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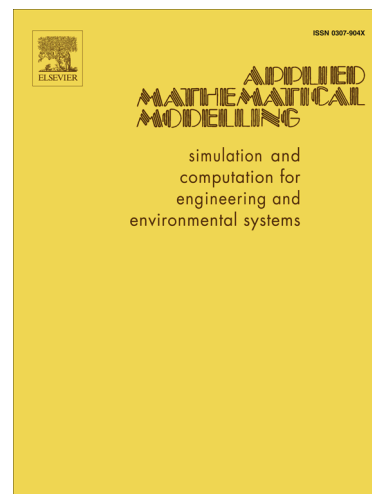
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# Normal Parameter Reduction in Soft Set Based on Particle Swarm Optimization Algorithm

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**Abstract:** Parameter reduction in soft set is a combinatorial problem. In the past, the problem of normal parameter reduction in soft set is usually be solved by deleting dispensable parameters, that is, by the trial and error method to search the dispensable parameters. This manual method usually need much time to reduce unnecessary parameters, and the method is more suitable for small data. For the large data, however, it is impossible for people to reduce parameters in soft set. In this paper, the particle swarm optimization is applied to reduce parameters in soft set. Firstly, a definition is introduced to define the dispensable core, and some cases about the dispensable core are discussed. Then the normal parameter reduction model is built and the particle swarm optimization algorithm is employed to reduce the parameters. Experiments have shown that the method is feasible and fast.

**Keywords:** normal parameter reduction, soft set, particle swarm optimization, reduction

## 1. Introduction

It is very different that the nature of the uncertainty data appearing in economics, engineering, environmental science, sociology, medical science, and many other fields, and those data are with the complexity of uncertain data. Many mathematical tools are used to modeling for the uncertain data. Those tools include probability theory, fuzzy set theory, intuitionistic fuzzy set theory, rough set theory, vague set theory, interval mathematics and so on. While those tools are well-known and often work well, each of them has its inherent difficulties. Molodtsov [1] proposed an uncertainty-soft set theory that is completely new approach for modeling vagueness. Soft set theory is getting popularity among the researchers in these domains. Soft set has been extensively and successfully applied in decision making [2-19], data analysis [20-22], forecasting [23], simulation [24], evaluation of sound quality [25], rule mining [26], and so on.

Combining soft sets with others mathematical theories, such as fuzzy sets [15, 27-31], rough set [28, 31-33], vague sets [34], interval-valued fuzzy sets [10, 12, 35], interval-valued intuitionistic fuzzy soft set [36], intuitionistic fuzzy soft set [35, 37-39], and so on, has come forth rapidly to meet various demands in practical situations.

Parameter reduction in soft set is discussed in published papers. Maji et al. considered the initial level reduction soft set with the help of rough set approach [2]. However, Chen et al. pointed out that the errors of soft set reduction and presented a new notion of parameterization reduction in soft set [40]. Muhammmad Irfan Ali discussed another view on reduction of parameters in soft sets [41]. Kong et al. analyzed two cases, suboptimal choice and added

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