Assignment 2 Answers&Instruction

Assignment for Supervision 2 - Answers

Question 1. Click the `Info` tab below the `Menu bar`. Under `HOW IT WORKS`, you can find the rules of the game. Rules can be summarised as the four points below.

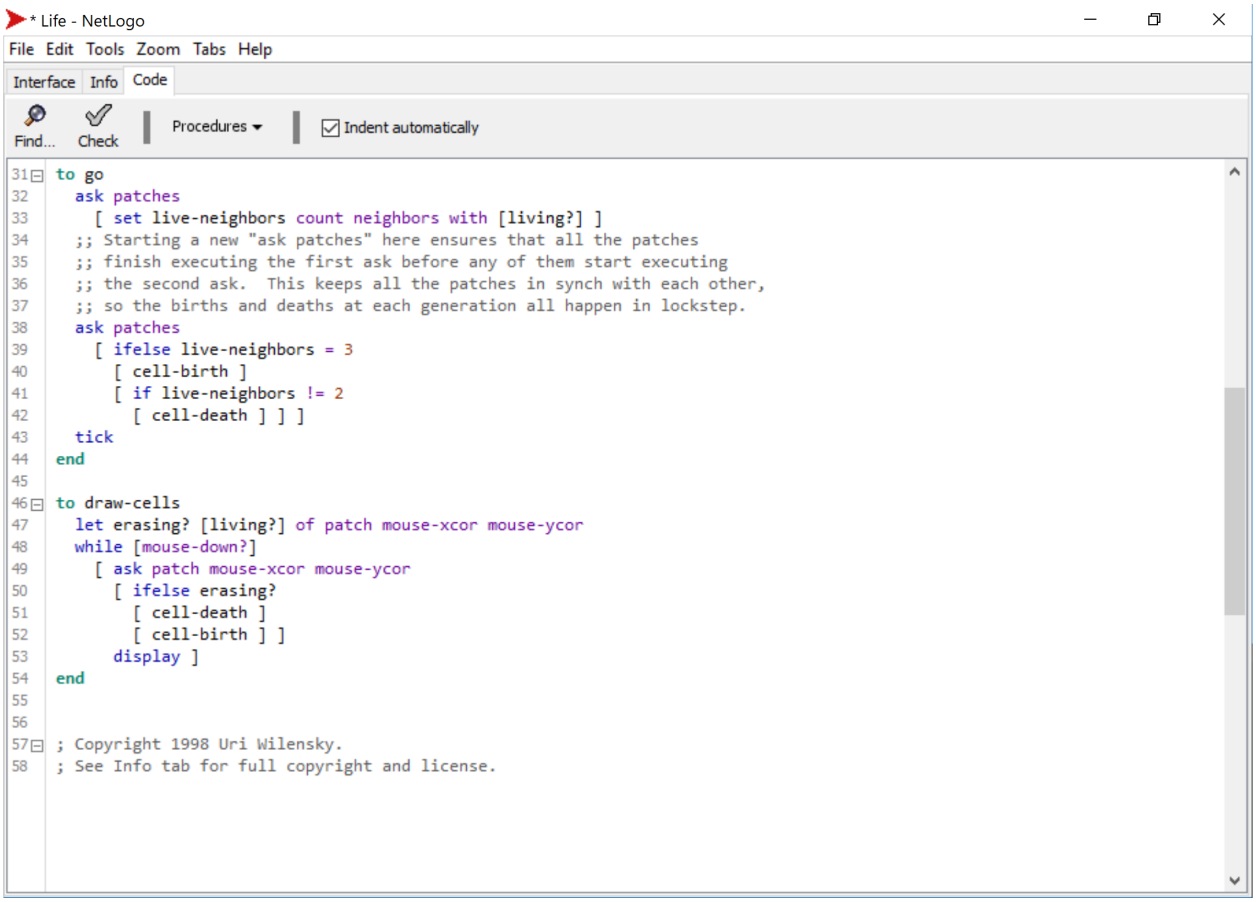
1. If there is exactly 3 alive neighbors, the cell becomes alive. (birth)
2. If there are less than 2 alive neighbors, the cell dies. (under-population)
3. If there are more than 3 alive neighbors, the cell dies. (over-population)
4. If there are 2 alive neighbors, the cell remains in the state it is in. (sustainable life)

