机器人 lab1
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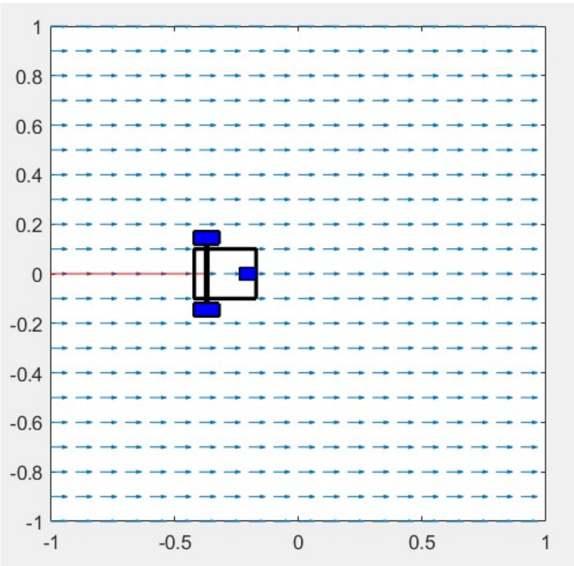
Q1
x, y	location
u, v	vector diagram vector
theta	car direction
x(k), y(k)	car position at time k
V	car's velocity

```
x(k)=V*cos(theta(k))* T+x(k-1); % calculating x
y(k)=V*sin(theta(k))* T+y(k-1); % calculating y
```

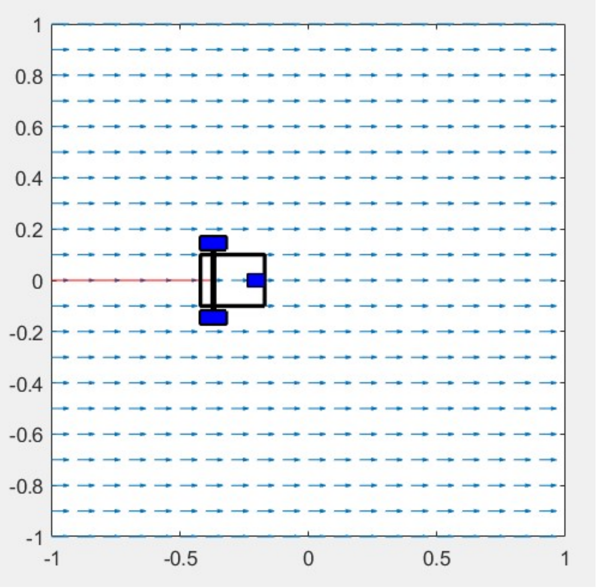
Uniform
Q1.1:
u=c, v=0, c is a constant
theta=0
Q1.2

```
[draw_x, draw_y]=meshgrid(-1:.1:1, -1:.1:1);
draw_u=ones(21, 21);draw_v=zeros(21, 21);
quiver(draw_x, draw_y, draw_u, draw_v, 0.5);
hold on
```



