Interactive Solution of Difficult Choice and Decision Making Problems: Effective and Efficient but not Always Easy

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Abstract. The present world is characterized by a huge and growing complexity of processes and systems involved, amplified by many other characteristic features that even increase the complexity exemplified by the human centricity, time criticality, emergent behaviors, a need for trustworthiness, etc.

Therefore, the most efficient effective and efficient paradigms for the solution of today's complex problems for now, maybe also for the foreseeable future, is not the "full automation", the so-called automated decision making (ADM) but rather the so called quasi-automated decision making (Quasi-ADM) which boils down to a synergistic combination of human and computer capabilities, mainly related to human capabilities to solve "delicate" problems, with a sheer number crunching ability of the computer. This is basically the essence of an interactive problem solving which is advocated by many experts, for instance, Geoff Hinton, one of the founders of deep neural networks.

We consider difficult decision making and choice problems which involve optimization that can be solved either by a strict optimization procedure or a meta-heuristic. First, we look at what can make an optimization based problem difficult. We propose an interactive approach via the so-called decision aid paradigm. We have a decision maker, called in this context a judge, who knows his/her area but not necessarily tools and techniques for solving resulting decision making and choice problems. So, the judge commissions an analyst, called here an advisor, who need not know the area but knows how to solve those resulting decision making and choice problems. Clearly, the advisor provides advice, information and suggestions, while the judge makes the final decision.

We discuss various issues related to how the 3 stakeholder (judge, advisor and the pair "judge-advisor") cooperate and collaborate, and in which relations they enter. This is considered, mainly in the context of advice giving (by the advisor) and advice taking (by the judge), and possible different intentions and interests of all parties. In particular, we focus on the so-called advice discounting related to an insufficient use of advice by the judge, unintentionally and intentionally, and analyze various cognitive and psychological reasons, and some ways out. We also discuss some economic aspects. Suggestions for the design and implementation of interactive solution procedure are proposed.