

An Inquiry into the Usage of Complex Systems Models to Examine the Effects of the Agent Interaction in a Political Economic Environment

Authors : Ujjwall Sai Sunder Uppuluri

Abstract : Group theory is a powerful tool that researchers can use to provide a structural foundation for their Agent Based Models. These Agent Based models are argued by this paper to be the future of the Social Science Disciplines. More specifically, researchers can use them to apply evolutionary theory to the study of complex social systems. This paper illustrates one such example of how theoretically an Agent Based Model can be formulated from the application of Group Theory, Systems Dynamics, and Evolutionary Biology to analyze the strategies pursued by states to mitigate risk and maximize usage of resources to achieve the objective of economic growth. This example can be applied to other social phenomena and this makes group theory so useful to the analysis of complex systems, because the theory provides the mathematical formulaic proof for validating the complex system models that researchers build and this will be discussed by the paper. The aim of this research, is to also provide researchers with a framework that can be used to model political entities such as states on a 3-dimensional plane. The x-axis representing resources (tangible and intangible) available to them, y the risks, and z the objective. There also exist other states with different constraints pursuing different strategies to climb the mountain. This mountain's environment is made up of risks the state faces and resource endowments. This mountain is also layered in the sense that it has multiple peaks that must be overcome to reach the tallest peak. A state that sticks to a single strategy or pursues a strategy that is not conducive to the climbing of that specific peak it has reached is not able to continue advancement. To overcome the obstacle in the state's path, it must innovate. Based on the definition of a group, we can categorize each state as being its own group. Each state is a closed system, one which is made up of micro level agents who have their own vectors and pursue strategies (actions) to achieve some sub objectives. The state also has an identity, the inverse being anarchy and/or inaction. Finally, the agents making up a state interact with each other through competition and collaboration to mitigate risks and achieve sub objectives that fall within the primary objective. Thus, researchers can categorize the state as an organism that reflects the sum of the output of the interactions pursued by agents at the micro level. When states compete, they employ a strategy and that state which has the better strategy (reflected by the strategies pursued by her parts) is able to out-compete her counterpart to acquire some resource, mitigate some risk or fulfil some objective. This paper will attempt to illustrate how group theory combined with evolutionary theory and systems dynamics can allow researchers to model the long run development, evolution, and growth of political entities through the use of a bottom up approach.

Keywords : complex systems, evolutionary theory, group theory, international political economy

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