AS-84.3127 Paikannus- ja navigointimenetelmät

Laskuharjoitus 3.

1.

Tunnetaan kahden puun xy-koordinaatit:

x1= -1 m ja y1= 10 m

x2=1 m ja y2=10 m

Robotti mittaa laserilla etäisyyden d molempiin puihin

d1=10.05 m ja d2=10.05 m

Mikä on robotin paikka?

Jos mittaus d2 on -10 cm virheellinen, eli d2=9.95 m, niin kuinka iso virhe syntyy x-suunnassa ja y-suunnassa.

Eli laske xdop ja ydop

$\Delta x = xdop * \Delta d$

$\Delta y = ydop * \Delta d$

2.

Laske robotin paikka ja asento kulmamittausperiaatetta (triangulation) käyttäen kuvan kaltaisessa tapauksessa.

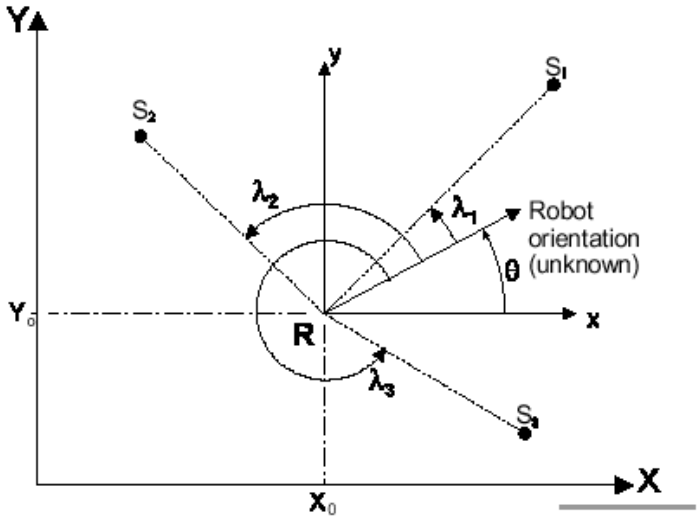

Figure 6.1: The basic triangulation problem: a rotating sensor head measures the three angles λ_1, λ_2, and λ_3 between the vehicle's longitudinal axes and the three sources S_1, S_2, and S_3.

Majakoiden koordinaatit ovat S1(x=5,y=5), S2(0,5) ja S3(5,0). Kulmamittausarvot ovat λ1=0, λ2=90 ja λ3=270 astetta.

AS-84.3127 Localization- and navigation methods

Exercise 3.

1.

The xy-coordinates of two trees are known:

x1= -1 m and y1= 10 m

x2=1 m and y2=10 m

The robot measures the distance d to both threes with a laser

d1=10.05 m and d2=10.05 m

What is the position of the robot?

If measurement d2 has an error -10 cm, that is d2=9.95 m, then how large is the resulting position error in x- and y-direction.

in other words, calculate xdop and ydop

$\Delta x = xdop * \Delta d$

$\Delta y = ydop * \Delta d$

2.

Calculate the robots position and heading in a situation such as depicted in the figure below, using triangulation.

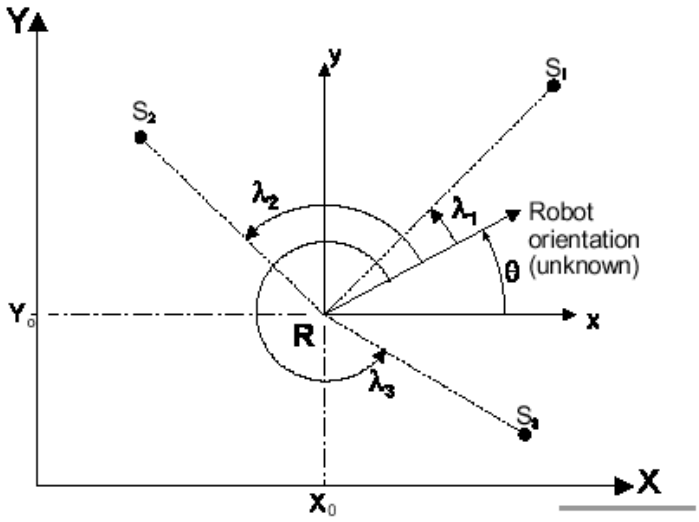

Figure 6.1: The basic triangulation problem: a rotating sensor head measures the three angles λ_1, λ_2, and λ_3 between the vehicle's longitudinal axes and the three sources S_1, S_2, and S_3.

The beacon coordinates are S1(x=5,y=5), S2(0,5) and S3(5,0). Bearing measurements are λ1=0, λ2=90 ja λ3=270 degrees.