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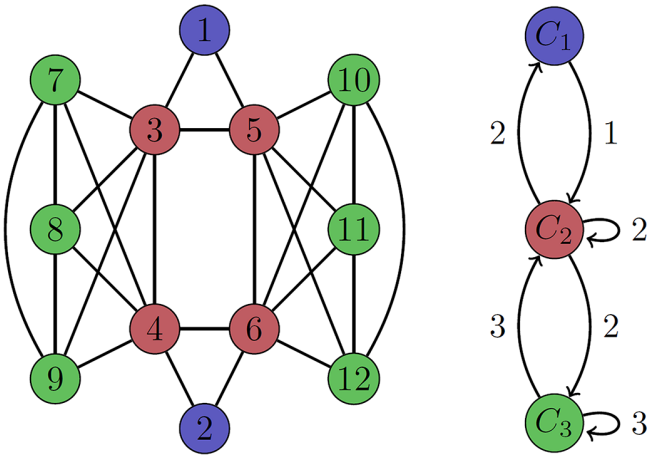
Researchers developed a method of determining the possibility of consensus within subgroups of a system by analyzing graph symmetries.



Consensus problems are important to study for systems where multiple nodes require uniform behavior, such as power stations in an electrical grid. However, complete consensus in which all nodes converge to a single final state is not always desirable for certain systems. To address such cases, researchers look to group consensus for solutions.

A new article investigated the group consensus problem from the perspective of graph automorphisms. The researchers built an adjacency matrix that indicates connected and disconnected nodes in the network. They discovered that one can decouple the motion along a group consensus manifold from the motion orthogonal to it by performing a block diagonalizing transformation on the matrix. Once transformed, each block in the matrix would represent an independently evolving subsystem, allowing one to choose coupling protocols for certain clusters to form isolated group consensus.

They tested their method using a coupling protocol with two tunable parameters and were able to achieve group consensus in a system regardless of its stability. The block diagonalizing transformation approach may be applicable for other coupling protocols as well, potentially with more tunable parameters.

According to author Isaac Klickstein, this method of analyzing graph symmetries to determine the possibility of group consensus has potential applications in autonomous vehicle systems, biological cell regulation, and marketing campaigns that wish to target certain populations. “Any system which is composed of a heterogeneous population with interaction could benefit from the results we present,” he said.

Source: “Symmetry induced group consensus,” by Isaac Klickstein, Louis Pecora, and Francesco Sorrentino, *Chaos: An Interdisciplinary Journal of Nonlinear Science* (2019). The article can be accessed at https://doi.org/10.1063/1.5098335.