電気情報工学基礎演習B

Control a Mobile Robot: Lecture 3

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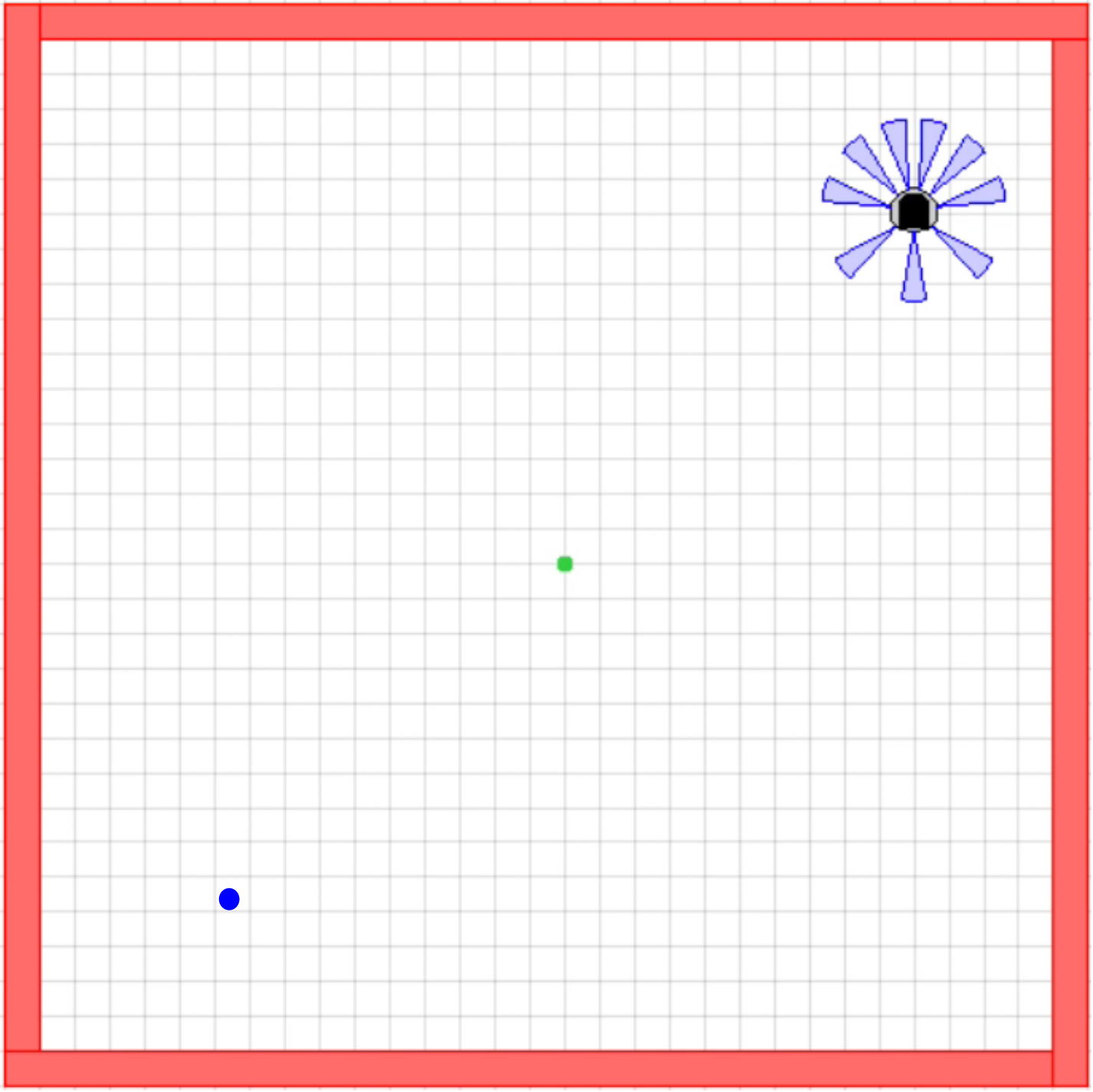
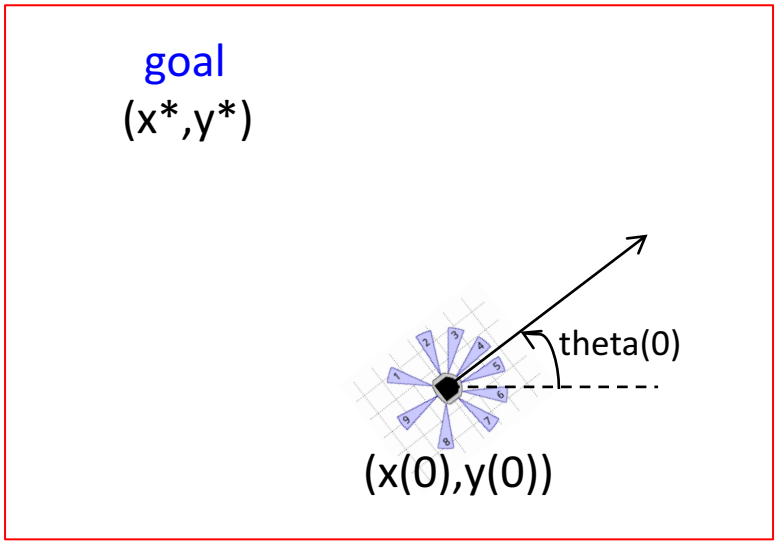


