Introduction to ABC-SysBio

Methods

abc for model selection Given the range of parameter values shown to give rise to bistability during the parameter scan shown above, a sample of those were used as priors for ABC SMC parameter inference. The initial conditions were set to gA = 1.0, gB = 1.0 and A2 = 10. Thus the system began at the off state. An inducer is added at t=20 and another one at t=70. The model is shown below and the distance function used is shown in the Appendix. The results are shown in Figure XXX. The target behaviour to which the model was compared to is shown in Figure fig:behaviour.

The standard toggle switch model was shown to successfully behave like a switch within the parameter range used here. As a next step it will be examined whether the addition of feedback loops can make the switching more robust to parameter changes. It is predicted that the addition of feedback loops will increase the robustness of the switch and thus be selected over the standard toggle switch.

Model selection can arise from the ABC SMC methodology naturally, by adding the model as an unknown parameter to the selection process. A model and its parameter values, , are sampled from the prior distribution. Using these parameter values the sampled model is simulated and the distance between the resulting time course and the target time course measured. The algorithm then proceeds as described previously, by sampling each time models and parameters from their priors. When the last is reached, the algorithm will have concluded to a posterior distribution of parameters for each model, a subset of the prior distribution that can give the best rise to the data. The model that performs over a greater posterior parameter range is selected as the most robust Toni:2009tr.

In order to select for the more robust toggle switch, the standard toggle switch will be compared to switches with positive or negative auto-regulation in one or both nodes as shown in Figure fig:toggle$_s$witch$_d$esigns.Therear

figure*[htbp] center [scale=0.5]chapterABCSysBio/images/model$_s$election.png[LoFcaption]fig : abc$_m$odel$_s$el : Mode