Q1.3

```
V=0.5;
theta(1)=0;
 theta(k)=theta(k-1); % calculating theta
```



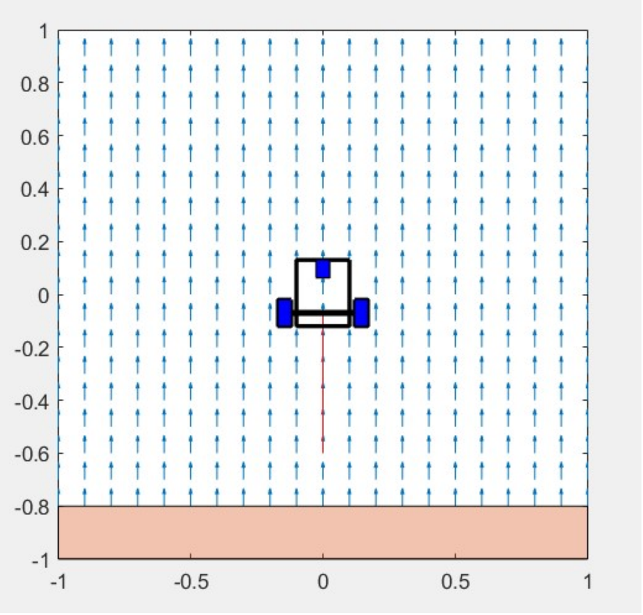
perpendicular

Q1.1

```
u=0, v=c, c is a constant
theta=pi/2
```

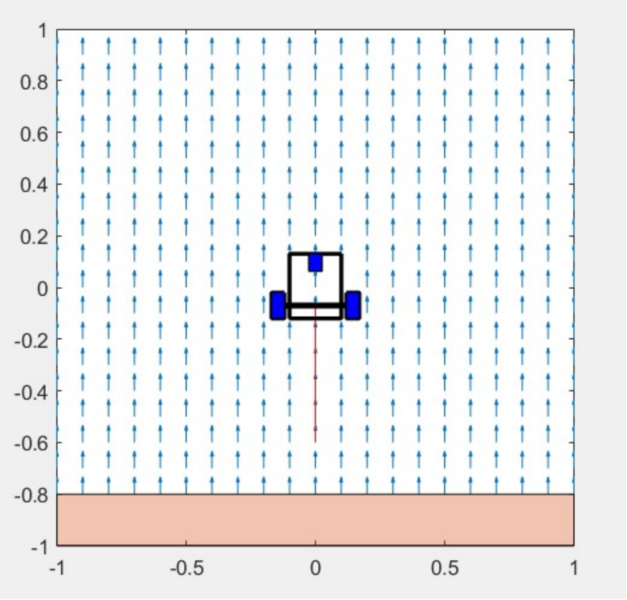
Q1.2

```
[draw_x, draw_y]=meshgrid(-1:.1:1, -1:.1:1);
draw_u=-draw_x;draw_v=-draw_y;
quiver(draw_x, draw_y, draw_u, draw_v, 0.5);
hold on
plot(polyshape([-1 -1 1 1],[-1 -0.8 -0.8 -1]))
hold on
```



Q1.3

```
V=0.5;
theta(2)=pi/2; % initilize the state theta
theta(k)=theta(k-1); % calculating theta
```



attractive
Q1.1

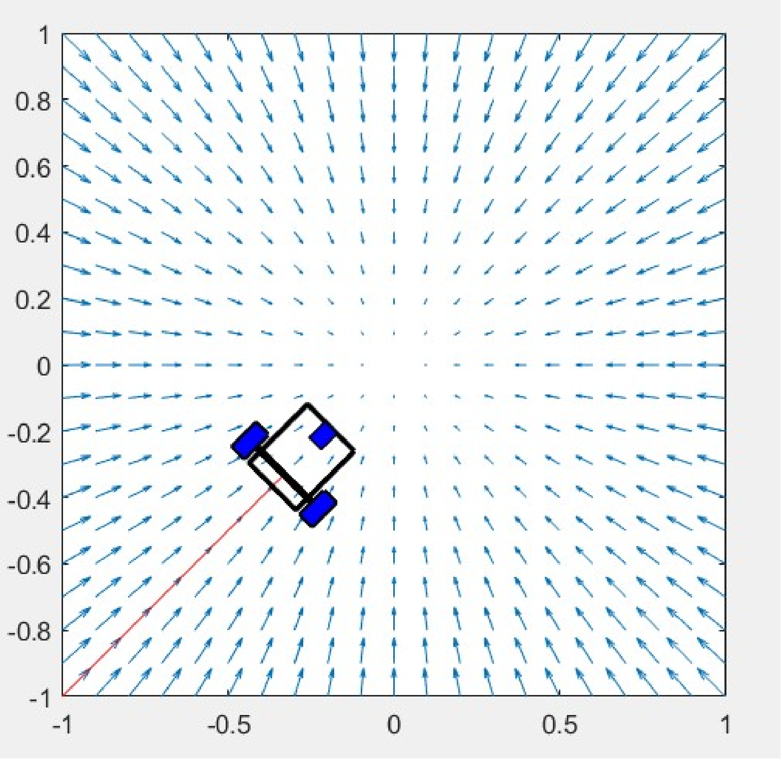
`u=-x; v=-y`

$theta = \arctan\left(\frac{y(k)}{x(k)}\right) + \frac{pi}{2} * (sign(x(k)) + 1)$

