Scanning Laser Range Finder & Robot Kinematics

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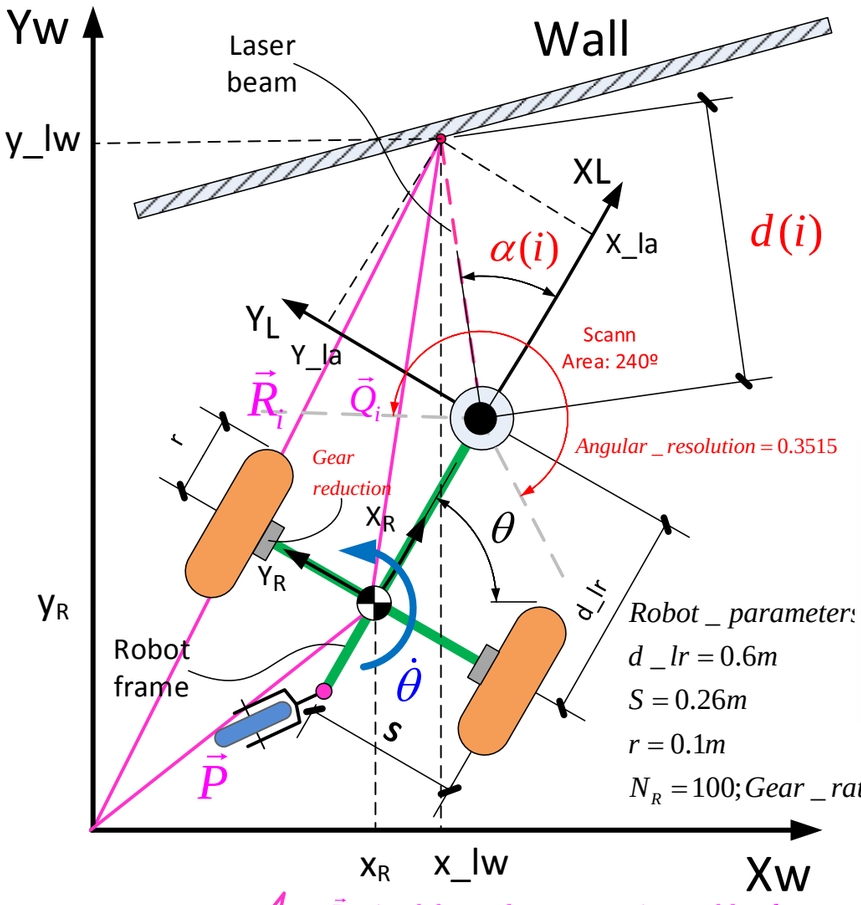


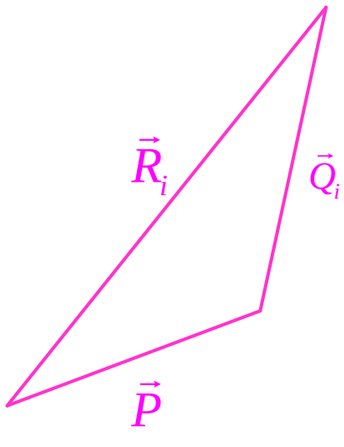
$Robot\_parameters$

$d\_lr = 0.6m$

$S = 0.26m$

$r = 0.1m$

$N_R = 100; Gear\_ratio$



$\vec{R}_i : i-th\ laser\ data\ vector\ in\ world\ reference\ frame$

$\vec{P} : Robot\ position\ vector\ in\ world\ reference\ frame$

$\vec{Q}_i : i-th\ laser\ data\ vector\ in\ Robot\ coordinates\ frame$

$$R_i = {}^{W}T_R Q_i$$

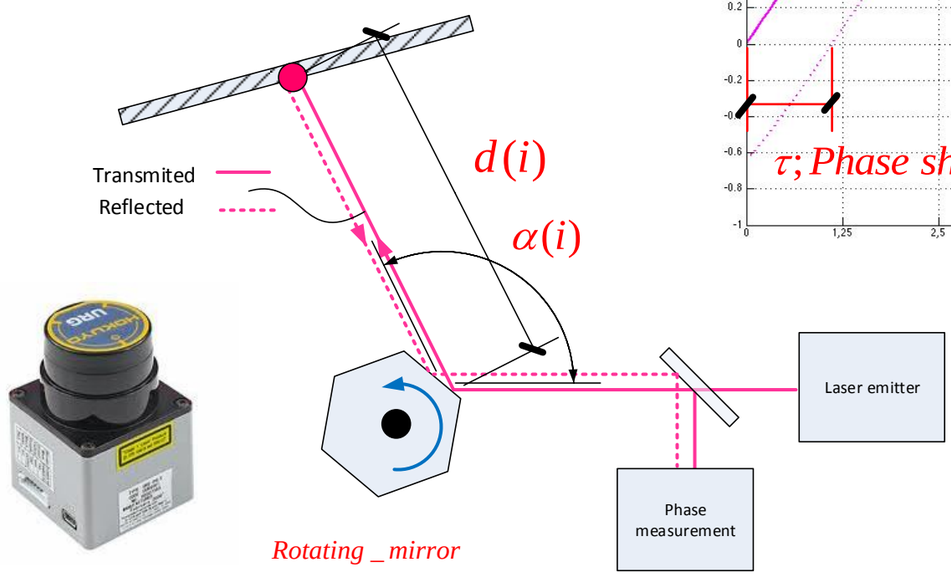
$$ {}^{W}T_R = \begin{pmatrix} c\theta & -s\theta & 0 & x_R \\ s\theta & c\theta & 0 & y_R \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Avalaible information: Sensor_Data.mat

