Market-mediated Schelling dynamics

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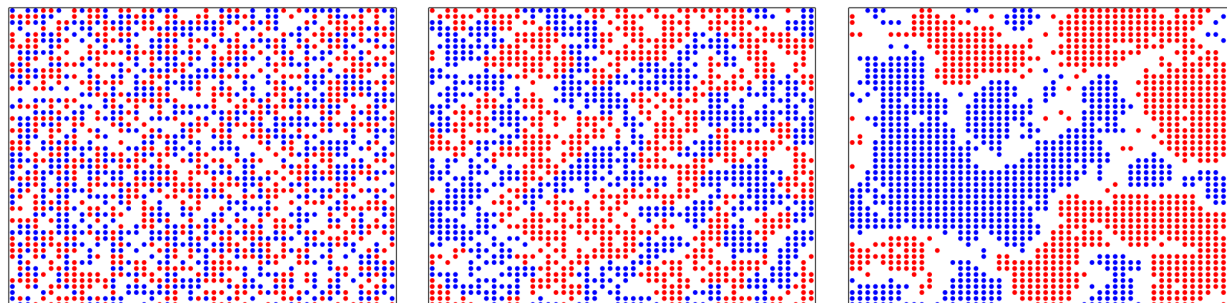*Contact:* michael.benzaquen@polytechnique.edu

Figure 1: Numerical simulation of Schelling's segregation model. Copyright 2018 - binPress.com

In the late 60's/early 70's Nobel Prize winner Thomas Schelling built an agent-based model, coined the *Schelling segregation model*, [1, 2] to account for racial segregation in American cities. Ever since, the model has been widely used to explain segregation based on gender, age, language, sexual preference, or religion to name a few. Schelling's main contribution was to show, within a very simple setup, that aggregate outcomes most often do not reflect individual motives. Or as put by Schelling himself: "*The systemic effects are found to be overwhelming, there is no simple correspondence of individual incentive to collective results*". More precisely, optimum seeking individuals may very well find themselves in completely non-optimal collective states.

Relating microscopic and macroscopic behaviour is the very *raison d'être* of statistical physics. It is well known that systems made of a large number of interacting individual entities may display robust, often unanticipated, regularities that rise above individual behaviours (such as phase transitions) or as put by Anderson "*More is different*" [3]. A number a physicists have taken interest in Schelling's model (see e.g. [4]). Recently, Grauwin *et al.* [5] were able to solve exactly a Schelling-like model interpolating continuously between cooperative and individual dynamics. In particular they showed that varying cooperativity induces a qualitative transition between a segregated high energy phase and a mixed lower energy phase.

The aim of the present internship is to study, both numerically and theoretically, whether and how mediating Schelling individual dynamics by a real estate market changes the usual outcomes. One may prospectively argue the adding a market mechanism to the Schelling story is, to some extent, tantamount to modifying the interactions, by that facilitating optimal macroscopic states. Another interesting and very general question that can be addressed within this framework is whether the phase transition survives in presence of detailed balance-breaking choice rules. It should be noted that this study constitutes a challenging intellectual issue, the outcomes of which may have practical implications for a wide class of segregation situations.

References

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