

# Impact of Canalizing Functions on the Phase Space of a Gene Regulatory Network

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A canalizing Boolean function (CBF) is a Boolean function of several variables that is guaranteed to attain a fixed value when a “canalizing variable” takes on a certain value, regardless of the rest. CBFs seem to be nature’s choice as update functions of gene regulatory networks (GRNs). Although CBFs do not necessarily give rise to different phase space diagrams when compared to generic Boolean functions, they do have an outsized effect on the stability of a GRN when randomly assigned as a family. In this preliminary report, we will first talk about our previous work with Devin Akman on processing the phase space of a GRN -a functional digraph- rather than the wiring diagram for certain purposes. We will then emphasize the role of a particular adjacency matrix of the phase space as opposed to its conjugates by permutations of the gene labels in detecting CBFs (hopefully leading to effective algorithms to generate large ensembles of such matrices), and summarize some contributions of CBFs to the symmetry and stability of the phase space.