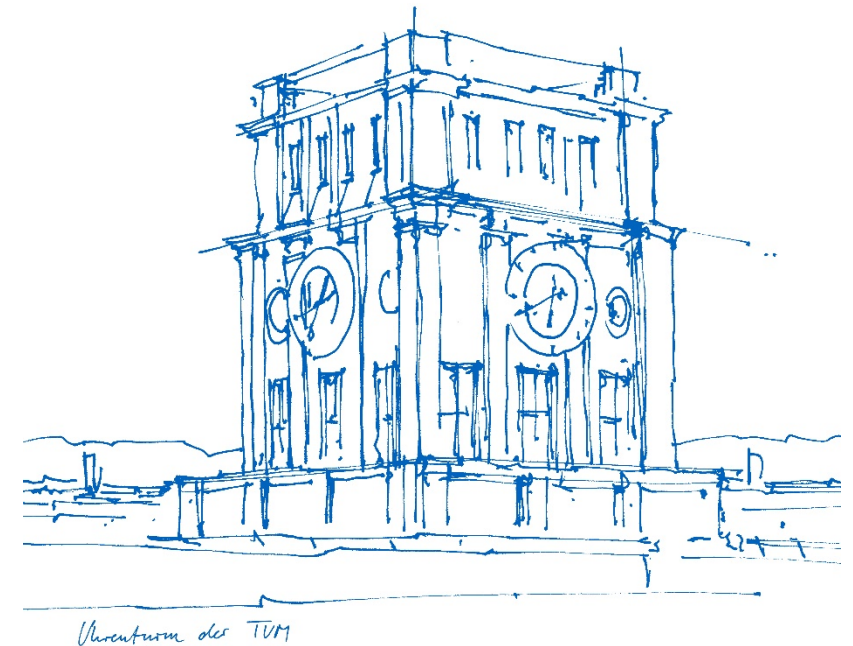# Simulation - Übung

Jürgen Pfeffer

Technical University of Munich

Bavarian School of Public Policy

juergen.pfeffer@tum.de | @JurgenPfeffer
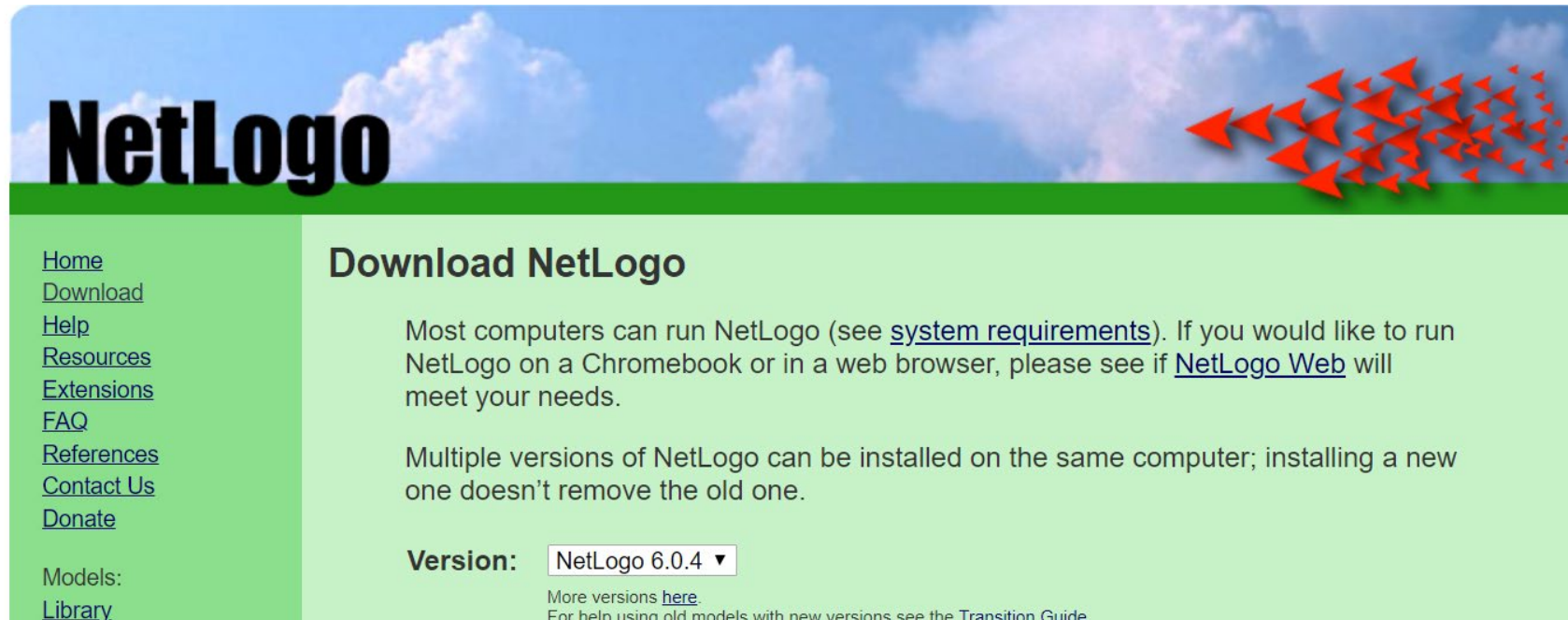
Uhrenturm der TUM