$V = \sqrt{x_{k-1}^2 + y_{k-1}^2}$ // increase with distance to center

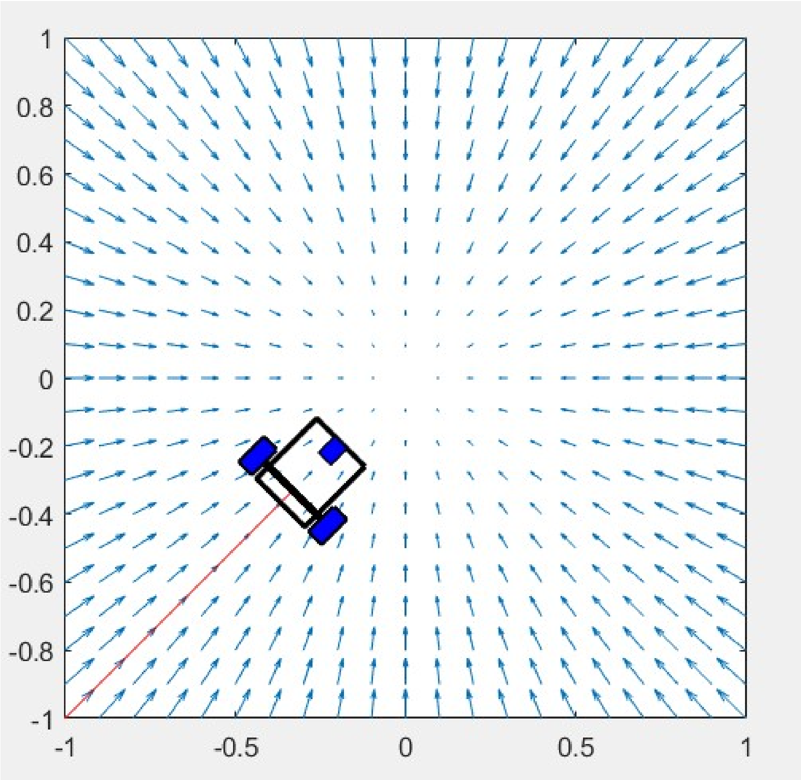
Q1.2

```
[draw_x, draw_y]=meshgrid(-1:.1:1, -1:.1:1);
draw_u=-draw_x;draw_v=-draw_y;
quiver(draw_x, draw_y, draw_u, draw_v);
hold on
```



Q1.3

```
V=(x(k-1)^2+y(k-1)^2)^0.5;W=1;
theta(k)=atan(y(k)/x(k))+pi/2*(sign(x(k))+1);          %
calculating theta
```



repulse

Q1.1

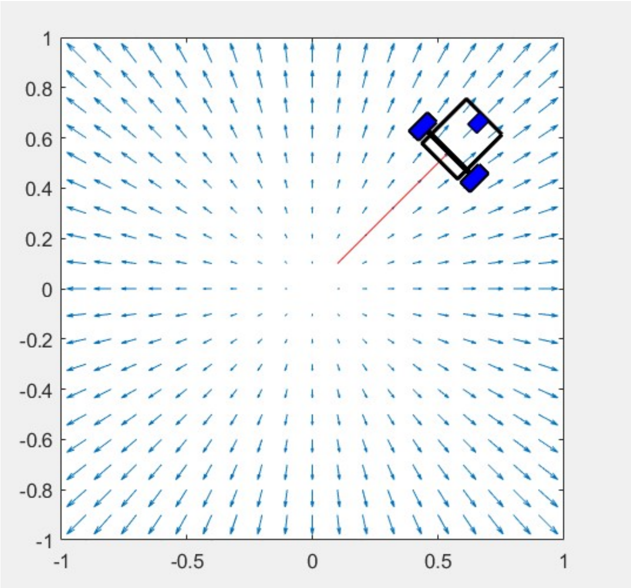
```
u=x, v=y
```

$theta = \arctan\left(\frac{y(k)}{x(k)}\right) + \frac{pi}{2} * (sign(x(k)) - 1)$ % calculating theta