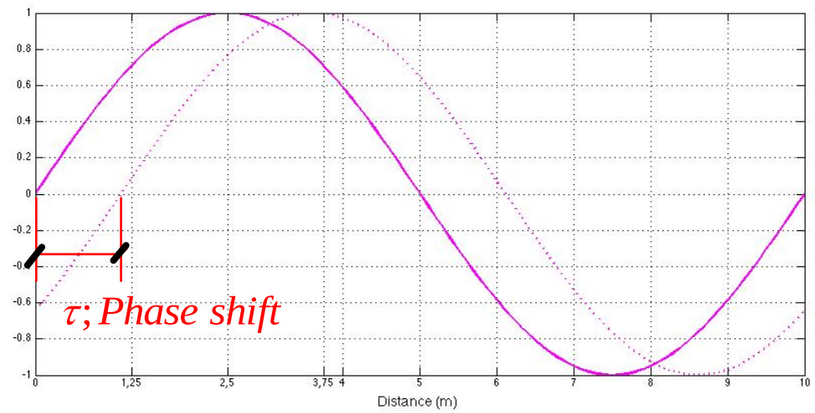
$A) right\_angular\_speed; (rad/s); Ts = 0.02 sec$

$B) left\_angular\_speed; (rad/s); Ts = 0.02 sec$

$C) polar\_laser\_data; [mm; \deg rees]; Ts = 0.4 sec$



Phase-shift measurement



Involved ecuations:

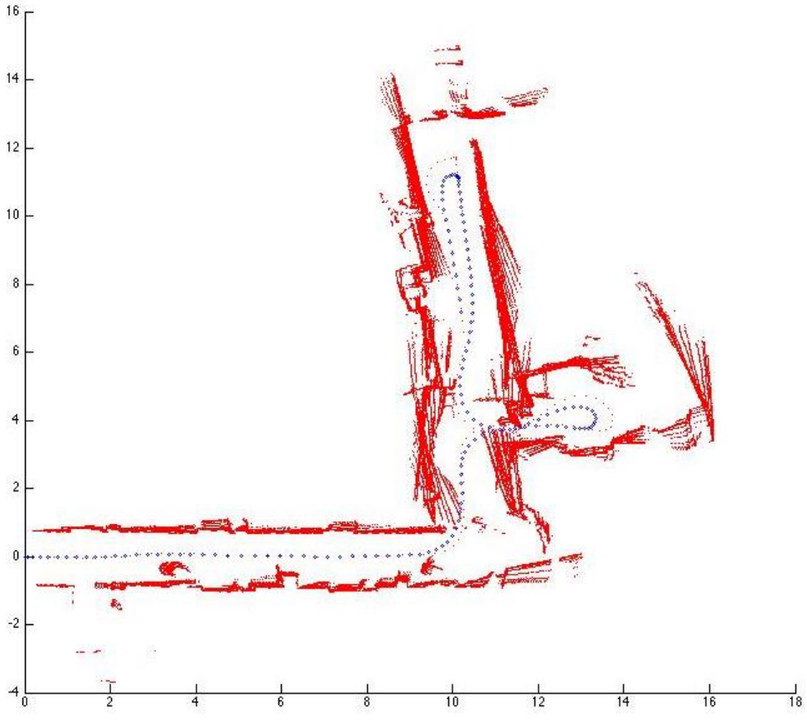
$f = 30MHz; Modulating\ frequency$

$c = 3 \cdot 10^8 m/s; Speed\ of\ light:$

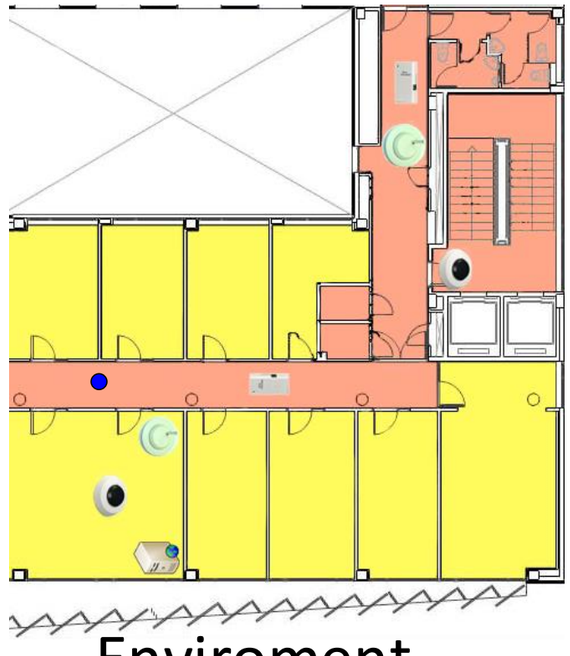
$\lambda = \frac{c}{f} = 10m; wave\ lenght$

$\tau; Phase\ shift$

$d(i) = \frac{\lambda}{4\pi}\tau(i);$



Expected result



Enviroment