Download NetLogo

Please download: NetLogo (google it)

- http://ccl.northwestern.edu/netlogo/.....

Versions available: Mac OS X, Windows, Linux
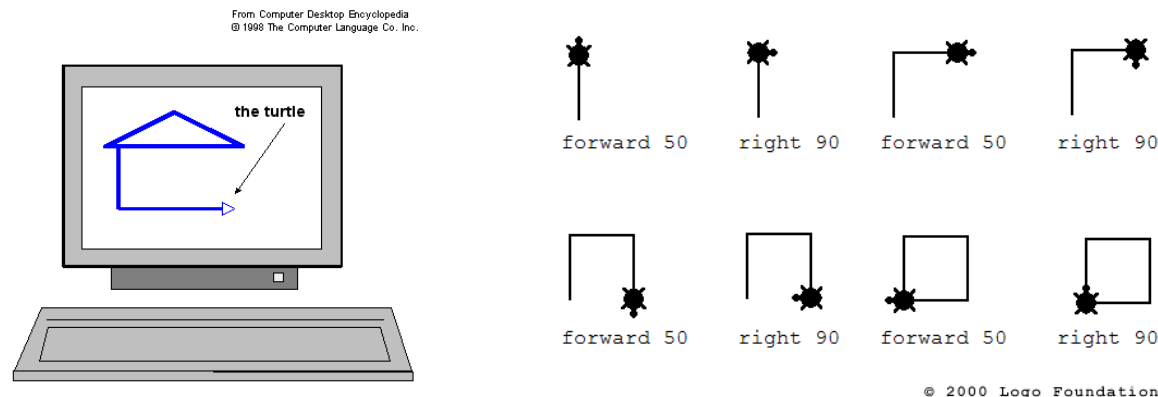
StarLogo/NetLogo

Agent-based simulation language

Developed at MIT (Mitchel Resnick, Eric Klopfer, etc.)

Predecessor: Logo (1967)

StarLogo TNG: User friendly for kids, harder to make mistakes

NetLogo: More agents possible, much faster, more complicated behavior, controllable via Java

From Computer Desktop Encyclopedia
© 1998 The Computer Language Co. Inc.

