Assignment 1 Designing a Mental Network Model for a Short Scenario

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Assignment 1

Designing a Mental Network Model for a Short Scenario

Assignment Outcomes:

After doing this assignment it is expected that you would understand the following terms:

- Network-oriented modeling based on nonadaptive temporal-causal networks
- Conceptual representation of a network model in three forms: graphical, connection matrix and role matrices.
- Impact of loops and negative connection weights

References:

Book 1, Chapter 2 (Section 2.4), and Book 2, Chapter 2 (Sections 2.2, 2.3, 2.4).

Consider this scenario:

> After Jenny has entered Mark's door, her presence clearly makes that Mark becomes happy. Liking Mark a lot, his happiness makes her nervous, which makes that she breaks one of the two nice vases near the door. Seeing this, Mark becomes angry at her. This makes Jenny sad. Jenny's sadness makes Mark's anger disappear, and he gives Jenny a hug. Seeing this, Mark's partner Dion becomes jealous, upon which she breaks the other vase.

Use the concepts and formats introduced in the above references to analyse and model this scenario by a temporal-causal network by the following steps.

Q1. Make a conceptual representation in graphical format

- Make a list of about 10 states with own-chosen names to describe the scenario.
- Make a graph with connections for the causal relations involved for these states.
- Indicate which of these connections should model a negative impact in order to make the level of the affected state lower.
- Indicate what are loops in this network.
- Add labels to this graph for connection weights, combination functions, and speed factors.

For combination functions, select the identity function **id(.)** *for states with single incoming connections and the advanced logistic sum function* **alogistic(..)** *for states with multiple incoming connections.*

Q2. Make a conceptual representation in two different matrix formats (e.g., in Word or Excel):

- The square connection matrix
- The role matrices for the different network characteristics:
  - connectivity (**mb** for base connectivity and **mcw** for connection weights)
  - aggregation (**mcfw** for combination function weights and **mcfp** for combination function parameters)
  - timing (**ms** for speed factors).

Q3. Describe what behaviour you expect from the above network model.

Which states are constant and nonzero from the beginning? Which states start at 0? In which order will the states have high and low values?

Hints:

- As an example, note that Mark’s anger starts low but becomes high after breaking the first vase; moreover, Mark’s anger becomes low again after Jenny’s sadness is high and before Mark’s hugging of Jenny becomes high.
- So the state for Mark's anger should have low values first, then high values after the breaking and low values again after the state for Jenny's sadness has become high, and before the state for hugging is high.

Q4. Choose appropriate values for the characteristics represented in the role matrices and initial values and run a simulation of this scenario in the Matlab template NOMEnonadaptive.

Check whether the results are in accordance with the expectations described in 3.

Hints:

- To get constant state values 1 for Jenny’s presence and Jenny likes Mark you can make a connection with weight 1 from the state to itself and select the identity function **id(.)** as combination function and set the initial values at 1
- Concentrate mainly on the speed factors and the steepness and threshold parameters of the combination function **alogistic(..)** for the states with two incoming connections. When you can use some help to get appropriate parameter values, don’t hesitate to ask for it.
- For running a simulation, copy the role matrices you found into the Matlab templates within the brackets [..] of the value role matrices **mb**, **mcwv**, **msv**, **mcfwv**, **mcfpv**.