

Multi-criterial Decision-Making and the Cognitive Architecture of Problem Solving

B. Chandrasekaran, *Fellow, IEEE*

Abstract— Rational decision-making is often modeled as choosing the alternative that maximizes utility for the decision maker. Over the last few decades, much evidence has been produced to demonstrate that human decision-making is subject to irrationalities, such as intransitivity and framing biases. I seek an explanation for how these irrationalities arise, specifically, how they relate to the intrinsic nature of problem solving as setting up and searching in problem spaces, guided by knowledge. Even in simple decision-making problems where the alternatives are small in number and clearly specified, problem solving is required to evaluate the alternatives. One source of the explanation of the irrationalities is the characteristic strategies that are used to evaluate the alternatives. When decision-making problems are complex, additional opportunities arise for sub-optimal decisions. I also attempt to relate the traditional decision-making model of maximizing a single real-valued utility function to the common situation where decision-making is modeled as multi-criterial. I end with some ideas for how decision support system designers can use the analysis to reduce the opportunities for irrationalities.

B. Chandrasekaran is Professor Emeritus of Computer Science and Engineering, The Ohio State University, Columbus, OH 43210 USA. (phone 614-292-0923, e-mail: chandra@cse.ohio-state.edu). The research in support of this presentation was supported by participation in the Advanced Decision Architectures Collaborative Technology Alliance sponsored by the U.S. Army Research Laboratory under Cooperative Agreement DAAD19-01-2-0009. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the Army Research Laboratory or the U. S. Government.