the turtle

forward 50   right 90   forward 50   right 90

forward 50   right 90   forward 50   right 90
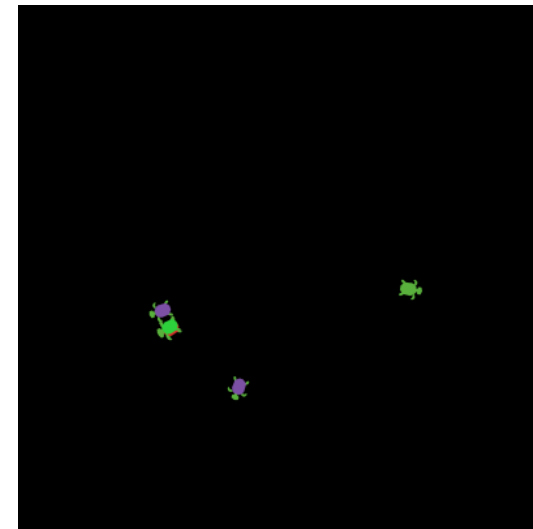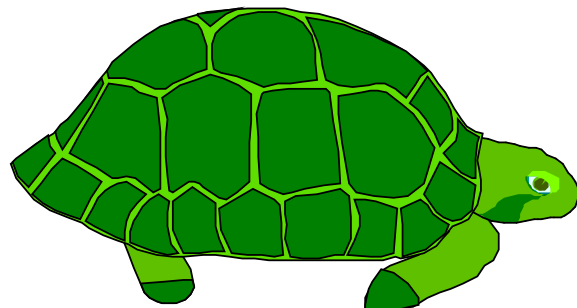
© 2000 Logo Foundation

Basic Ideas

Main elements of modeling: Turtles
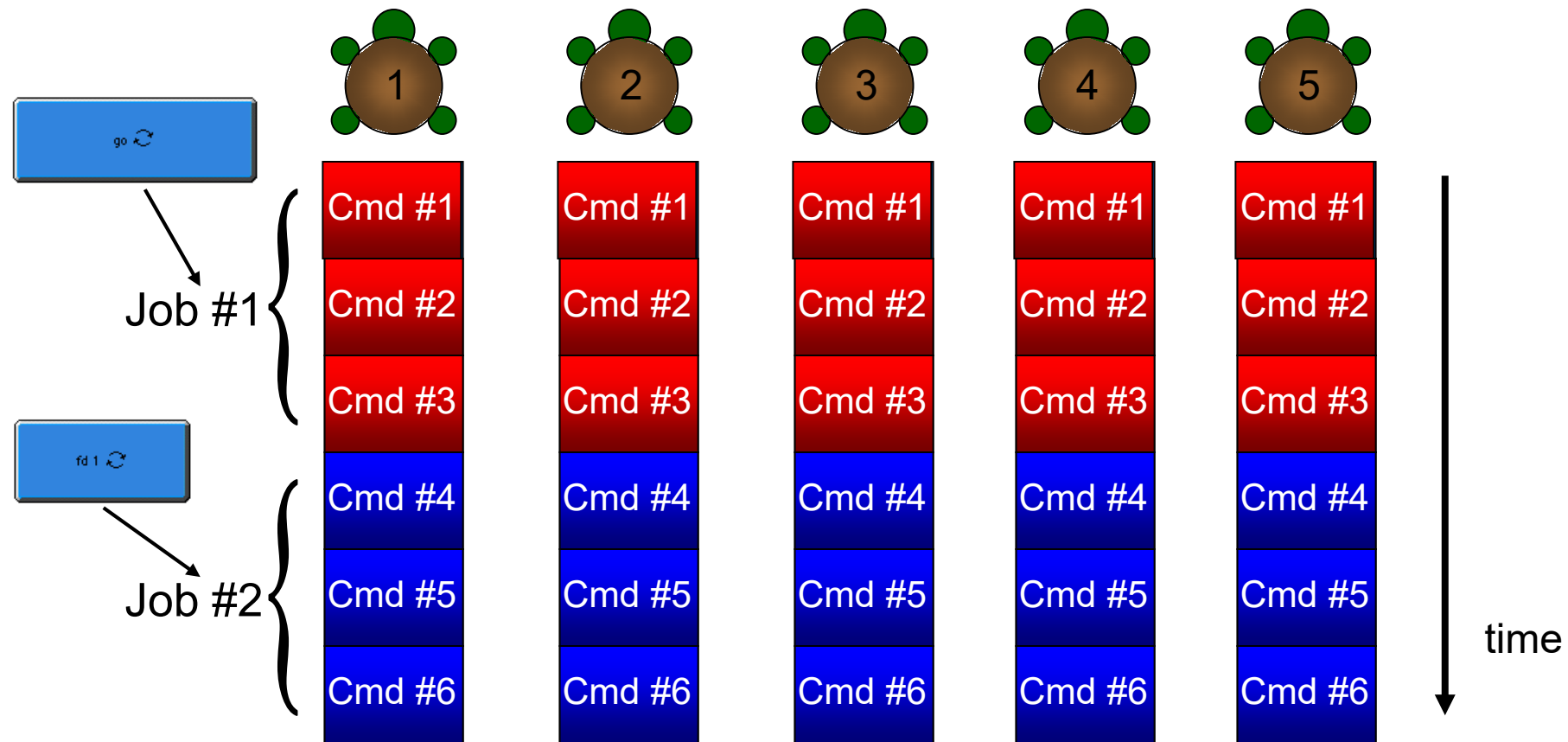
Turtles move around a grid-based world (no borders)

