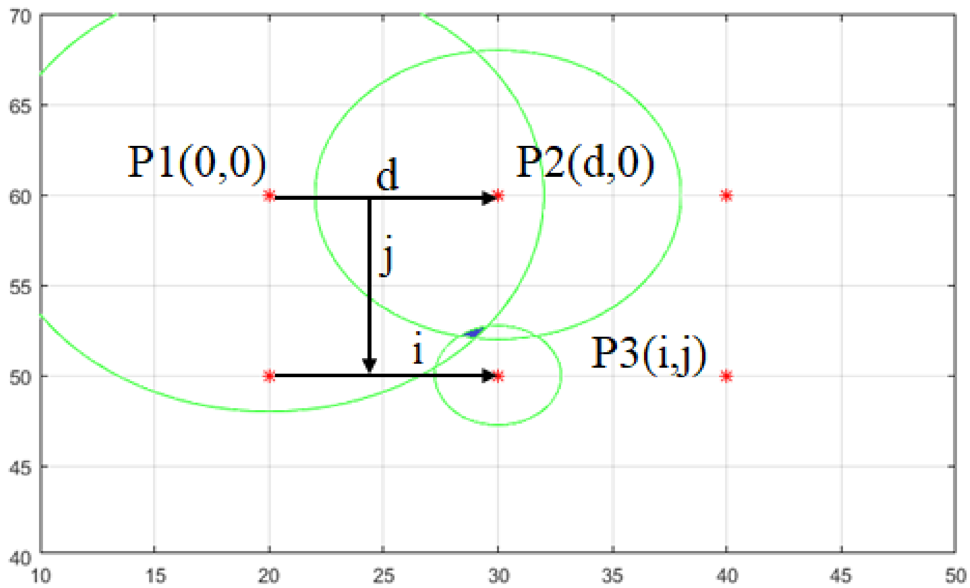

Figure 1: Overview Trilateration

With known positions of the center of the circles d, i and j can be computed in the following

[1]Indoor Robot Positioning using an Enhanced Trilateration Algorithm

way:

$$d = |P_2 - P_1| \tag{2}$$
$$e_x = \frac{1}{d}(P_2 - P_1) \tag{3}$$
$$a_x = P_3 - P_1 \tag{4}$$
$$i = e_x \cdot a_x \tag{5}$$
$$a_y = (P_3 - P_1) - i * e_x \tag{6}$$
$$e_y = \frac{a_y}{|a_y|} \tag{7}$$
$$j = e_y \cdot a_x \tag{8}$$

After knowing the these values, the relative distance in x- and y-direction can be computed with the help of 4.2 and the center of the circles P_1(0,0), P_2(0,d) and P_3(i,j) as follows:

$$x_t = \frac{r_1^2 - r_2^2 + d^2}{2 * d} \tag{9}$$
$$y_t = \frac{r_1^2 - r_3^2 + i^2 + j^2}{2 * j} - i * \left(\frac{x_t}{j}\right) \tag{10}$$

The absolute position of the intersection point is computed in following way:

$$P = P_1 + e_x * x_t + e_y * y_t \tag{11}$$

4.3 ...

5 Simulation[2]

5.1 Emulator

5.2 RSSI Measurements with real HW

5.3 Simulation with emulated data

5.4 Results

[2]Stephan

6 Implementation

7 Hardware[3]

7.1 Communication (Abdul and/or Stefan)

7.2 Initialization procedure (Stephan and Stefan)

7.2.1 Recording and filtering data (Stefan)

7.2.2 Analysing data (Stefan)

7.2.3 Estimation of position and orientation (Stephan)

7.3 Results

7.4 Improvements

[3] Abdul and Stephan

8 Conclusion

conclude..

9 Future Work

...

10 References

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11 Appendixes