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Secondary bifurcations in systems with $\mathbf{S}_N$ symmetry

Abstract: In a recent paper, Dias and Stewart (*Secondary bifurcations in systems with all-to-all coupling*, Proc. R. Soc. Lond. Ser. A, 2003) studied the existence, branching geometry, and stability of secondary branches of equilibria in all-to-all coupled systems of differential equations. That is, they studied the general cubic order truncation for ODEs that are equivariant under the natural permutation action of the symmetric group $\mathbf{S}_N$ (action in $\mathbf{R}^N$). Primary branches in such systems correspond to partitions of N into two parts p, q with $p+q=N$. Secondary branches correspond to partitions of N into three parts a, b, c with $a+b+c=N$. In this same work they realized that the third order truncation is not enough to provide secondary branches for the case $a=b=c$. We study the existence, branching geometry, and stability of secondary branches of equilibria with $\mathbf{S}_N \times \mathbf{S}_N \times \mathbf{S}_N$ symmetry, in systems of ODEs that commute with the usual action of the symmetric group $\mathbf{S}_{3N}$ (action on $\mathbf{R}^{3N}$).

This is a joint work with A. P. S. Dias.