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Improving and scaling evolutionary approaches to the mastermind problem.

Di Chio, Cecilia (ed.) et al., Applications of evolutionary computation. EvoApplications 2011: EvoCOMPLEX, EvoGAMES, EvoIASP, EvoINTELLIGENCE, EvoNUM, and EvoSTOC, Torino, Italy, April 27–29, 2011. Proceedings, Part I. Berlin: Springer (ISBN 978-3-642-20524-8/pbk). Lecture Notes in Computer Science 6624, 103-112 (2011).

Summary: Mastermind is a well-known board game in which one player must discover a hidden combination of colored pegs set up by an opponent, using the hints that the latter provides (the number of places – or pegs – correctly guessed, and the number of colors rightly guessed but out of place) in each move. The feasibility of evolutionary approaches to solve this problem has been already proved; in this paper we will assess different methods to improve the time it takes to find a solution by introducing endgames, that is, shortcuts for finding the solution when certain circumstances arise. Besides, we will measure the scalability of the evolutionary approaches by solving generalized Mastermind instances in several sizes. Tests show that endgames improve the average number of solutions without any influence on the quality of the game; at the same time, it speeds up solutions so that bigger problems can be approached. Tests performed with eight colors and four or five pegs and nine colors with five pegs show that scaling is quite good, and that the methodology yields an average number of games that is competitive with the best solutions published so far. Scaling with problem size depends on the method, being better for entropy-based solutions, but – besides raw problem size – there are complex dependencies on the number of pegs and colors.

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