
SCI131 Code Guide

Computing Basin Boundaries in Julia

Mahnoor Qadri

Supervised by Claire Postlethwaite and Matthew Egbert

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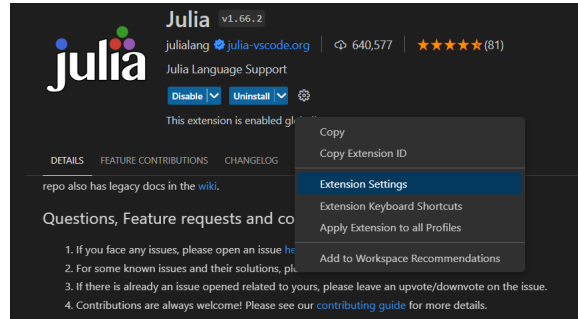
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1 Getting Started

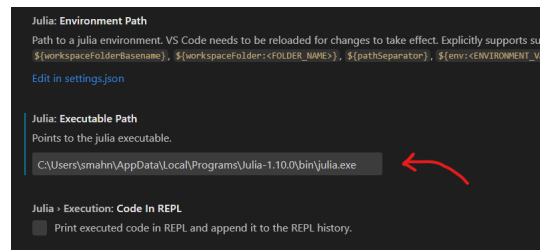
1.1 Downloading Julia in VSCode

Download the relevant repository from GitHub: <https://github.com/s-mahnoor-q/viabilitysystem>
Download Julia v1.10.0: https://julialang.org/downloads/#current_stable_release

I will be using VSCode as my virtual environment, though it is also possible to use the Julia terminal. In VSCode Extensions, download the Julia language extension:



You may notice that the version in Extensions does not match the version of Julia downloaded. To change this, click 'Extension Settings', and change the executable path to the directory of Julia v1.10.0:



1.2 Setup

Open the clone of the github repository in VSCode. Press **Alt + J**, **Alt + O** to open the Julia REPL terminal. In order to check the version of packages, into the terminal type `]` **status**.

At the time of publishing, this is the following set of packages used in the environment:

```
1 (viabilitysystem) pkg> status
2 Status 'C:\Users\smahn\OneDrive\Documents\Github Repos\viabilitysystem\
  Project.toml'
3 [f3fd9213] Attractors v1.13.6
4 [0f109fa4] BifurcationKit v0.3.3
5 [0c46a032] DifferentialEquations v7.12.0
6 [61744808] DynamicalSystems v3.2.4
7 [e9467ef8] GLMakie v0.9.5
8 [1ecd5474] GraphMakie v0.5.9
9 [86223c79] Graphs v1.9.0
10 [033835bb] JLD2 v0.4.45
11 [ee78f7c6] Makie v0.20.4
```

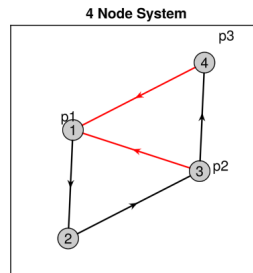
2 Using the program

2.1 Params vs Input Function?

There are two separate versions of the applet and network generating file. This is because currently, you can either create a system which has constant input parameters, or one parameter which is a sine wave.

2.2 generate_network_v3_params.jld2

The commands required to create the following network are outlined below:



```
1 Welcome to the network generator!
2 -----
3 Note that entries with 1 will be AND together, and 2 will be OR together
4 Please select the number of nodes in your network:
5 julia> 4
6 4
7 Please enter the adjacency row of node 1, separated by spaces:
8 0 1 0 0
9 Please enter the adjacency row of node 2, separated by spaces:
10 0 0 1 0
11 Please enter the adjacency row of node 3, separated by spaces:
12 2 0 0 1
13 Please enter the adjacency row of node 4, separated by spaces:
14 2 0 0 0
15 Adjacency matrix:
16 [0 1 0 0; 0 0 1 0; 2 0 0 1; 2 0 0 0]
17 Please enter the parameters of your network, separated by spaces:
18 0.7 0.8 0.5
19
20 Entering parameter adjacency matrix: e.g. parameter 1 feeds into node 1 and
    2, so has adjacency row [1 1 0 ...]
21 Please enter the adjacency row of parameter 1 = 0.7, separated by spaces:
22 1 0 0 0
23 Please enter the adjacency row of parameter 2 = 0.8, separated by spaces:
24 0 0 1 0
25 Please enter the adjacency row of parameter 3 = 0.5, separated by spaces:
26 0 0 0 1
27 Parameters: [0.7, 0.8, 0.5]
28 Please enter the index of the parameter to bifurcate:
29 1
30 Index: 1
31 Please enter the range to bifurcate from and to separated by a space:
32 -0.5 1.5
```

```

33 *Please enter the initial conditions of your network, separated by spaces:
34 0.4 0.5 0.9 0.4
35 Would you like to save this network? (y/n)
36 y
37 Please enter the name of the file you would like to save to (e.g. net.jld2):
38 fournode_test.jld2
39 File saved successfully!
40 ODENetworkModel(4, [0 1 0 0; 0 0 1 0; 2 0 0 1; 2 0 0 0], [1 0 0 0; 0 0 1 0; 0
    0 0 1], [0.7, 0.8, 0.5], 1, -0.5, 1.5, [0.4, 0.5, 0.9, 0.4])

```

(Note: I will hopefully fix the first bug soon, and get rid of the unnecessary bifurcation range...)