

Wednesday, August 24th, 2011 – Playing with NetLogo turtle graphics...

observer> cro 16 Create 16 Ordered Turtles (Note: crt creates random direction turtles)
turtles> fd 16 Forward 16 steps using the fd command: fd n steps fd 10 fd 8 fd 5.5
turtles> bk 8 Backward or backup 8 steps: bk n to backup n steps bk 1 or bk 12 or bk 3.5
turtles> set shape "airplane" Tools menu, Turtle Shapes editor to see the choices of images for the turtle agent.
turtles> set size 3 Set the size of the turtles
turtles> pd pd for PEN DOWN, i.e. drag your tail and leave a trail, turtle. Turtle graphics!
turtles> fd 3 Draws a line 3 units long, since the pen is down
turtles> pu pu is Pen Up. No graphics trails is left from here on. No drawing. Tail is up, no trail.
turtles> fd 3
turtles> pd
turtles> repeat 4 [fd 2 rt 90 wait 0.5] Repetition of the statements within the SQUARE brackets [] – 4 times.
turtles> pu
turtles> bk 10
turtles> set size 1 set the size of the turtles back to size 1, the default.
turtles> pd
turtles> square Teach the turtle a new word so it knows how to do squares.
turtles> repeat 36 [square rt 10] Draw a spiral of 36 squares. What is 36 times 10?

observer> ca ca is for clear all. The ca command erases all drawing and deletes all turtles.

observer> cro 16 ← **Note: the observer prompt instead of the turtles prompt! VIP!**

turtles> fd 8
turtles> pd
turtles> square
turtles> repeat 36 [square rt 10]
turtles> pu
turtles> fd 4
turtles> ht Hide Turtles = ht. Use ht to make the turtles invisible.
turtles> st Show Turtles with the st command.

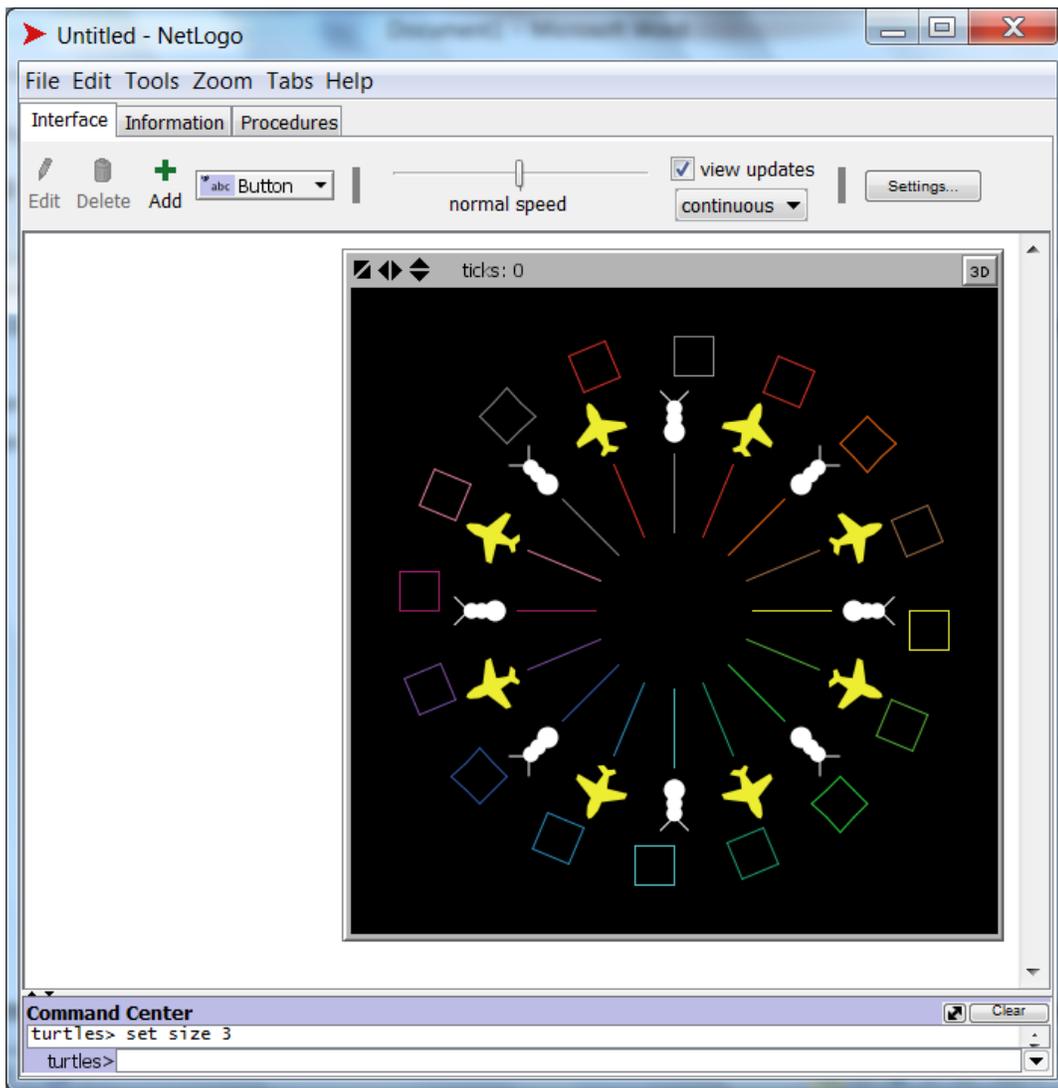
turtles> if xcor > 0 and ycor > 0 [set color white] ← What did this command do?
turtles> if (xcor <= 0) and (ycor <= 0) [set color red] ← What did this one do? Which area of grid got RED turtles?

