

CulSim: A Simulator of Emergence and Resilience of Cultural Diversity

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CulSim, the computer simulation software presented here, is a tool to further explore recent and influential models of the emergence of cultural groups (Axelrod, 1997; Flache and Macy, 2011). CulSim introduces additional novel tools that simulate drastic events (e.g. genocides, or invasions) in order to study the resilience of cultural diversity in the provided models. It also includes my own recently proposed model, introducing institutions to explore their effects in cultural diversity (Ulloa et al., 2016). CulSim also offers the possibility to analyze drastic events on an institutional level (for example in the form of institutional collapse).

The existence of diverse cultural groups is considered paradoxical given that we live in an interconnected world where individuals constantly share information with each other. Moreover, this diversity persists despite confrontations with drastic changes over the course of population lifetimes. As an example, the Maya have often been recognized for their cultural diversity, although they have been victims of catastrophic events: pre-Hispanic collapses; Spanish invasion; and genocide (~1980).

The ubiquity of different groups raises questions related to the emergence and resilience of cultural diversity. Researchers have proposed models to study the emergence of cultural diversity under social influence. Formal models demonstrated that everyone should, in the long term, hold all the same information when all individuals are connected to the same social network (e.g. Harary, 1959). More recently, agent-based models have facilitated the study of multiple factors that have been shown to affect the emergence and preservation of cultural diversity. Initially, Schelling (1971) used the idea that a small “dislike” for a dissimilar neighbor could lead to complete segregation. Conversely, Axelrod (1997) used the principle of “like attracts like” (homophily) to successfully allow the emergence of cultural diversity, though this emergence heavily depended on initial parameters (e.g. number of traits, or population and neighborhood sizes), and, moreover, Axelrod’s model was found to be sensitive to perturbations, noise that was introduced in two different forms: mutations (Klemm et al., 2003), i.e. random changes in a feature of an agent’s cultural vector, and selection error (Flache and Macy, 2011) i.e. occasional perception mistakes of a neighbor’s similarity (error estimating homophily).

Since then, several researchers have addressed the robustness of the emergence of cultural diversity against perturbation, e.g. by allowing a dynamic social network (Centola et al., 2007), using multilateral social influence (Flache and Macy, 2011), or by introducing institutions (Ulloa et al., 2016), following up on the idea that institutions play a

large role in group formation (Durkheim, 1951). To our knowledge, no research exists on the effects of drastic events which would affect many individuals at the same time, such as the ones described for the Maya case, on diversity.

CulSim allows exploration of eleven parameters (e.g. sources of noise, institutional parameters such as influence, democracy and propaganda), and nine configurable types of drastic events (including parameter change, population and institutional-related events), with the possibility of combining those events. The software encompasses a graphical user interface to visually explore singular scenarios or multiple repetitions, and a command-line interface to configure comprehensive experimental designs in computer servers. A video that gives a brief overview over the functionality can be accessed at bit.ly/VidCS, and the (GPL-licensed) code and wiki (user manual) at git.io/vrmKi.

The proposed presentation in the workshop will cover a literature review of the models, parameters and sociological theories that inspired CulSim, as well as demonstrations on the use of the software. Some preliminary results will be presented and we will discuss some of the implications of the findings in terms of the two concurrent discourses on cultural diversity and globalization.

References

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