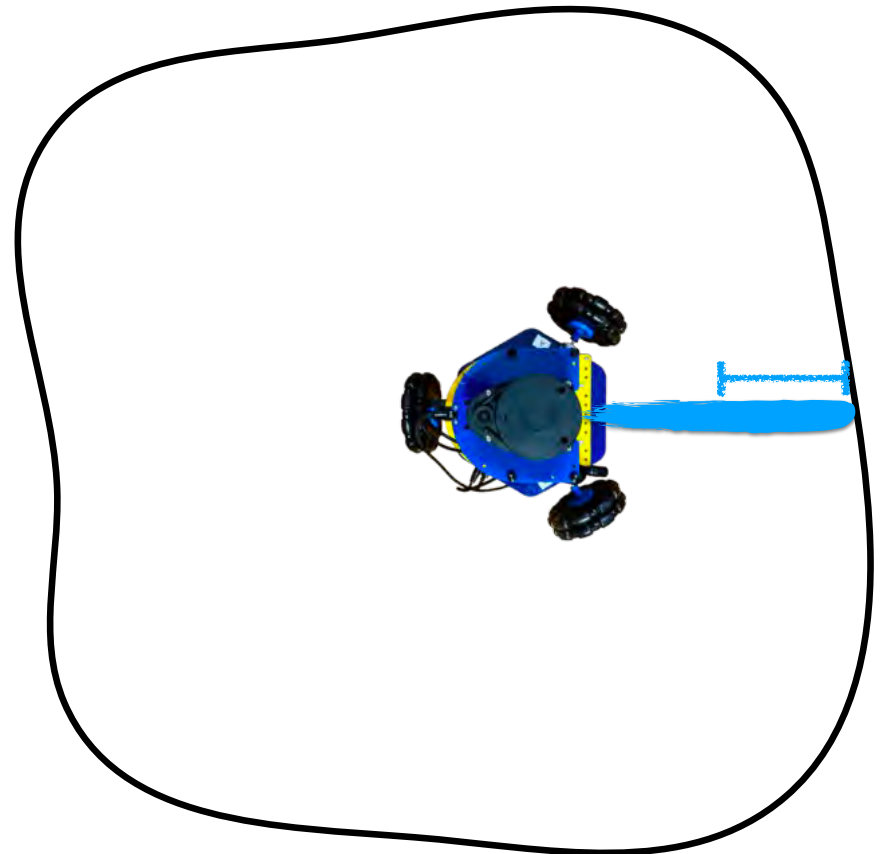


Robotics 102 (Sep 13 2021)

- Project 0 (Pocket Calculator)
- Continuing: Range scan conversion (if not already done)
- In-class Activity: Bang-Bang Control (optional, but encouraged)
- Open Q&A