turtles> if remainder who 2 = 0 [set shape "bug"] ← What did this command do?
turtles> if remainder who 2 = 0 [set shape "bug" set color blue]

<http://www.cs.uni.edu/~jacobson/logo/applets/Mod3turtlesREMAINDER3.html> ← Try out my if remainder example.

What is the “who number” for a turtle? What are the results when you divide by 3 instead of 2? 0 or 1 or 2 for the remainder. How did we find out a specific who number for a turtle when working in NetLogo?

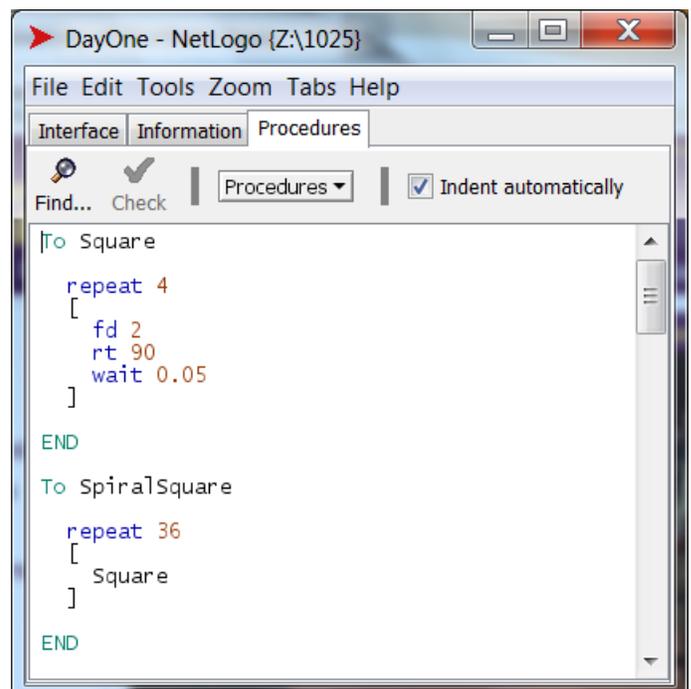
See <http://www.cs.uni.edu/~jacobson/logo/applets/FlyFishing.html> again for another example of using who numbers in combination with if or with ifelse and the remainder operation. Click the Flying and Fishing button to see Airplanes flying and Fish swimming. Click the See All Shapes button to see most of the different turtle shapes that are available.



