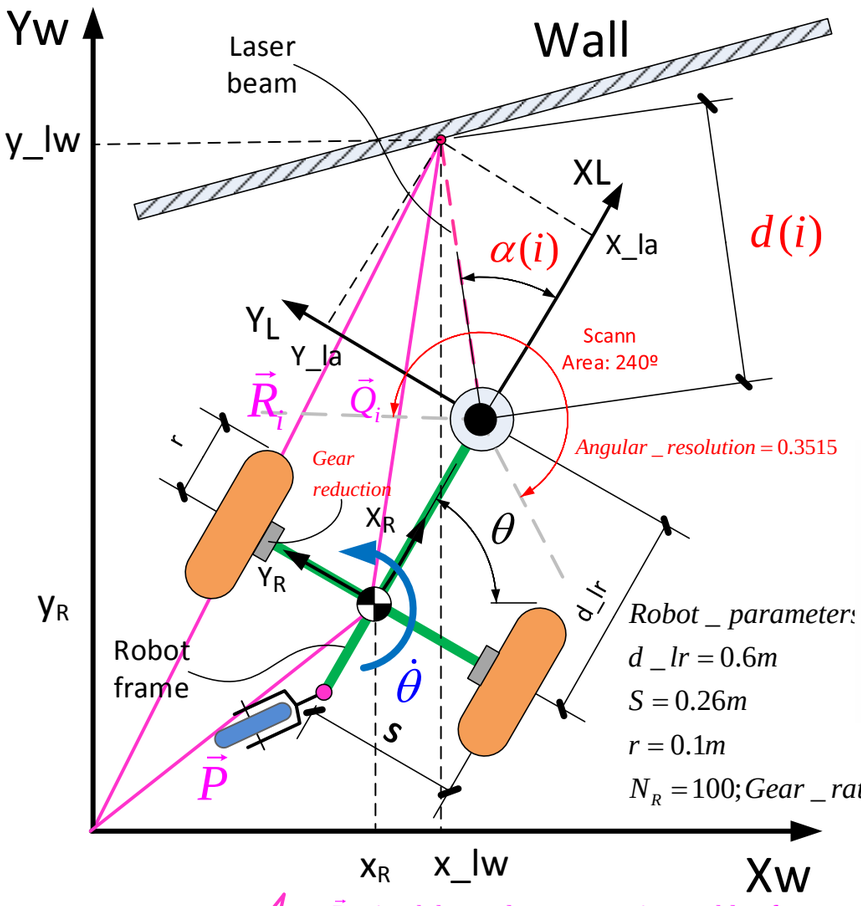
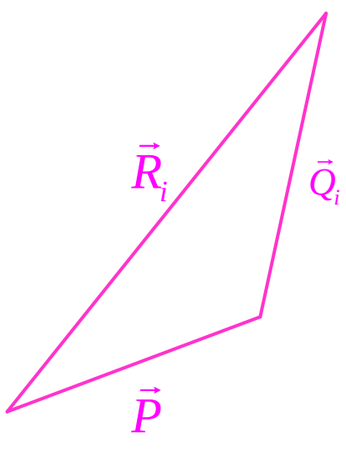
Scanning Laser Range Finder & Robot Kinematics

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Departament d'Enginyeria de Sistemes, Automàtica i Informàtica Industrial



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

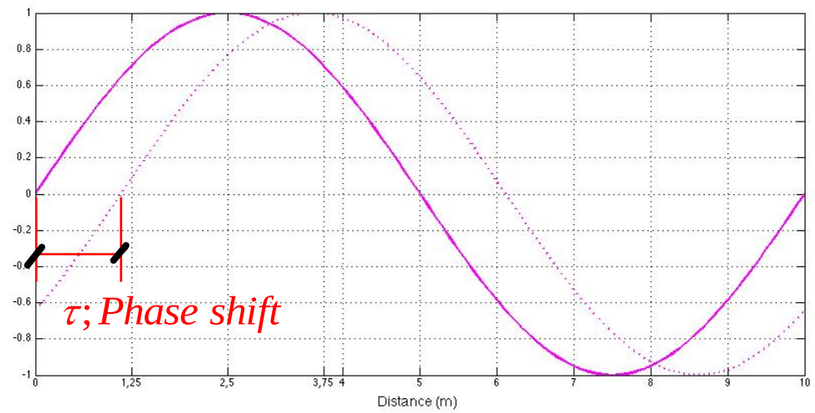
A) $right\_angular\_speed; (rad/s); Ts = 0.02 sec$