1-1. Try writing these into NetLogo code using `if` (http://ccl.northwestern.edu/netlogo/docs/dict/if.html) statement, one line of code for the first three points (Note: You don't need to worry about the 4th point because it doesn't change the cell state). Model answer:

1. `if live-neighbors = 3 [ cell-birth ]`
2. `if live-neighbors < 2 [ cell-death ]`
3. `if live-neighbors > 3 [ cell-death ]`

1.2. Explain how these three lines of code can be shortened to line 39-42 written in the model.

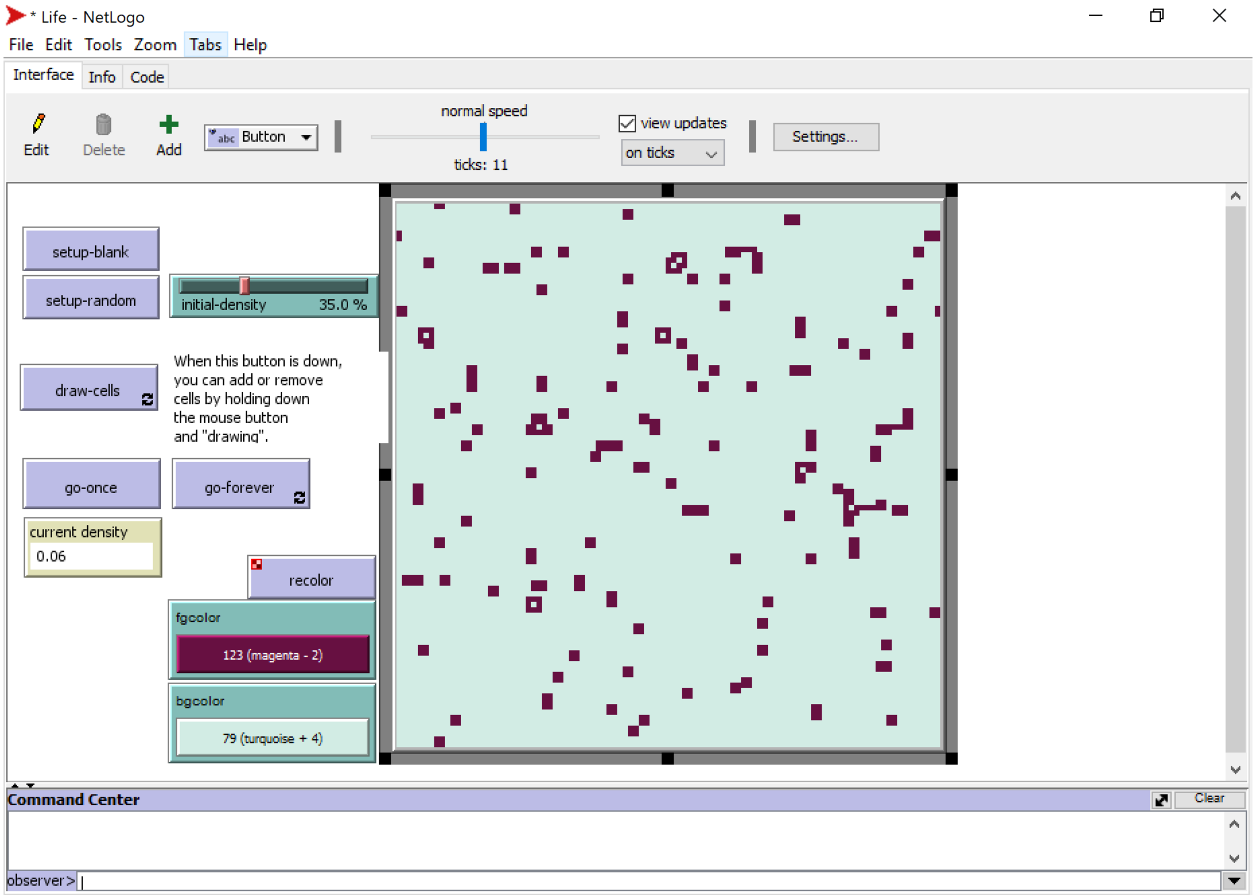
- Model answer: `if live-neighbors < 2 [ cell-death ]` and `if live-neighbors > 3 [ cell-death ]` can be combined to `if live-neighbors != 2 [ cell-death ]` as `[ elsecommands ]` of the `ifelse` command if no `if live-neighbors = 3 [ cell-birth ]` reports true.




```
31 to go
32   ask patches
33     [ set live-neighbors count neighbors with [living?] ]
34   ;; Starting a new "ask patches" here ensures that all the patches
35   ;; finish executing the first ask before any of them start executing
36   ;; the second ask.  This keeps all the patches in synch with each other,
37   ;; so the births and deaths at each generation all happen in lockstep.
38   ask patches
39     [ ifelse live-neighbors = 3
40       [ cell-birth ]
41       [ if live-neighbors != 2
42         [ cell-death ] ] ]
43   tick
44 end
45
46 to draw-cells
47   let erasing? [living?] of patch mouse-xcor mouse-ycor
48   while [mouse-down?]
49     [ ask patch mouse-xcor mouse-ycor
50       [ ifelse erasing?
51         [ cell-death ]
52         [ cell-birth ] ]
53       display ]
54 end
55
56
57 ; Copyright 1998 Uri Wilensky.
58 ; See Info tab for full copyright and license.
```

