Artificial Decision Maker Driven by PSO: An Approach for Testing Reference Point Based Interactive Methods

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Abstract. Over the years, many interactive multiobjective optimization methods based on a reference point have been proposed. With a reference point, the decision maker indicates desirable objective function values to iteratively direct the solution process. However, when analyzing the performance of these methods, a critical issue is how to systematically involve decision makers. A recent approach to this problem is to replace a decision maker with an artificial one to be able to systematically evaluate and compare reference point based interactive methods in controlled experiments. In this study, a new artificial decision maker is proposed, which reuses the dynamics of particle swarm optimization for guiding the generation of consecutive reference points, hence, replacing the decision maker in preference articulation. We use the artificial decision maker to compare interactive methods. We demonstrate the artificial decision maker using the DTLZ benchmark problems with 3, 5 and 7 objectives to compare R-NSGA-II and WASF-GA as interactive methods. The experimental results show that the proposed artificial decision maker is useful and efficient. It offers an intuitive and flexible mechanism to capture the current context when testing interactive methods for decision making.

Keywords: Multiobjective optimization · Preference articulation
Multiple criteria decision making · Particle swarm optimization

1 Introduction

Interactive multiobjective optimization methods based on a reference point are very popular techniques [1–3] not only in current research, but also in industry, as they allow decision makers (DMs) to specify information about their preferences in an intuitive manner to direct the operation of the optimization algorithms. As a consequence, the DM is able to learn progressively (at each iteration) about the

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