Applying Social Choice Theory to Solve Engineering Multi-Objective Optimization Problems

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***Abstract*—Multi-objective optimization problems usually don't have a single unique optimal solution, either for discrete or continuous domains. Furthermore, there are usually many possible available algorithms for solving these problems, and one typically does not know in advance which of these will be the most effective for solving a particular problem instance. Hyper-heuristics (HHs) are often used as a means to make this choice. In particular, the underlying idea of HHs is to run several algorithms or heuristics and dynamically decide, based on different criteria, which problem or part of the problem should be solved by which algorithm or heuristic. On the other hand, the domain of social choice theory studies how to design collective decision processes by aggregating individual inputs into collective ones. In this paper, we explore the use of social choice theory in creating HHs. By using HHs based on different voting methods, like Borda, Copeland, and Kemeny-Young, we show how we can solve both continuous and discrete engineering multi-objective optimization problems, and discuss the results obtained by each of these methods. Our obtained results show that our strategy has found solutions that are at least equals to the ones generated by the best algorithm among the studied ones, and sometimes even overcomes these results.**

***Keywords*— Hyper-heuristics ; Multi-objective Evolutionary; algorithms; Voting methods; Crashworthiness; Car Side Impact; Machining; Water Resource Planning; Multi-objective Travel Salesperson Problem.**

***Classification*— Doctorate degree**

***Category*— Indicate the state of the research:In conclusion**

I. Introduction

We communicate the paper [1] which had a final acceptance and it is going to be online in December of 2019.

References

[1] CARVALHO, V. R. de et al. Applying social choice theory to solve engineering multi-objective optimization problems. *Journal of Control, Automation and Electrical Systems (JCAE)*, v. 30, n. 6, dez. 2019. ISSN 2195-3899.