Question 2. In line 33, try changing `neighbors` to `neighbors4` and run the model. Observe and explain how this change affects the simulation. (Refer to `neighbors4`(http://ccl.northwestern.edu/netlogo/docs/dict/neighbors4.html).)

- Model answer: Changing from `neighbors` to `neighbors4` reduces the number of a cell's neighbours from 8 to 4. This makes it more difficult to have `cell-birth` because the chance of having 3 alive neighbors out of 4 is lower than out of 8. This makes the cells die out and at initial density of 35%, by about tick 11, the remaining alive cells do not change the state anymore.



Question 3. Let's add one additional command to the model. Add the following lines below the `to cell-death` part. Explain this rule in your own words.

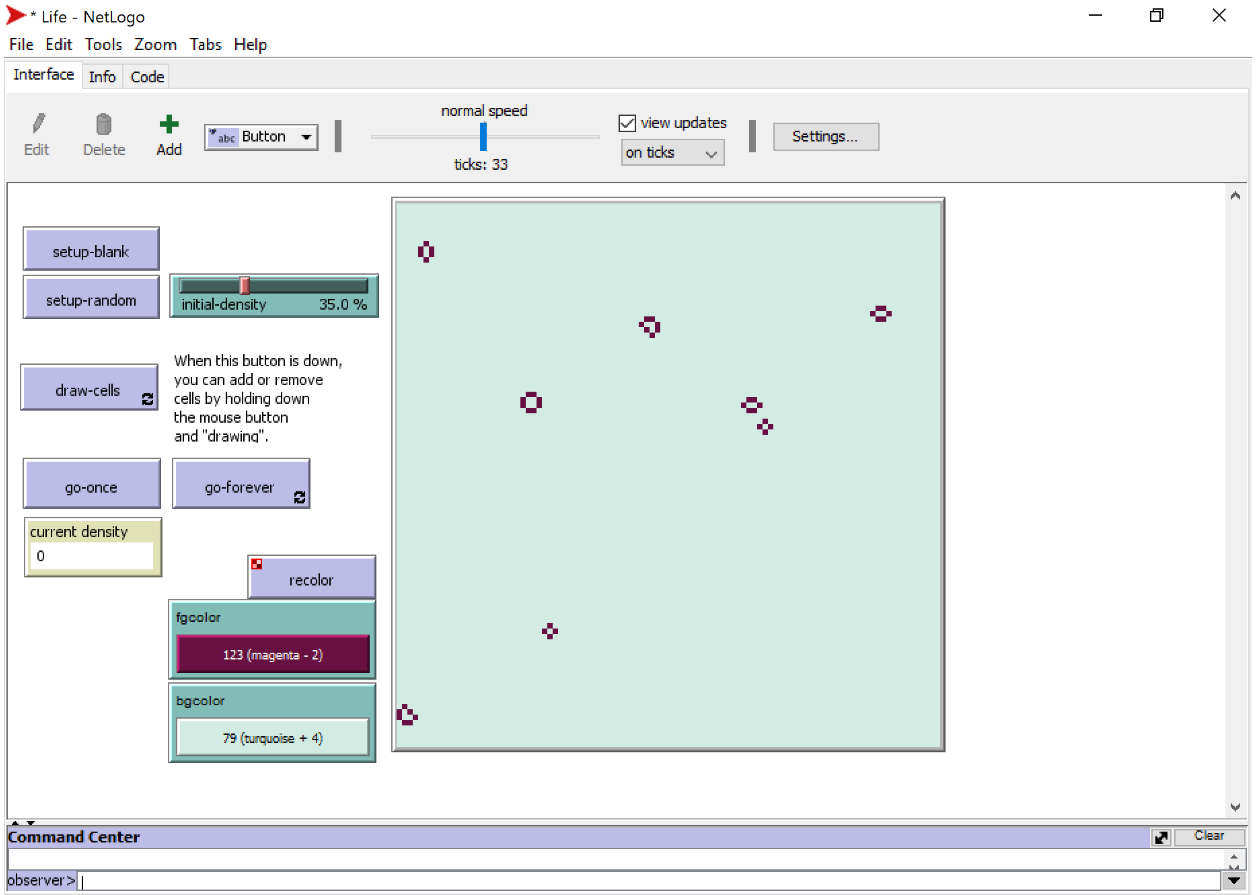
```
to zombie-birth
  set living? true
  ask neighbors [ cell-death ]
  set pcolor green
end
```

- Model answer: Begin a command procedure of `zombie-birth` and set these cells as living cells. Make these zombie cells kill their eight surrounding patches (neighbors) by making them run the [cell-death] command. Color these zombie cells green.

Question 4. Let's add a new rule for `zombie-birth`. Add the following lines below the `ask patches [ ifelse ]` part. This rule runs the same ifelse command on the 1,000 randomly chosen patches, this time for `zombie-birth`. (Note: `n-of`(http://ccl.northwestern.edu/netlogo/docs/dict/n-of.html)). Run the model and explain how this change affects the simulation.

