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Roach colony optimization: a new approach to problem solving

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Computational intelligence, more specifically agent-based computing is a new way of thinking about computation that differs from the old methods of logical deconstruction and processing. We are developing a computational intelligence algorithm based on newly discovered social behavior of cockroaches. Our algorithm is called roach-colony optimization. There are many possible applications for this research, including objective function optimization, navigation and goal-seeking behavior of autonomous robots, and modeling of socio-cultural phenomena. The original concept of agent-based computing was inspired by flocking behavior in birds and schools of fish. It was found that if the simulated creatures were given enhanced communication abilities they may be used to find the best solution to a particular problem. We present several numerical examples that provide evidence as to the feasibility of our algorithm in successfully optimizing highly-modal non-linear objective functions. We compare the results of roach-colony optimization first to a random search, and then to traditional methods, such as gradient-descent, and finally to more modern methods, such as particle swarm optimization.