電気情報工学基礎演習B

Control a Mobile Robot: Lecture 5

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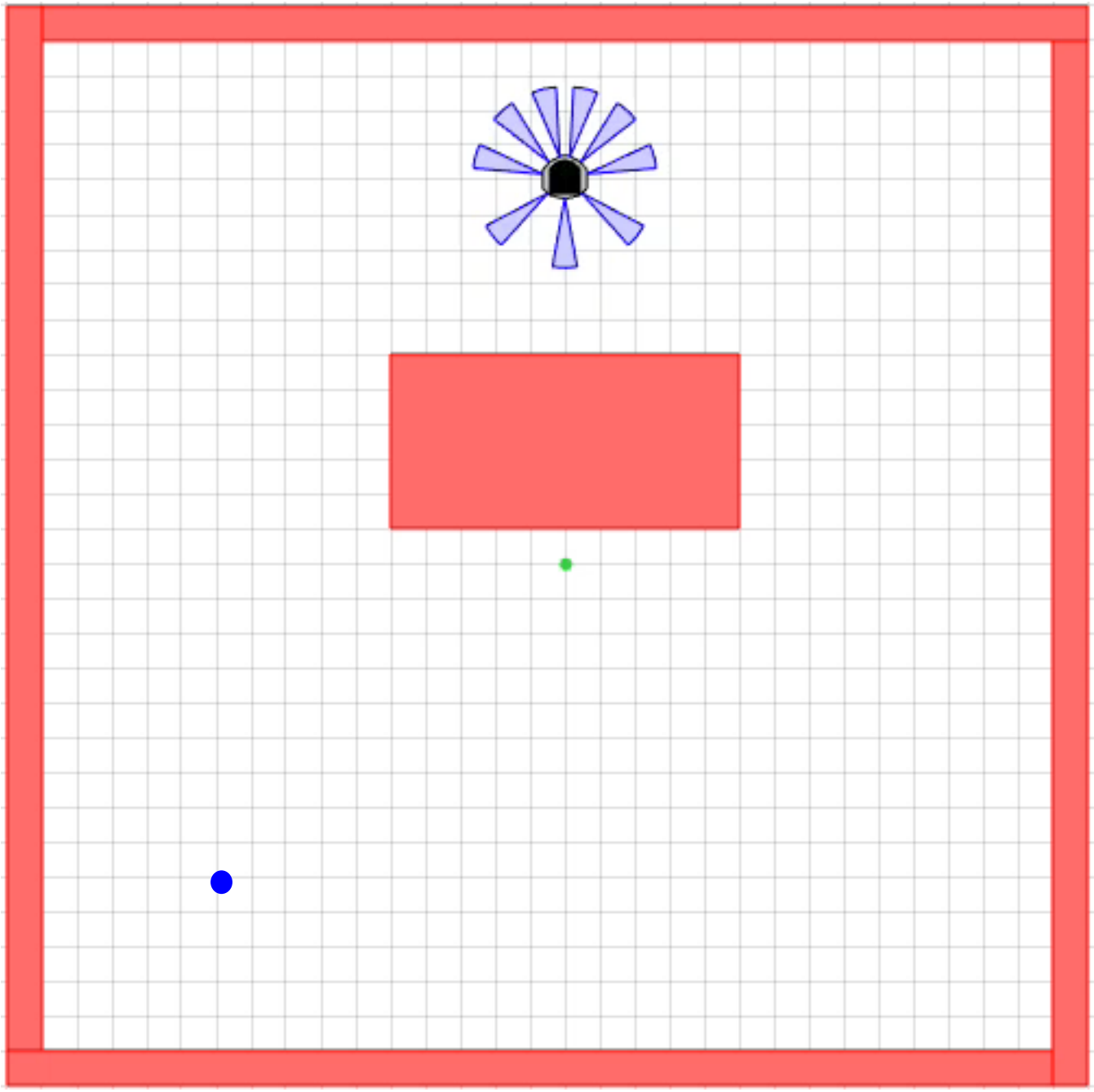


