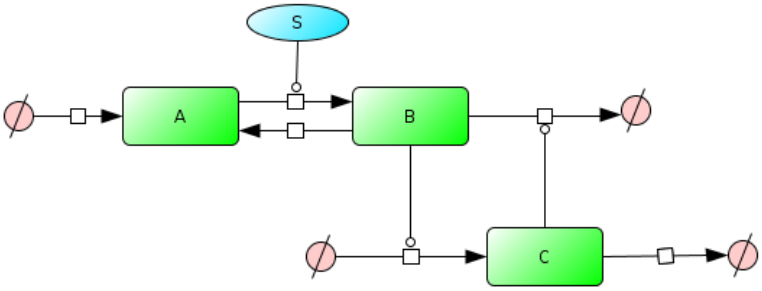
Task1: Model building and simulation

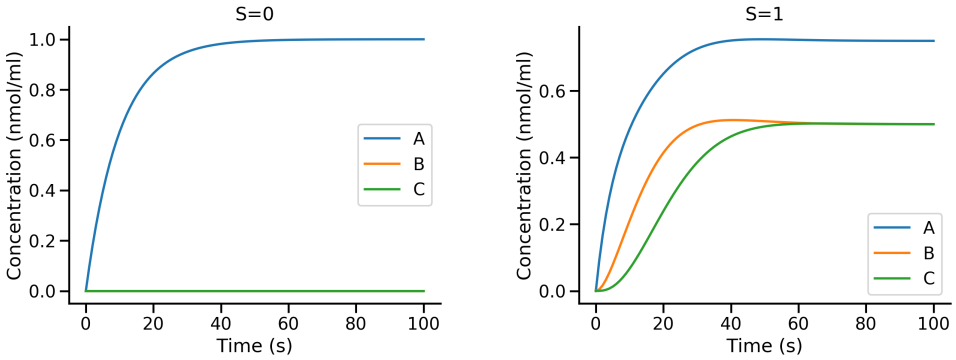
May 13, 2019

In model1 (fig. 1a) A is produced from outside the system by constant, 0 order mass action kinetics. A is at steady state because A also undergoes degradation. Without stimulation by S, all that happens is that A finds a steady state. In the presence of S, A is reversibly converted to B. B stimulates the production of C which both undergoes spontaneous first order degradation and induces the degradation of B, thereby completing a negative feedback.

1. Write the model equations with pen and paper
2. Reproduce the simulation output in fig. 1 using Copasi
3. Reproduce the simulation output using tellurium and antimony
4. Change the rate law for the reaction where A gets converted to B by S to michaelis-menten kinetics using both Copasi and Antimony
5. Change the rate law for the reaction where B is degraded by C to competitive inhibition kinetics using both Copasi and Antimony



(a) Topology diagram of model 1.



(b) (c)

Figure 1: Simulation of (a) model 1 with (b) $S_0 = 0$ and (c) $S_0 = 1$. Initial concentrations: $A = B = C = 0$ and all kinetic parameters $k_1, ..., k_7 = 0.1$