Assignment 0: Minitutorial for the Nonadaptive Matlab Template

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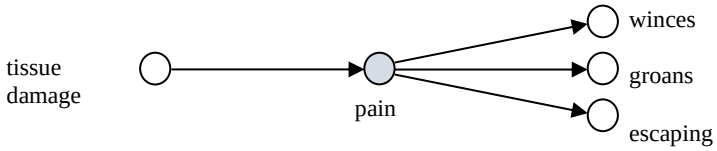
Minitutorial for the Nonadaptive Matlab Template

Use the Matlab file `NOMEnonadaptivePainexamplev01` which is the nonadaptive template which has the pain example already in it. This pain example was taken from Book 1, Chapter 1, Section 1.3 (see Fig. 1.1) to explain the functional role of a mental state; it has the following graphical representation



The following states are used in the network model:

nr	state name	explanation
X_1	tissue damage	The person burns a finger by touching a hot pot during cooking
X_2	pain	The person feels pain
X_3	winces	The person winces
X_4	groans	The person groans
X_5	escaping	The person escapes from the hot pot (and perhaps holds the finger in cold water for a while)

The role matrices and the initial values are as follows; see Book 2, Chapter 2, Section 2.4.1 for an explanation of the different types of role matrices. Here the stepmod combination function is used to generate out of the blue tissue damage at time point 20, and stop it at time point 50.

mb — base connectivity

		1	2
X_1	tissue damage	X_1	X_5
X_2	pain	X_1	
X_3	winces	X_2	
X_4	groans	X_2	
X_5	escaping	X_2	

mcwv — connection weights

		1	2
X_1	tissue damage	1	0
X_2	pain	1	
X_3	winces	1	
X_4	groans	1	
X_5	escaping	0.7	

mcfwv — combination function weights

		1 alogistic	2 step mod
X_1	tissue damage	0.3	0.7
X_2	pain	1	
X_3	winces	1	
X_4	groans	1	
X_5	escaping	1	

mcfpv — combination function parameters

		1 alogistic		2 step mod	
	parameter	1 σ	2 τ	1	2
X_1	tissue damage	5	0.7	50	20
X_2	pain	5	0.7		
X_3	winces	5	0.6		
X_4	groans	5	0.7		
X_5	escaping	5	0.8		

msv — speed factors

		1
X_1	tissue damage	2
X_2	pain	0.5
X_3	winces	0.5
X_4	groans	0.5
X_5	escaping	0.2

iv — initial values

		1
X_1	tissue damage	0
X_2	pain	0
X_3	winces	0
X_4	groans	0
X_5	escaping	0

Copied into the Matlab template these role matrices look like the following; here in matrix **mb** the X_i are replaced by their index i and all empty cells are filled with NaN (Not a Number), as the Matlab template needs numbers and does not accept empty cells in matrices but NaN indications instead:

```
mb=[1   5
1   NaN
2   NaN
2   NaN
2   NaN
]

mcwv=[1 0
1   NaN
1   NaN
1   NaN
0.7 NaN
]

msv=[2
    0.5
    0.5
    0.5
    0.2
    ]

mcfwv=[0.3  0.7
1   NaN
1   NaN
1   NaN
1   NaN
]

mcfpv = cat(3,[5    0.7
5   0.7
5   0.6
5   0.7
5   0.8
],[50   20
NaN NaN
NaN NaN
NaN NaN
NaN NaN
])
```

These are the questions:

Q1. Check whether you see that all role matrices are included and run a simulation with the file as is.
What is the value of the pain threshold here?
Try a higher pain threshold value like 1, and after running the simulation again report how this changed value affects the pain level and the responses.
Try a lower pain threshold value like 0.2, and after running the simulation again report how this value affects the pain level and the responses.
After this, set the pain threshold back to its original value.

Q2. Again, run a simulation with the file as is. Explain from the role matrices why from the three responses X_3, X_4, X_5 on pain, the escape response X_5 is the lowest.

Q3. For the escaping state X_5 change one by one the values of the weight of its incoming connection, its speed factor, and the threshold of its combination logistic function, until a very strong (= close to 1) escaping response is obtained. For each change run the simulation again and report what is the result. Keep the values you found to use them in 4.

Q4. In addition to 3., now make that the escaping negatively affects the tissue damage.
Draw the new picture.
Next, in Matlab change the value 0 of the connection weight from escaping to tissue damage in role matrix **mcwv** for connection weight values (first row for X_1) into -0.7.
Run the simulation again and report the results.