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

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

See it at the workspace

Phase-shift measurement



Involved ecuations:

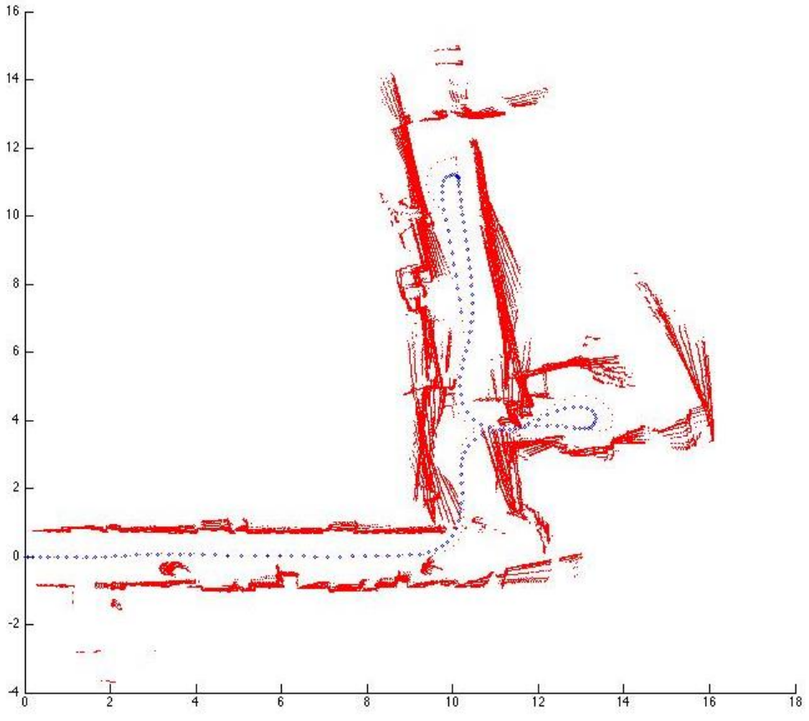
$f = 30MHz; Modulating\ frequency$

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

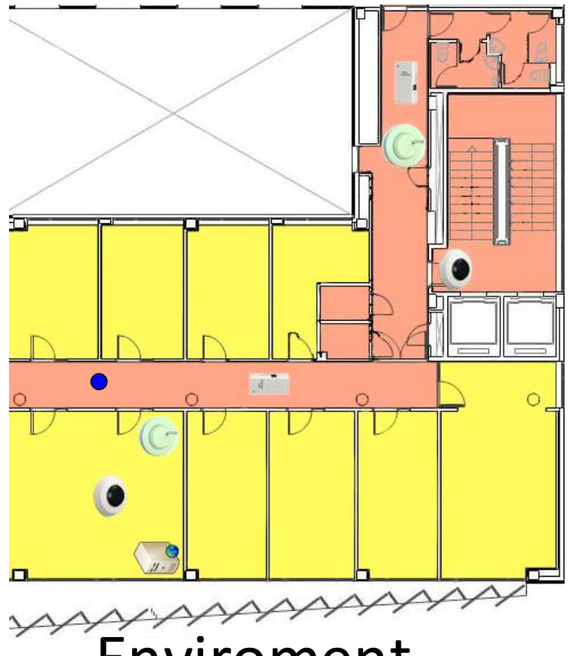
$\lambda = \frac{c}{f} = 10m; wave\ lenght$

$\tau; Phase\ shift$

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



Expected result



Enviroment