$V = \sqrt{x_{k-1}^2 + y_{k-1}^2}$

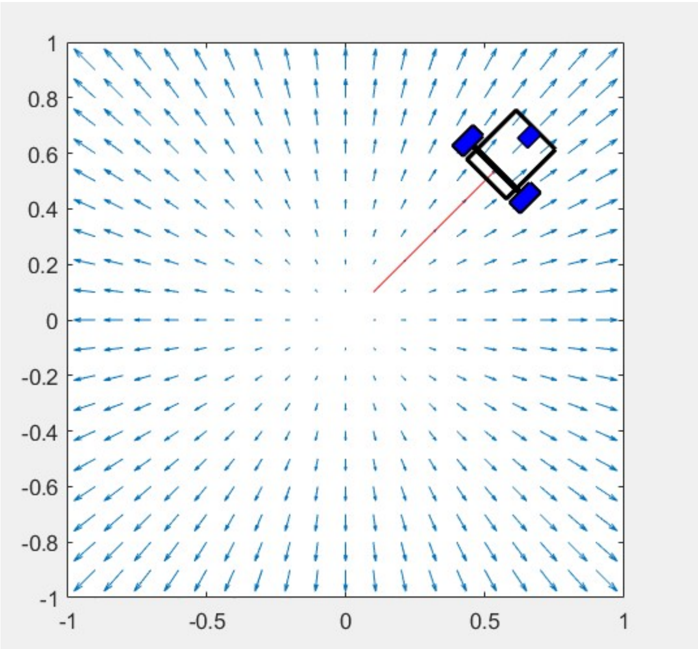
Q1.2

```
[draw_x, draw_y]=meshgrid(-1:.1:1, -1:.1:1);
draw_u=draw_x;draw_v=draw_y;
quiver(draw_x, draw_y, draw_u, draw_v);
hold on
```



Q1.3

```
V=(x(k-1)^2+y(k-1)^2)^0.5;
theta(k)=atan(y(k)/x(k))+pi/2*(sign(x(k))-1);        % calculating theta
```



tangential

Q1.1

We set the center of circle with (0, 0.5)

Considering $x = \cos\theta, y = \sin\theta + 0.5$

Then $\frac{dx}{d\theta} = -\sin\theta = -y + 0.5, \frac{dy}{d\theta} = \cos\theta = x$

So we have u=0.5-y, v=x

```
theta(k)=W*T + theta(k-1);
```

W is the angular velocity

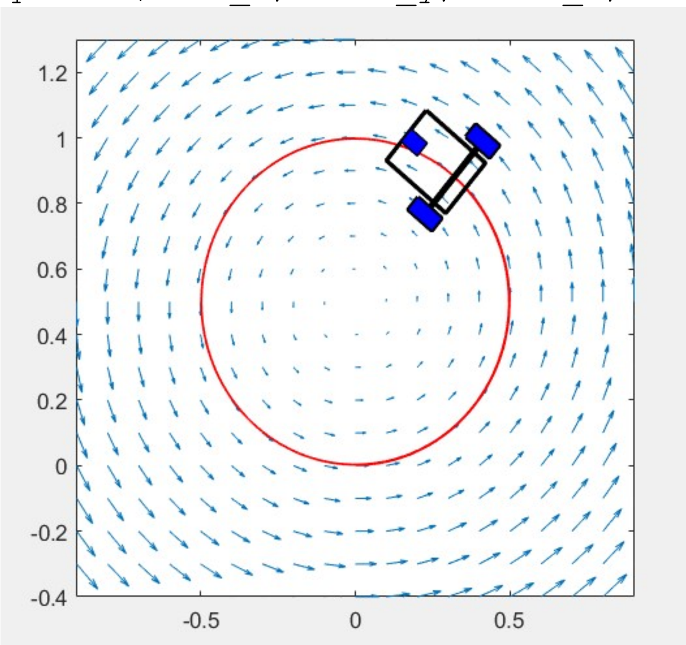
We assume the circle radius is 0.5, so we set $V =$

$\sqrt{x^2 + (y - 0.5)^2}$ and W=1(a constant)

So this could be uniform circular motion

Q1.2

```
[draw_x, draw_y]=meshgrid(-1:.1:1, -.5:.1:1.5);
draw_u=.5-draw_y;draw_v=draw_x;
draw_u=draw_x;draw_v=draw_y;
quiver(draw_x, draw_y, draw_u, draw_v);
```



Q1.3

```
theta(k)=W*T+theta(k-1); % calculating theta
V=(x(k)^2+(y(k)-0.5)^2)^0.5;
```