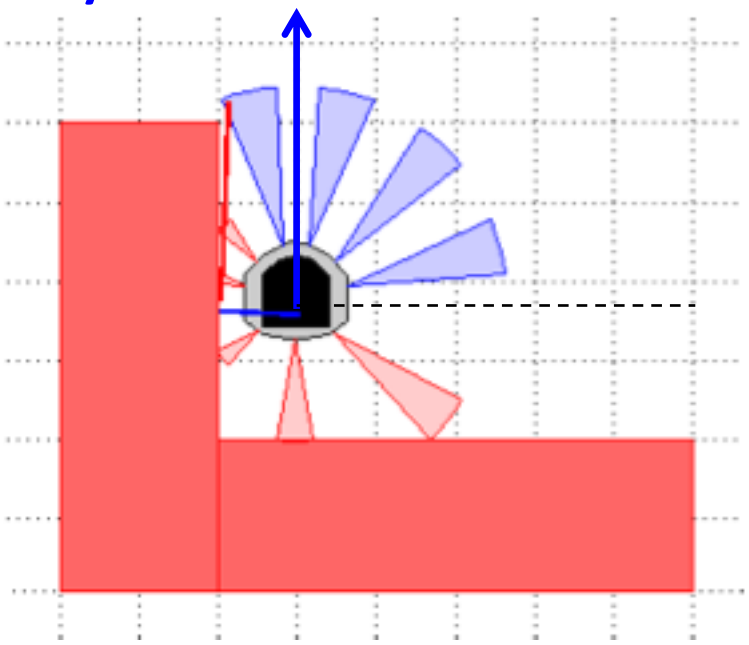
Week 5

- GoToGoal & AvoidObstacles control

Go To Goal & Avoid Obstacle

- Objective: steer the robot to reach a goal *and* avoid nearby obstacles

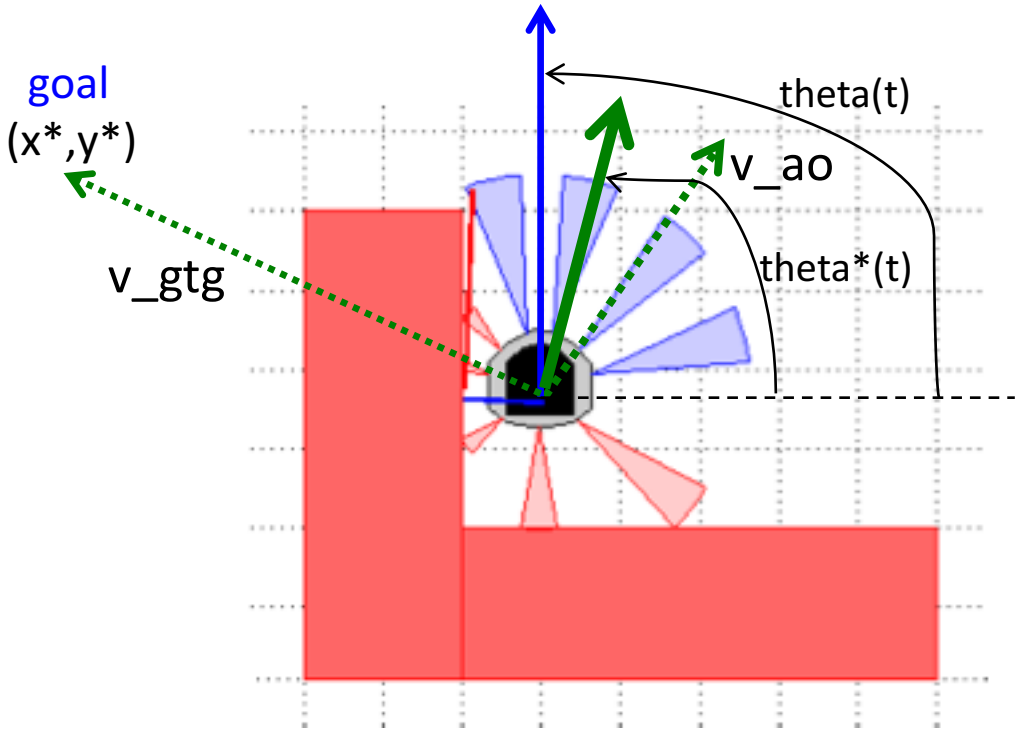
goal
(x*,y*)



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

AOandGTG Controller



$$v^*(t) = \alpha \cdot \text{v\_ao}(t) + (1-\alpha) \cdot \text{v\_gtg}(t), \quad \alpha \in (0,1)$$

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

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

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/AOandGTG.m
  - function obj=AOandGTG()

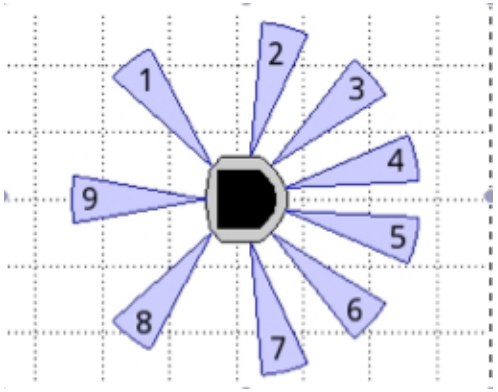
```
% Input your code below %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Propositional control gain %
obj.Kp = 0; (change this to see what happens)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Code

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

```
% Input your code below %
%%%%%%%%%%%%%%%%%%%%%%%%
% Weights for the nine sensors %
sensor_gains = [1 1 1 1 1 1 1 1 1];
(change this to see what happens)
%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%
% Weight for blending the gtg and ao vectors %
alpha = 0.5; (change this to see what happens)
u_ao_gtg = alpha*u_gtg+(1-alpha)*u_ao;
%%%%%%%%%%%%%%%%%%%%%%%%
```



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 AOandGTG.m
- Adjust sensor weights in AOandGTG.m
- Adjust controller blending weight in AOandGTG.m