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MULTICRITERIA TRADEOFFS IN INVENTORY CONTROL USING MEMETIC PARTICLE SWARM OPTIMIZATION

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Abstract. *Inventory control is actually a multicriteria optimization problem. It needs to identify some tradeoff alternatives in which no one excels the others in all criteria related to operating cost and customer service. In this paper, we present a Pareto memetic algorithm based on Particle Swarm Optimization (PSO) to tackle a multicriteria (r, Q) system with lost sales. The approach proposed is intrinsically multicriteria, not only in its formulation but also in the computing method. It can simultaneously determine order quantity and safety stock without the need to estimate stockout cost or service level. The memetic design keeps the benefits of evolutionary algorithms and local search heuristics in a single optimization method. Experimental results show that the proposed method can generate more accurate and diverse nondominated control policies than the Strength Pareto Evolutionary Algorithm (SPEA) and, in general, provide the entire picture of optimal cost-service tradeoff such that more information is disclosed to decision makers.*
Keywords: Inventory control, Multicriteria optimization, Particle swarm optimization, Memetic algorithms

1. **Introduction.** Many real-world problems arising in science, engineering and business fall into the category of multicriteria optimization that conflicting and incommensurate criteria are involved. For example, inventory control aims to maintain desirable customer service while operating the system in an efficient way. On one hand, firms prefer to stock more inventories in order to achieve a better service. This act may result in the risk of liquidity and a number of management issues. On the other hand, cost down pressure drives firms to hold fewer inventories. It would cause customer attrition due to the loss in goodwill. This dilemma could be modeled as multicriteria (or multiobjective) optimization problems that usually do not have a single solution that can optimize all criteria simultaneously. Hence, the goal is to identify some tradeoff solutions (or efficient solutions) in which no one excels the others in all criteria. The collection of all efficient solutions is called the efficient set. The image of efficient set in criterion space is referred to as the Pareto-optimal front or tradeoff surface [21].