Many turtles

Observer: Global activities (e.g. create turtles)

Patch: Background grid (e.g. used for resources)

Many Turtles – One Code

go

fd 1

Job #1

Job #2

1	2	3	4	5
Cmd #1	Cmd #1	Cmd #1	Cmd #1	Cmd #1
Cmd #2	Cmd #2	Cmd #2	Cmd #2	Cmd #2
Cmd #3	Cmd #3	Cmd #3	Cmd #3	Cmd #3
Cmd #4	Cmd #4	Cmd #4	Cmd #4	Cmd #4
Cmd #5	Cmd #5	Cmd #5	Cmd #5	Cmd #5
Cmd #6	Cmd #6	Cmd #6	Cmd #6	Cmd #6

time

Command Center

Observer:
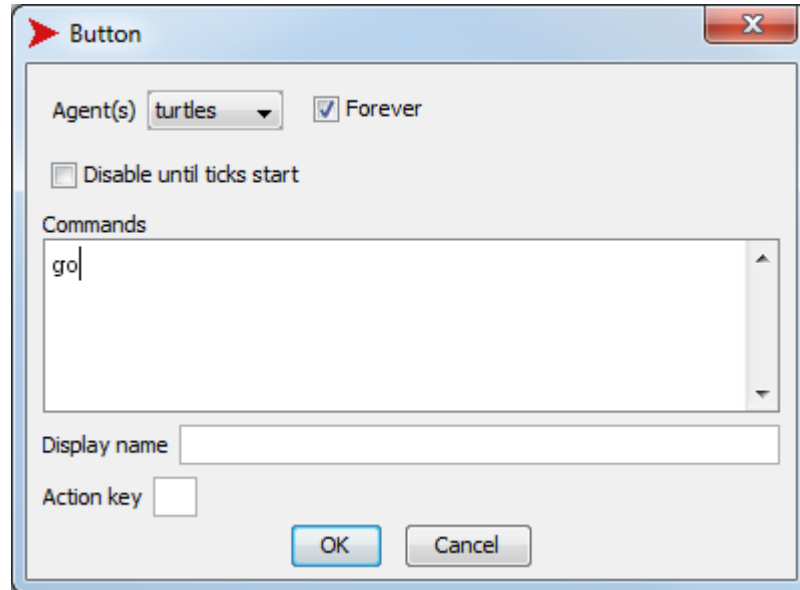
```
crt 20
```

Turtles:

```
fd 10

rt 180

fd 2

lt 45
```

Procedures

```
to go

  rt 10

  fd 1

end
```
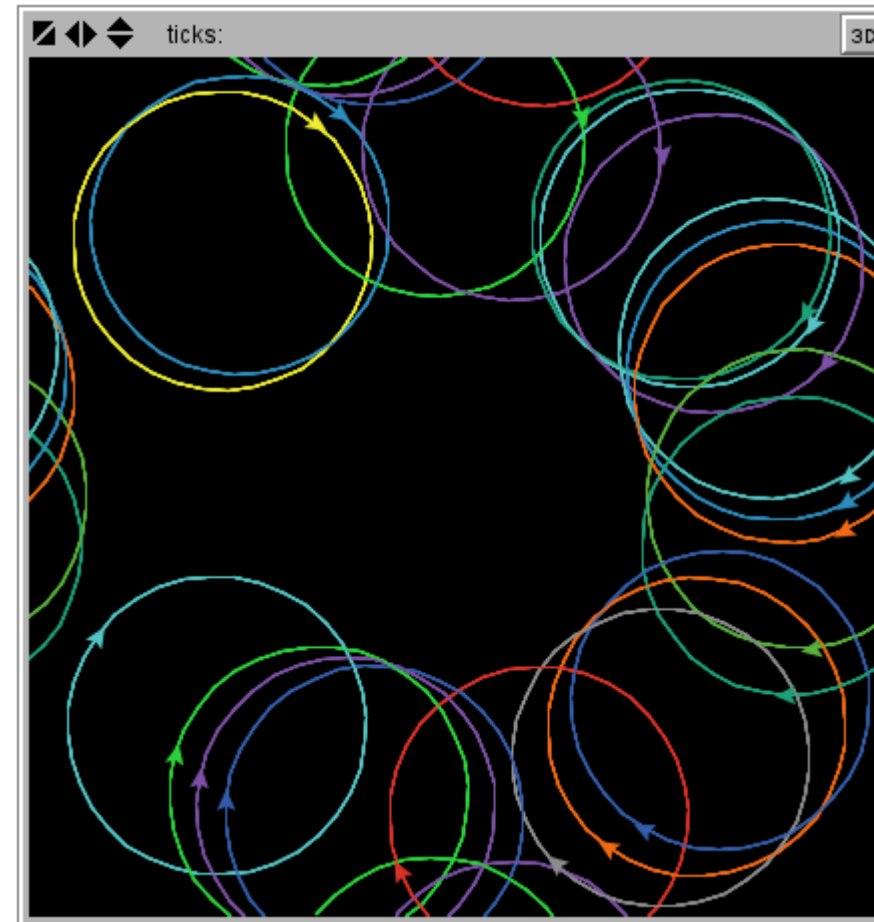
Interaction Elements

Drawing With Turtles

`pd` (=pen down)

`pu` (= pen up)

`cp` (=clear pen drawing)

