

Programming Fundamentals

Lecture 3

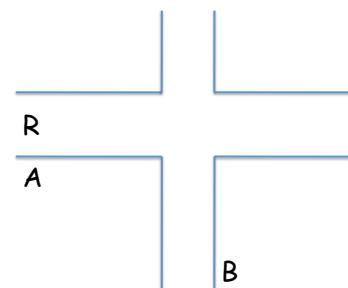
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Programming Fundamentals

- ★ Programming is about telling the computer what to do.
- ★ The computer can execute a limited set of actions
 - ◎ The actions need to be combined to enable it to accomplish sophisticated tasks.
 - ◎ A program is simply a combination of these actions.

- ## Programming Fundamentals
- ★ Imagine that you are programming robot R to move from point A to point B
 - ★ Robot R has very limited actions
 - ◎ walk one step ahead
 - ◎ turn left
 - ◎ turn right
 - ★ Assume it takes robot R 20 steps to complete each segment of the path

Programming Fundamentals



Programming Fundamentals

★Program

```
repeat 20 times: ahead  
    right  
repeat 20 times: ahead
```

Programming Fundamentals

★Programming concepts

- ◎Sequential steps
- ◎Counting loops

Programming Fundamentals

★Imagine that you are programming robot R to move from point A to point B

★Robot R has limited actions

- ◎walk one step ahead

- ◎turn left

- ◎turn right

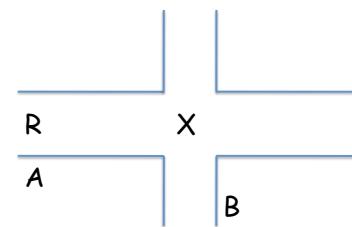
- ◎sense locations

- ◊Condition turning point

- ◊Condition final destination

★Assume no knowledge of the length of each segment

Programming Fundamentals



Programming Fundamentals

★Program

```
repeat  
    if at turning point X, right  
    if at final destination, stop  
    otherwise, ahead
```

Programming Fundamentals

★Program

```
repeat if not at final destination  
    if at turning point X, right  
    otherwise, ahead
```

Programming Fundamentals

★Programming concepts

- ◎Conditionals
- ◎Conditional loops

Programming Fundamentals

★Examples

- ◎Write a program to move robot R from A to B and from A to C
 - ◊Robot R knows the distances
 - ◊Robot R can sense turning points and final destination

```

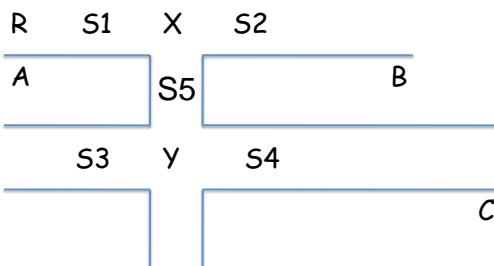
from A to C
1)
repeat s1 times: ahead
right
repeat s5 times: ahead
left
repeat s4 times: ahead
2)
while not at X
    ahead
    right
    while not at Y
        ahead
        left
    while not at destination
        ahead

```

from A to B

repeat s1+s2 times: ahead
while not at destination
 ahead

Programming Fundamentals



Programming Fundamentals

★Extra concept

◎Concurrency

- ❖ Enables the computer to execute tasks in parallel
- ❖ Enables the robot to do more than one thing at the same time

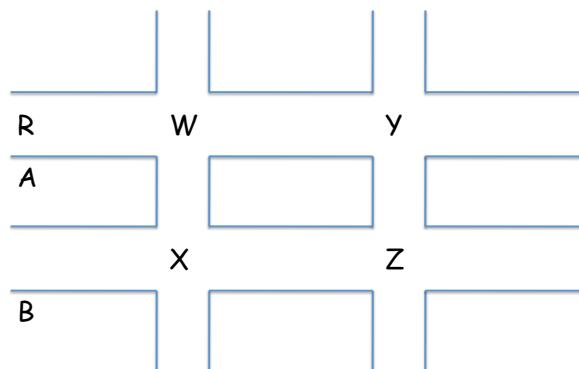
Programming Fundamentals

★There are always several options

◎Write a program to move robot R from A to B

❖ Robot R can sense turning points and final destination

Programming Fundamentals



Programming Fundamentals

★ Program 1

repeat if not at final destination
if at turning point
 W or X
 right
otherwise, ahead

★ Program 2

repeat if not at final destination
if at turning point
 Y or Z
 right
otherwise, ahead

Programming Fundamentals

★ Important programming goals

◎ Correctness

◎ Effectiveness

Programming Fundamentals

★ Summary

◎ Fundamental Concepts

◊ Sequential steps

◊ Conditionals

◊ Loops

 – Counting

 – Conditional

◊ Concurrency