Here is a 12 minute long video review of using NetLogo from August 29th, 2010.

<http://www.cs.uni.edu/~jacobson/025/f10/v1/LOGOAug29th.html>

Also an email note review: <http://www.cs.uni.edu/~jacobson/025/dayOne025.txt>



1. ca - clear all is abbreviated ca for clear all

Any turtles created with cro or crt are destroyed and removed from the turtle GRID world.

Any drawings that have been created are erased. Drawing would have been created with turtles moving about with their PD Pens Down, or pd tails dragging.

2. cro - cro 8 create ordered turtles and since $\frac{360}{8} = 45$ degrees,

the heading or directions of the 8 turtles would be:

0 and 45 and
90 and 135 and
180 and 225 and
270 and 315

cro 36 create ordered turtles with each turtle facing 10 degrees more than the first turtle.
Headings would be 0, 10, 20, 30, ... , 340, 350 degrees for the 36 turtles.

3. crt n crt 10 creates 10 turtles, but they have random headings.
crt 8 creates 8 turtles, located at (0,0) the same as cro would do, but they have totally random headings.

You discover the random headings or directions the turtles are facing when you do the command fd n, such as:

```
ca
crt 16
ask turtles [ fd 8 ]
```

would show you that the turtles were facing every which way, and NOT facing a very symmetric 0, 22.5, 45, 67.5, 90, ... etc.

Do you understand the difference between CRO and CRT now?

4. turtles - two vip facts about any turtle at any moment: position and heading

turtles have a position (or location)... 2D = 2 dimensional space = 2D space

The default position of any turtle created with cro or crt command is (0, 0), which is the very center of the GRID of patches, the very center of the turtles 2D world.

turtles have a heading, or a direction that they are facing and will move in when asked to go forward with the fd command.

5. pu = pen up - pu or pen up or turtle tail up is the DEFAULT. Any turtle created by cro or crt will be DEFAULT have its pen up.

pd = pen down - turtle will leave a trail or draw a line when it moves when its pen is down.

6. fd n - tells the turtle to move forward n steps or a length of n grid units.

```
fd 5 moves the turtle forward 5 steps.
fd 14 moves the turtle forward 14 steps or grid units.
```

If a turtle was facing due NORTH on the grid and at center square, i.e. its position was (0,0), and we told it to move forward 5 units, with fd 5 command, where would it be?

(0, 5) would be the location of the turtle.

Note: WE DID NOT COVER POSITION YET BUT WILL DURING CLASS #4 on MONDAY.

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If a turtle was facing to the left, i.e. to due west on the grid, and at (0, 0) or the default start location for all turtles, and we said:

```
fd 14
the turtles
location would now be (-14, 0)
```

```
bk n   examples   bk 3   tell to turtle to move or walk backwards or back
bk 14   - - - - -
bk 5    3 or 14 or 5 or 12 steps.
bk 12
```

```
7. rt n   turn right n degrees   rt = RightT   examples   rt 45   rt 90   rt 10
lt n     turn left n degrees    lt = LeftT   examples   lt 120  lt 180  lt 14   lt 5
```

Note: The following two commands would result in exactly the same heading for any turtle, i.e. are two ways of a turtle obeying an about face command:

```
rt 180      and      lt 180
```

It just depends on whether you want the turtles to turn clockwise or to turn counterclockwise.

In any case, every computer would do this SO FAST, you would not be able to tell which way the turtle turned!

8. repeat n [what statements you want repeated n times]

```
repeat 4 [ fd 10 rt 90 ]   draws a square with side length 10 units,
                           if the PD pen is down with pd.
```

You don't see the square that the turtle traced if the pu pen was up with pu instead of pd.

So don't forget to put the pen down with PD when you want to DRAW some graphics with the turtles!