Destroy the Turtle World

`ct` (=clear turtles)

`ca` (=clear turtles & reset patches

Trust to Change

`random` (n creates a random number [0 – (n-1)])

`rt random 180`

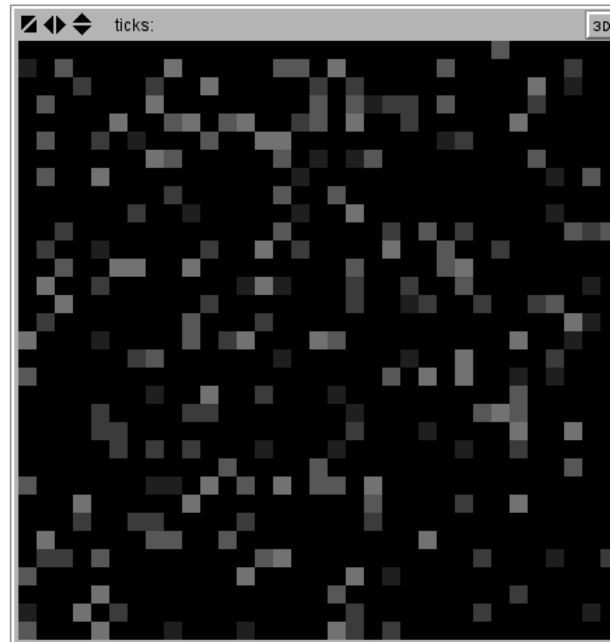Procedure:

```
to waggle
      rt random 30
      lt random 30
end
```

→ Change the go procedure to call wiggle instead of rt 10

Communicating Through Patches

Only visible on that patch

Useful for communicating information to all turtles on that location (i.e. infection)

Draw Patch & Conditions

Observer:

```
ask patches with [pxcor > 5 and pxcor < 10 and
pycor > 5 and pycor < 10] [set pcolor blue]
```

Procedure:

```
to go

…

   if [pcolor] of patch-ahead 1 = blue [rt 90]

…

end
```

