A comparative analysis of three multi-agent computational algorithms used to harvest grain

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The development of theory and applications of multi-agent systems determined in the last years a real revolution regarding the modeling of complex systems. The structure of any agent-based computational model contains the next elements: parameters, variables, algorithms and agents. We make a comparative analysis of three multi-agent computational algorithms (RAND, NMEM and WMEM) used to harvest grain in a bi-dimensional lattice. The first algorithm RAND is the simplest because the agent sets randomly a certain harvesting direction and harvests all the grain he can find. The second algorithm NMEM uses 8 searching directions. From these 8 variants, the agent selects the alternative that gives the maximum amount of grain. The searching is repeated for vision times. If this search fails to find any grain than the agent pass to RAND algorithm. The third algorithm WMEM uses the same searching algorithm as NMEM algorithm, but this one
memorizes the patches that the agents have discovered. When this searching algorithm fails to find grain, than the agent uses its memory to find the nearest patch with available grain. The algorithms are implemented using NetLogo. This software platform was designed by Uri Wilensky it in the year 1999. NetLogo is in a process of development and modernization in the frame of Center for Connected Learning and Computer-Based Modeling - Northwestern University, Illinois, USA. NetLogo is written in Java language and can be run on all major platforms (Mac, Windows, Linux etc.). In addition, individual models can be run as Java applets inside web pages. We did three computational experiments and we observe that the best results are obtained when we used WMEM algorithm. In this case, the grain was harvested in a period of 1141 simulation steps. On the second place was NMEM algorithm with a harvesting period of 6982 simulation steps and on the last place was RAND algorithm with a harvesting period of 18183 simulation steps.