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Weaving the social fabric: The past, present and future of optimization problem solving with cultural algorithms

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Abstract: Purpose ? The purpose of this paper is to investigate the performance of cultural algorithms (CAs) over a complete range of optimization problem complexities, from fixed to chaotic and specifically observing whether there is a given homogeneous agent topology within a culture which can dominate across all complexities. Design/methodology/approach ? In order to apply the CA overall complexity classes it was necessary to generalize on its co-evolutionary nature to keep the variation in the population across all complexities. First, previous CA approaches were reviewed. Based on this the existing implementation was extended to produce a more general one that could be applied across all complexity classes. As a result a new version of the cultural algorithms toolkit, CAT 2.0, was produced, which supported a variety of co-evolutionary features at both the knowledge and population levels. The system was applied to the solution of a 150 randomly generated problems ranging from simple to chaotic complexity classes. Findings ? No homogeneous social fabric tested was dominant over all categories of problem complexity; as the complexity of problems increased so did the complexity of the social fabric that was need to deal with it efficiently. A social fabric that was good for fixed problems might be less adequate for periodic problems, and chaotic ones. Originality/value ? The paper presents experimental evidence that social structure of a cultural system can be related to the frequency and complexity type of the problems that presented to a cultural system.