```
ask n-of 1000 patches
  [ ifelse live-neighbors = 3
    [ zombie-birth ]
    [if live-neighbors != 2
      [ cell-death ] ] ]
```

- Model answer: The green zombie cells kill the alive cells and by around tick 33, the remaining alive cells do not change the state anymore (survivors).



Question 5. In 500 words, explain how the concept of game of life can apply to planning-related studies. Suggested reading includes the following and you can also refer to other materials that you find. In-text citation is encouraged.

- Dounas, T. et al. (2017) 'Dense Urban Typologies and the Game of Life: Evolving Cellular Automata', in Çağdaş, G. et al. (eds) Proceedings of the 17th International Conference on Computer Aided Architectural Design Futures, Istanbul Technical. Levent, Istanbul: Cenkler Matbaa, pp. 648–666. Available at: http://papers.cumincad.org/data/works/att/cf2017_648.pdf.
- Pinto, N. N. and Antunes, A. P. (2007) 'Cellular automata and urban studies: a literature survey', ACE: architecture, city and environment, 1(3), pp. 368–399. doi: 10.5821/ace.v1i3.2378. Available at: https://www.research.manchester.ac.uk/portal/files/22523283/POST-PEER-REVIEW-PUBLISHERS.PDF
- Model answer: We will show some good answers from students at the revision supervision and discuss.