

DSGRN Group Meeting Presentation 1

Adam Zheleznyak

DIMACS REU 2020

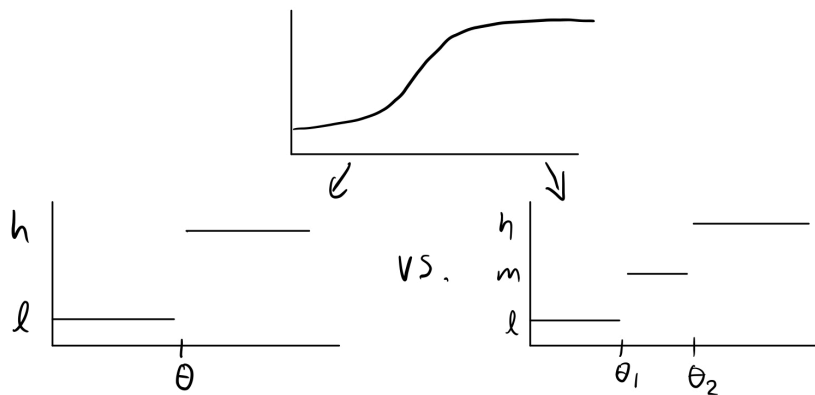
June 9, 2020

My Goal

Current Questions: Can DSGRN be generalized to account for several toggles? Could this give more interesting information compared to the simpler model?

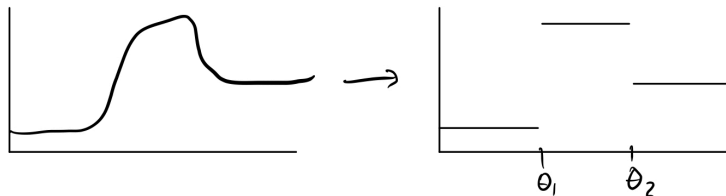
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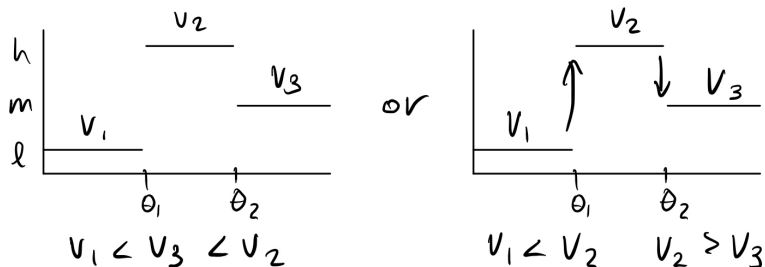


How should we even model this?

Two possible ways to decide on the threshold type (i.e. two ways to generalize the activation and inhibition):

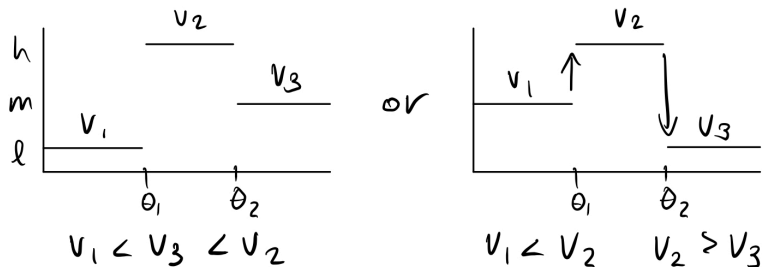
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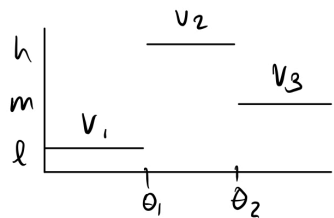
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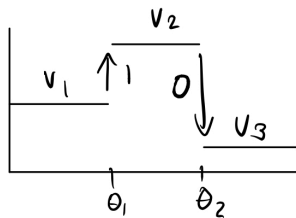
Two possible ways to decide on the threshold type (i.e. two ways to generalize the activation and inhibition):



$$v_1 < v_3 < v_2$$

Permutation

or

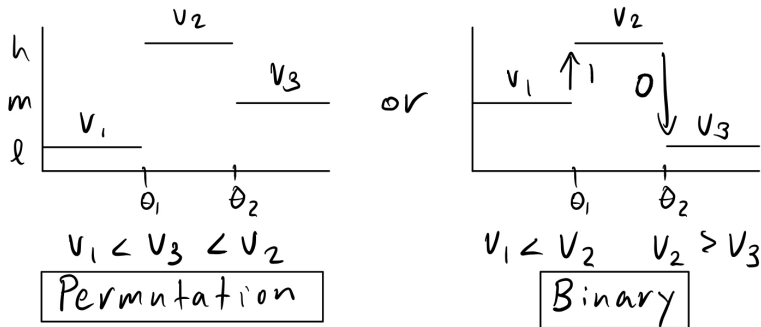


$$v_1 < v_2 < v_3$$

Binary

How should we even model this?

Two possible ways to decide on the threshold type (i.e. two ways to generalize the activation and inhibition):



Note that the first is more restrictive. However:

Conjecture

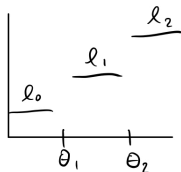
For any binary threshold type, there exists a corresponding permutation threshold type.

Phase diagrams of the simplest cases

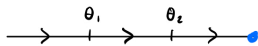


$\gamma, \theta_1, \theta_2, l_0, l_1, l_2$

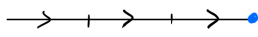
$$\dot{x} = -\gamma x + \begin{cases} l_0 & x < \theta_1 \\ l_1 & \theta_1 < x < \theta_2 \\ l_2 & x > \theta_2 \end{cases}$$



$\gamma\theta_1 < \gamma\theta_2 < l_0 < l_1 < l_2$



$\gamma\theta_1 < l_0 < \gamma\theta_2 < l_1 < l_2$



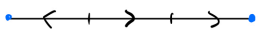
$\gamma\theta_1 < l_0 < l_1 < l_2 < \gamma\theta_2$



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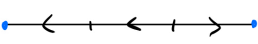
$l_0 < \gamma\theta_1 < l_1 < \gamma\theta_2 < l_2$



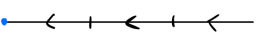
$l_0 < \gamma\theta_1 < l_1 < l_2 < \gamma\theta_2$



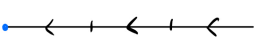
$l_0 < l_1 < \gamma\theta_1 < \gamma\theta_2 < l_2$




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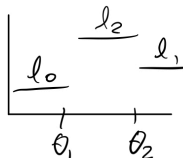


Phase diagrams of the simplest cases

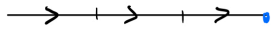


 $\gamma, \theta_1, \theta_2, l_0, l_1, l_2$

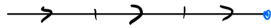
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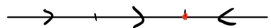
$$\gamma\theta_1 < \gamma\theta_2 < l_0 < l_2 < l_1$$



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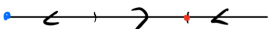
$$\gamma\theta_1 < l_0 < l_2 < l_1 < \gamma\theta_2$$



$$l_0 < \gamma\theta_1 < \gamma\theta_2 < l_2 < l_1$$



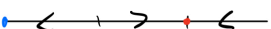
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