Thesis: Game Dynamics In Complex Networks.

Abstract: Social networks started as a platform to meet people, maintain relationships which would otherwise be too distant, and organize into groups that share common agenda. The same networks, designed for people to "keep in touch" with each other are now being increasingly used to express opinions, spread information and communicate with the world. Naturally, these networks have now become powerful tools for politics, marketing and every aspect of society that thrives on information flow. It is this popularity, that has attracted researchers in the areas of mathematics, computer science, biology, economy and sociology to understand how networks are organized. Main results in Physics have been about how the structural character of real-life networks are different from regular and random networks. Biologists, economists and social scientists have studied evolution of cooperation in two player games played in networks. In these studies, social networks are represented as graph structures where vertices represent relationship, friendship and nodes represent individuals, organizations or groups. These relationships and the interaction between them are reminiscent of two player games. Therefore, scientists have used game theory to understand the evolution of game strategies under several rounds of repeated games with some update function that determines the strategy players use in subsequent rounds of the game.

In this thesis, two 2-player games are used to understand properties Of several types of graph structures. We built a simulation framework and experimented with Stag Hunt and Hawk Dove games in Torus, Grid, Random, Watts Strogatz, Barabasi-Albert, and a Facebook friendship dataset. We show how player change strategies and how the evolution of cooperation depends on the game as well as the network structure. We show how real-life networks are differ from the other complex networks and draw similarities and differences between regular, random and complex networks. In particular, we found the network structure heavily influences metrics such as, the speed of convergence, the point of convergence and the final steady state

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