Lecture 3

- GoToGoal control

Go To Goal

- Objective: steer the robot to reach a goal



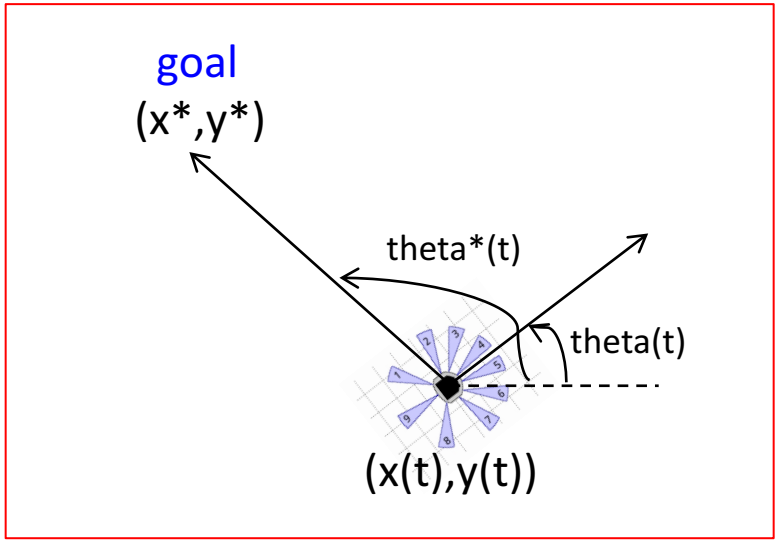
Assume robot is moving at linear velocity v=constant.

We only control robot's angular velocity w: $\frac{d\theta}{dt} = u(t)$, control input

Objective: $x(t) \to x^*$ and $y(t) \to y^*$ as $t \to \infty$

GoToGoal Controller

- Objective: steer the robot to reach a goal

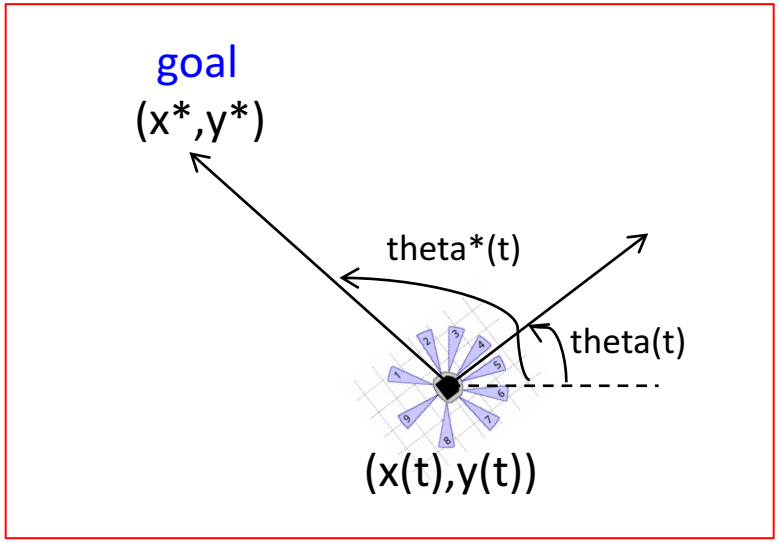


Objective: $\theta(t) \rightarrow \theta^*(t)$ as $t \rightarrow \infty$

$$\theta^*(t) = \tan^{-1}\left(\frac{y^* - y(t)}{x^* - x(t)}\right)$$

GoToGoal Controller

- Objective: steer the robot to reach a goal



1. Use P-controller $u(t) = K_p(\theta^*(t) - \theta(t))$ to achieve $\theta(t) \rightarrow \theta^*(t)$

2. Stop robot when it is 'close' to goal:
$\sqrt{((x^* - x(t))^2 + (y^* - y(t))^2)} < \text{d\_stop}$

Code

- +simiam/+controller/+khepera3/K3Supervisor.m
  - function obj=K3Supervisor()

```
% Input your code below %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%Specified (constant) speed
obj.v = 0; (change this to see what happens)
%Goal location
obj.goal = [-1,-1]; (change this to see what happens)
%Stop condition
obj.d_stop = 0.1; (change this to see what happens)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Code

- +simiam/+controller/GoToGoal.m
  - function obj=GoToGoal()

```
% Input your code below %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Propositional control gain %
obj.Kp = 0; (change this to see what happens)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Code

- +simiam/+controller/GoToGoal.m
  - function outputs = execute(...)

```
% Input your code below %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% distance between goal and robot in x-direction. Hint: use
x_g, x
u_x = 0; (change this to see what happens)
% distance between goal and robot in y-direction. Hint: use
y_g, y
u_y = 0; (change this to see what happens)
% angle from robot to goal. Hint: use atan2, u_x, u_y
theta_g = 0; (change this to see what happens)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

$$\text{theta\_g} = \tan^{-1}\left(\frac{\text{y\_g} - y}{\text{x\_g} - x}\right) = \text{atan2}(\text{u\_y}, \text{u\_x});$$

Have Fun

- Change robot's initial pose in settings.xml
- Set robot's linear speed, goal location, and stop distance in K3Supervisor.m
- Adjust control gain parameter in GoToGoal.m
- Compute desired angle to goal in GoToGoal.m