Death Zone

```
ask patches with [pxcor < -5 and pxcor  > -10 and pycor < -5 and
pycor > -10] [set pcolor red]
```
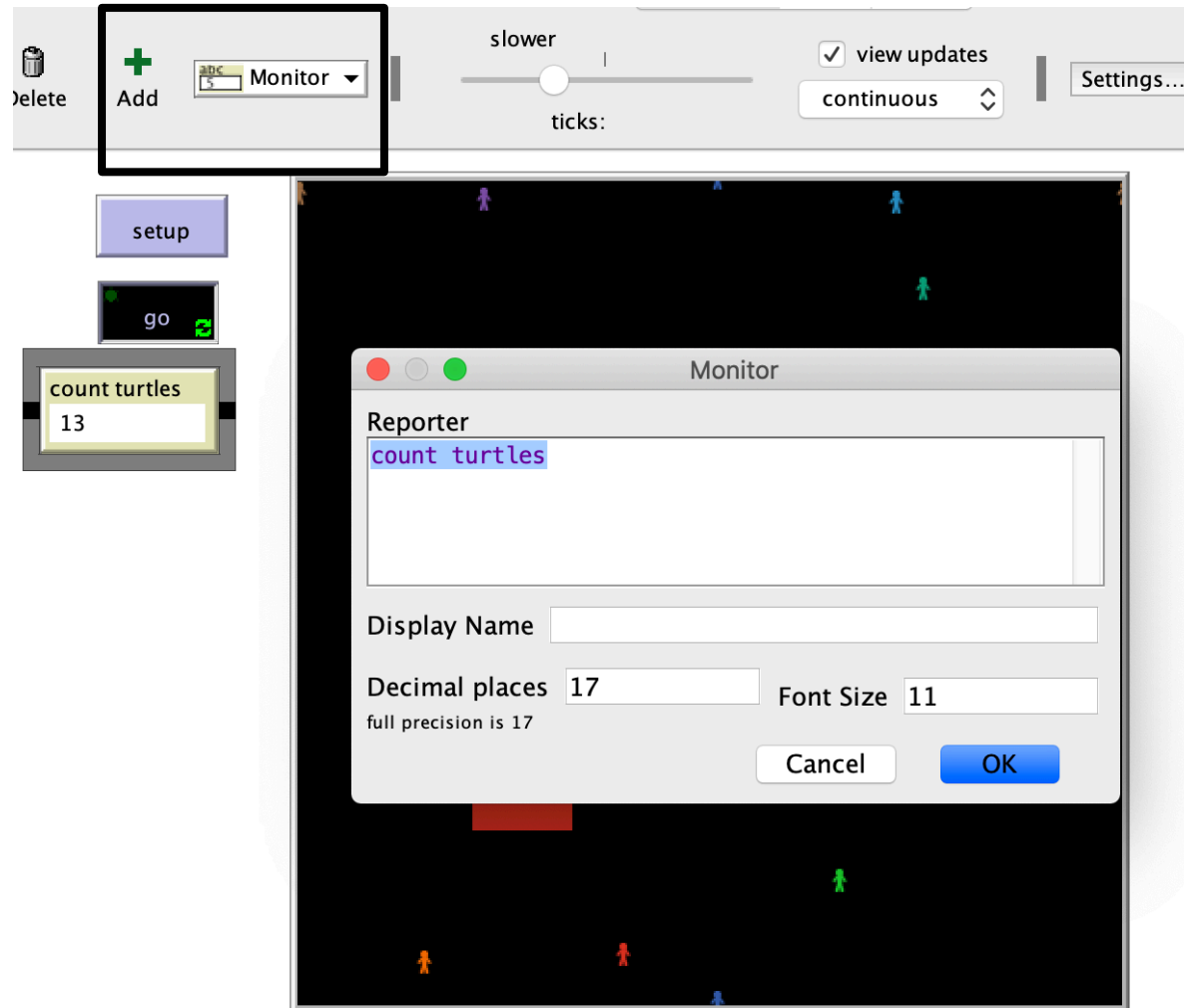
Procedure:

```
to go

…

   if [pcolor] of patch-here = red [die]

…

end
```

