Swarm-Optimization-Based Affective Product Design Illustrated by a Pen Case-Study

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Arvind Mohais, Alexander Nikov, Ashok Sahai, and Selahattin Nesil

Abstract—An optimization approach for suggesting product design parameters based on emotive responses is proposed that combines Kansei techniques and particle swarm optimization algorithm (PSO). The approach involves designing a Kansei survey for collecting data on customers' affective responses to various aspects of a product, using several exemplars of the product. After information gathering, the PSO algorithm is employed to build a prediction binary linear model that aggregates the survey data. Subsequently, another binary linear model links product design parameters to the outputs of the first model to establish mathematical connections between the subjective impression of a product (Kansei) and its properties. This approach is illustrated by a case study for pen design. Three PSO neighborhood configurations are tested, and the results yield insight into the nature of the optimization function. Experimental work in implementing the proposed approach was able to suggest customers' preferences for pen design attributes that would be considered optimal by all of those surveyed. They can be used for improvement and development of new future products.

Keywords—Affective design, neighborhood configurations, particle swarm optimization.