Practical 4

Part 1 - Introduction to elementary modes analysis

(a) Load the toy model from previous exercises and repeat the examples from the tutorial. What are the reactions involved in each mode? What are the net stoichiometries of each mode?

(b) Now introduce new reactions into your toy model in order to: *(i)* Generate new modes with the same net stoichiometries as previously; *(ii)* Generate modes with new net stoichiometries.

Part 2 - Elementary modes analysis of the Calvin cycle

In this exercise you will apply elementary modes analysis to a real metabolic system, namely the Calvin cycle of photosynthesis. In brief, plants have some enzymes that are turned on or off in light or dark conditions. The paper referred to in this exercise examines the significance of this, and the potential impact of deregulating one of the enzymes.

(a) Create and load the Calvin model as you learned in the previous practical.

(b) Download and familiarise yourself with the following paper. For the purposes of the practical, ensure that you can relate the network diagrams to the reactions in the model file, and identify which are light activated and which are dark activated.

(c) Identify the *light only* and *dark only* reactions in Table 1 (in the paper) in your model, note that starch synthesis reaction (*StSynth*) should be available under both conditions, whereas the light reaction should only be available under light conditions. You can add comments to your model like this:

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#this is a comment
```

(d) Make two new models - one for light conditions (i.e. comment out *dark only* reactions) and one for dark conditions.

(e) Load the new models and analyse the elementary modes. How many modes do they each have? What is their overall stoichiometries?

(f) If you compare the net stoichiometries of the elementary modes of the dark model with those listed in Table 3 in Poolman *et al* (2003), you may note that some modes are missing in your model. To reproduce the stoichiometries in Table 3 you need to define three new transporters of suitable metabolites. Remember to define the transporters as antiporters.

(g) Identify the *sedoheptulose-1,7-bisphosphatase* reaction and include it in the dark model. What is the impact of this change in network topology on the elementary modes of the model? What is the biological significance?

None: Meetings/C1netWork3/Prac4 (last edited 2017-01-24 14:06:45 by mark)