Modelling strangers

Citation for published version:

Link:
Link to publication record in Edinburgh Research Explorer

Document Version:
Peer reviewed version

General rights
Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy
The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.
Modeling Strangers: Population size, fluidity, and complexity in shared cultural systems

MICHAEL CHIMENTO1**, CHRISTINE CUSKLEY*, SIMON KIRBY*

Languages are equal in their ability to convey complex meanings, but there is variation in their encoding complexity. There has been a mounting body of evidence that language complexity is shaped by social features of its population (Lupyan & Dale, 2010; Reali, Chater & Christiansen, 2018) However, the causal mechanisms and dynamics of this process are still open questions.

We present an agent-based model exploring how the arrival of new agents interacts with social network features to shape the complexity of a cultural system. We apply the model to language complexity, though the paradigm readily extends to other forms of cultural consensus (Baronchelli, 2018). A population of agents plays a variant of the regularity game (Cuskley, Kirby & Loreto, 2018), where shared rule paradigms emerge over successive paired interactions. Importantly, agents change their generalization strategy as they become more proficient, mirroring experimental findings (Cuskley et al., 2015). We manipulate population size, turnover rate, and network position of entering agents to examine how these affect the complexity of the emerging systems.

Results show that larger, more fluid populations result in simpler rule systems due to constant pressure from new learners. Languages also become simpler when new learners inhabit central nodes of a heterogeneous network. These results support the claim that less proficient learners may be one of the drivers of language simplification, but shows that the mechanisms underlying this involve dynamic interactions between population structure and growth. We argue that size, turnover rate, and network position of incoming agents influences cultural outcomes because these parameters effect overall information loss in a population (Spike, Stadler, Kirby & Smith, 2016). Our results emphasize the importance of information loss for shared conventional structure in culturally transmitted systems, providing a useful empirical frame for future experimental and observational approaches to examining complexity and consensus in cultural systems.

1Corresponding author: chimento.cm@gmail.com
2Centre for Language Evolution, The University of Edinburgh, UK
3Cognitive and Cultural Ecology Research Group, University of Konstanz, Germany

References