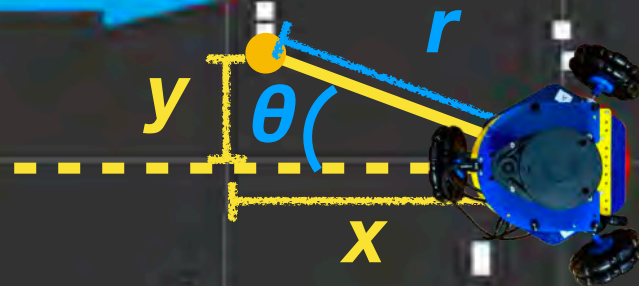
Last class: Convert range into point



Wrote a program to

Convert $r \theta$
into $x y$

Range
Data



Robot

Now

Move robot close to wall

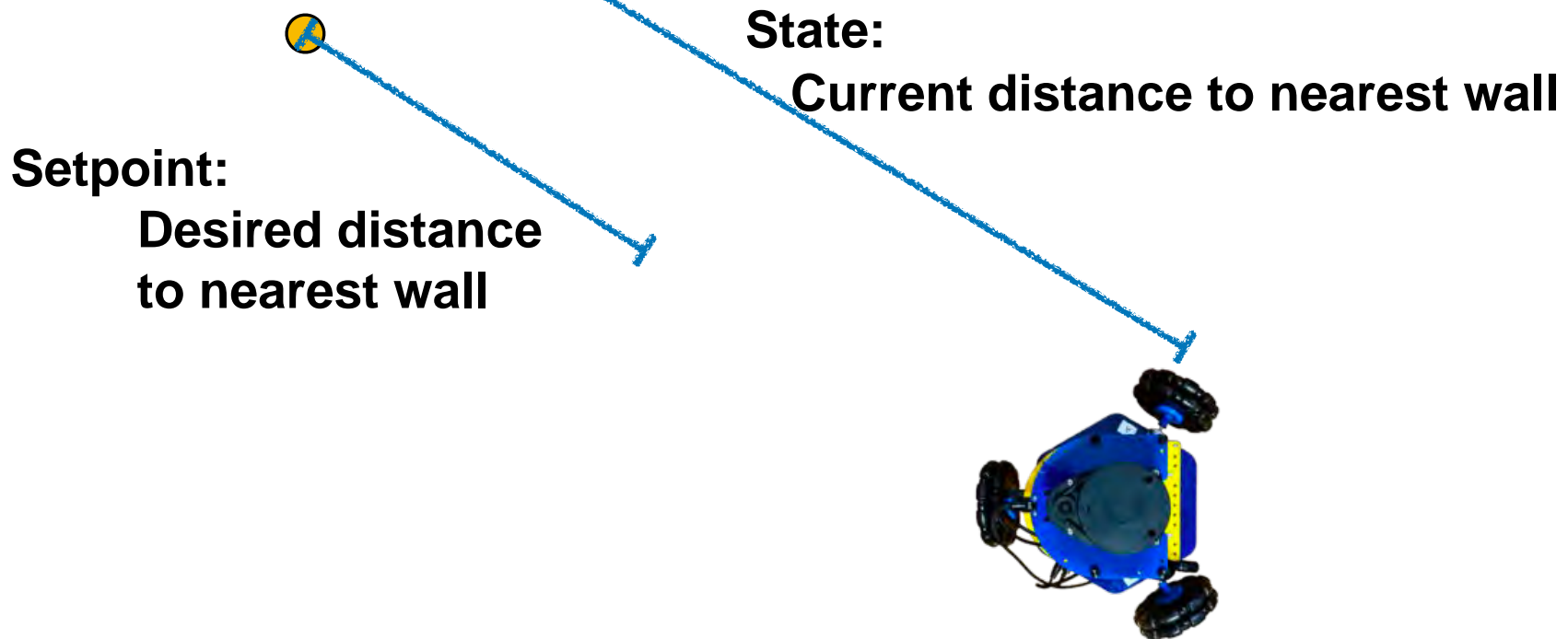


Current distance to nearest wall



Now

Move robot close to wall



Now

Move robot close to wall

Desired distance
to nearest wall

Current distance to nearest wall

How?



Now

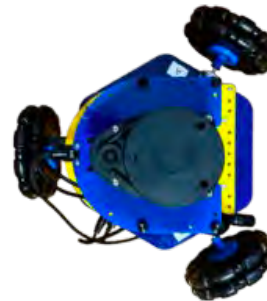
Move robot close to wall

**Desired distance
to nearest wall**

Current distance to nearest wall



**How does a
thermostat work?**



Setpoint Control



**Desired temperature
(setpoint state)**

**Current temperature
(current state)**

Bang-Bang Control



**Desired temperature
(setpoint state)**

**Current temperature
(current state)**

**If current state is
greater than setpoint,
turn on air conditioner**

**If current state is less
than setpoint,
turn on heater**

**If current state is
close enough to
setpoint, do nothing**

Repeat forever

Write a program for Bang-Bang Control

Asks user for 4 numbers:

Setpoint state

Initial state

Control magnitude: amount to change state

Allowable margin: as “close enough”

Main function performs an infinite loop that calls a Bang-Bang control function

At every loop iteration, output the desired state and the current state

**If current is greater than setpoint,
decrease temperature**

**If current is less than setpoint,
increase temperature**

**If current is close enough to setpoint,
do nothing**

Repeat forever

Testing



Try these inputs

Setpoint state: 77.9

Initial state: 72.4

Control magnitude: 0.1

Allowable margin: 0.2

**Once working,
show a course staff member your output**