Add Monitor

Reproduction Zone

```
ask patches with [pxcor > 5 and pxcor  < 8 and pycor > -8 and pycor
< -5] [set pcolor green]
```

Procedure:

```
to go

…

if [pcolor] of patch-here = green [hatch 1 [set color green fd 5]
fd 5]

…

end
```
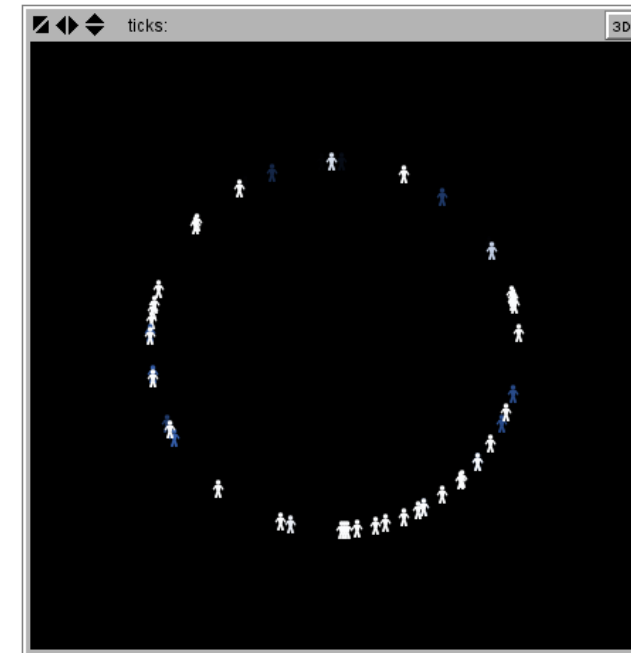
Humans and Variables

```
turtles-own [energy]

to setup
 crt 50 [fd 5
    set shape "person"
    set energy random 50
    farbe
  ]
…
end

to go
  set energy energy - 0.1
  farbe
  if (energy < 0) [die]
  fd 1
end

to farbe
  set color scale-color green energy 0 50
end
```
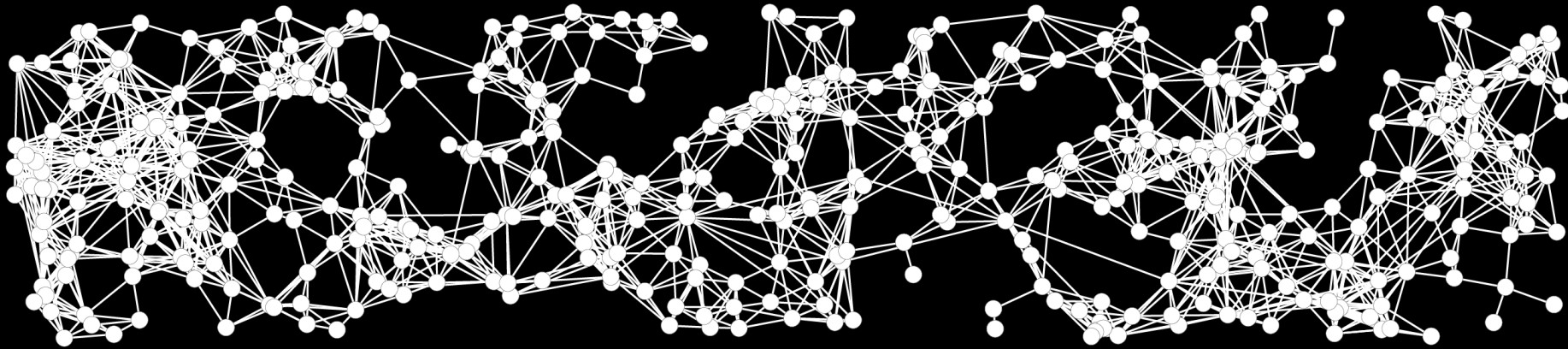
"Our mission is to go forward, and it has only just begun.
There's still much to do, still so much to learn. Engage!"
Jean-Luc Picard, Star Trek TNG, Season 1 Episode 26

Juergen.Pfeffer@tum.de   @JurgenPfeffer
Mirco.Schoenfeld@tum.de