Distributed Automated Experimentation for Agent Based Models

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An important challenge when using Agent Based Modeling (ABM) is effective parameter-space exploration and resulting model interpretation. Presented is an automated experimentation framework that combines a load balancing distributed computing environment with population-based search techniques to facilitate efficient model exploration and interpretation. This framework is under development to support an enhanced environmental policy-making project that uses ABMs to explore the effects of policy decisions on existing markets. The framework initially provides three non-linear search techniques, with each technique providing a specific exploratory-role. The search techniques are: Scouting[2], to broadly explore interesting model behavior; Active Nonlinear Tests (ANTs)[1], to evaluate hypothesis robustness; and Evolutionary Algorithms (EAs), to optimize for a specific model hypothesis. Scouting utilizes past parameter-space samplings to guide future sampling using an estimate of how well the current region is understood, when estimates are poor the system will sample locally and then more distantly as the estimate comes closer to actual behavior. ANTs is a technique for evaluating the stability of a specific parameter-space region for a given model hypothesis. The framework is implemented to allow arbitrary models to be used in experimental trials where the parameter-space is explored automatically and efficiently. Additionally, results from sampled parameter-space regions will be stored, so well sampled regions of the parameter-space do not need to be resampled and can be used in alternate model explorations. The current framework goal is to provide a flexible and efficient tool for exploring complex parameter-spaces. The ultimate framework goal is to develop a methodology for examining model behavior-spaces, moving beyond pure parameter-space analysis, and begin to examine the concept of automated docking between different models and real world behavior.

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If accepted: first preference is presentation, second preference is poster.

References

[1] John H. Miller. Active nonlinear tests (ANTs) of complex simulation models. *Management Science*, 44(6):820–830, June 1998.

[2] Jeffrey O. Pfaffmann and Klaus-Peter Zauner. Scouting context-sensitive components. In *Evolvable Hardware*, pages 14–20. IEEE Computer Society, 2001.