Autonomous Units to Model Games *

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Communities of autonomous units have been introduced and investigated as a formal graph-centered and rule-based framework for the modeling and analysis of interacting processes in logistics and computer science (cf. [HKK09]). In this paper we show that they can also be employed to design and describe games in an intuitive, flexible and precise way using the following features:

(1) A game takes place in some environment (e.g. a board) that is often suitably represented by a graph. (2) The players are individual entities acting independently of each other in an autonomous way. (3) Usually, a player can choose among several possible next actions in a given situation. The choice is based on some kind of decision mechanism, strategy, or control condition. (4) Moreover, a game follows some kind of overall discipline (like the order in which players can act) which may be seen as a global control condition.

Summarizing, a game may be considered as a community of autonomous units where the players (and other dynamic entities) are modeled as units with rules and control conditions.

The hope behind this approach is the following: (1) Graphs and graph transformation rules are intuitive and well-understood concepts to describe states, environments, structures, etc. and their step-wise dynamic changes. (2) Control conditions are quite generic means to provide autonomous units, like players, with decision mechanisms and strategies. (3) Graph transformation rules may be applied sequentially or in parallel so that players can act one after the other or simultaneously, whatever the game requires. (4) Graph transformation tools can be used to run the game on a visual level and to observe the effects and results. (5) The formal semantics provides the possibility to prove properties of games.

References

[HKK09] Karsten Hölscher, Hans-Jörg Kreowski, and Sabine Kuske. Autonomous Units to Model Interacting Sequential and Parallel Processes. *Fundamenta Informaticae*, 93(3):233–257, 2009.

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