CSC102
INTRO TO PROGRAMMING
WITH PYTHON

LECTURE 2
MICHAEL GROSSBERG
RUR-PLE

- **COMMAND**
  - move()
  - turn_off()
  - turn_left()
  - # This is a comment

- **ASSIGNMENT**
  - avance=move
RUR-PLE RULE 1

- Learning about computer programming is like learning to play a musical instrument: you have to do it, not simply read about it.
RUR-PLE RULE 2

- Write your computer programs to make them easy for people to read.

© Original Artist
I LIKE TO MOVE IT

☐ move()

☐ COMMAND

☐ ACTUALLY A PROCEDURE

☐ JUST “MOVE” WOULD BE A COMMAND .... NOT PYTHON

☐ THE PARENTHESIS TELL YOU IT DOES SOMETHING
DON'T CRASH

☐ REEBORG CAN'T GO THROUGH WALLS

That move really hurt!
Please, make sure that there is no wall in front of me!
SAVE POWER

☐ turn_off()

☐ ALWAYS TURN OFF YOUR ROBOT WHEN YOU ARE DONE

zzzz
REEBORG TURNS A CORNER

- `turn_left()`
- REEBORG CAN TURN IN ANY DIRECTION AS LONG AS IT IS LEFT
- WHAT DO YOU EXPECT FROM A ROBOT BOUGHT ON EBAY?
WRITE READABLE PROGRAMS

☐ # comments are for humans to read
NAME ≠ THING

Leci n’est pas une pipe.
ASSIGNMENT

☐ MOVE: A NAME WE GIVE TO AN ACTION

☐ WE CAN RE-NAME IT (ALMOST) ANYTHING WE LIKE

☐ avance=move

☐ WITHOUT PARENS IT IS THE NAME, WITH PARENS WE SAY “DO IT”
BEEPERS

- Beepers are just markers
- Pick one up
  - pick_beeper()
- Drop one
  - put_beeper()
- Number says how many
RUR-PLE WORLD FILE

- Walls and beepers part of RUR-PLE's world
- World file stores:
  - Locations of beepers
  - Locations of walls
  - Location of RUR-PLE
RUR-PLE PROGRAM FILE

WHAT REEBORG SHOULD DO
NEWSPAPER EXAMPLE

DELIVER NEWSPAPER HERE

NEWSPAPER = BEEPER
NEWSPAPER SOLUTION

move()
# climb step
turn_left()
move()
turn_left()
turn_left()
turn_left()
turn_left()
move()
move()
move()
# climb step
turn_left()
move()
turn_left()
turn_left()
turn_left()
turn_left()
turn_left()
turn_left()
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turn_left()
turn_left()
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move()

# put down newspaper and turn around
put_beeper()
turn_left()
turn_left()
turn_left()
# step down
move()
move()
move()
turn_left()
move()
turn_left()
turn_left()
turn_left()
...  
# move away and stop
move()
move()
turn_off()
RUR-PLE RULE 3: DRY

- **DRY = DON'T REPEAT YOURSELF**

- **IF YOU HAVE TO COPY AND PASTE CODE OVER AND OVER YOU ARE DOING SOMETHING WRONG**
LEFT TURN ONLY

- TURN_LEFT()
- TURN_LEFT()
- TURN_LEFT()
- = RIGHT_TURN()
- MAKE OUR OWN RIGHT TURN PROCEDURE
DEFINE YOUR RIGHTS

- DEF STATEMENT

```python
def right_turn():
    left_turn()
    left_turn()
    left_turn()
```

- INDENT 4 SPACES, NEVER TAB
- DEFINES A NEW PROCEDURE CALLED "RIGHT_TURN"
STEP UP

DEFINE A CLIMB STEP PROCEDURE

```python
def climb_step():
    turn_left()
    move()
    turn_left()
    turn_left()
    turn_left()
    turn_left()
    move()
    move()
```
DEFINE A STEP DOWN PROCEDURE

```python
def step_down():
    move()
    move()
    turn_left()
    move()
    turn_left()
    turn_left()
    turn_left()
```

Wednesday, September 1, 2010
new solution

move()
climb_step()
climb_step()
climb_step()
climb_step()
# put down newspaper
put_beeper()
# turn around
turn_left()
turn_left()
step_down()
step_down()
step_down()
step_down()
# move away and stop
move()
turn_off()
MORE REFACTORING

move()
climb_four_steps()
put_down_newspaper()
turn_around()
four_steps_down()
move()
turn_off()
def climb_four_steps():
    climb_step()
    climb_step()
    climb_step()
    climb_step()

STILL NOT DRY

def climb_four_steps():
    repeat(climb_step, 4)

ARGUMENTS

REPEAT

PROCEDURE
PICK UP LINE

- WE CAN DO IT IF WE KNOW BEEPER LOCATIONS
- WHAT IF WE DON'T?
- BETTER: PICK UP BEEPER IF ITS THERE!
ARE WE THERE YET?

- **HOW DO WE KNOW WE ARE DONE? TEST:**

  - next_to_a_beeper()

- **TRUE OR FALSE**

- **HOW DO WE LET KNOWLEDGE EFFECT OUR DECISIONS?**
NEED A REST STOP?
BRANCH ON BEEPER

IF YES
PICK UP

NO

NEXT TO A BEEPER?
def move_and_pick():
    move()
    if next_to_a_beeper():
        pick_beeper()

if something_is_true():
    do_thisThing()
MORE TESTS

- REEBORG SENSORS
  - front_is_clear()
  - left_is_clear()
  - right_is_clear()
THIS OR THAT

GO WITH THIS DO THIS, GO
WITH THAT DO THAT

def move_if_possible():
    if front_is_clear():
        move()
    else:
        turn_off()
THANKS