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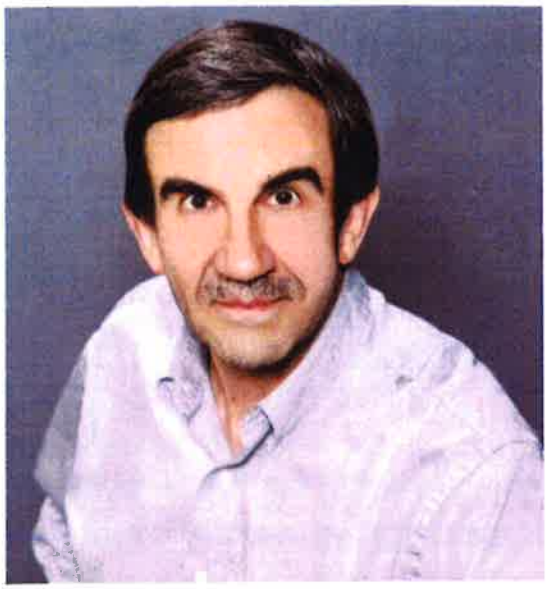

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Bounded Rationality in Decision Making Under Uncertainty: Towards Optimal Granularity

Abstract. Starting from well-known studies by Kahneman and Tversky, researchers have found many examples when our decision making seems to be irrational. We show that this seemingly irrational decision making can be explained if we take into account that human abilities to process information are limited. As a result, instead of the exact *values* of different quantities, we operate with *granules* that contain these values. On several examples, we show that optimization under such granularity restriction indeed leads to observed human decision making. Thus, granularity helps explain seemingly irrational human decision making.

Similar arguments can be used to explain the success of heuristic techniques in expert decision making. We use these explanations to predict the quality of the resulting decisions. Finally, we explain how we can improve on the existing heuristic techniques by formulating and solving the corresponding optimization problems.

Vladik Kreinovich received his MS in Mathematics and Computer Science from St. Petersburg University, Russia, in 1974, and PhD from the Institute of Mathematics, Soviet Academy of Sciences, Novosibirsk, in 1979. From 1975 to 1980, he worked with the Soviet Academy of Sciences; during this time, he worked with the Special Astrophysical Observatory (focusing on the representation and processing of uncertainty in radioastronomy). For most of the 1980s, he worked on error estimation and intelligent information processing for the National Institute for Electrical Measuring Instruments, Russia. In 1989, he was a visiting scholar at Stanford University. Since 1990, he has worked in the Department of Computer Science at the University of Texas at El Paso. In addition, he has served as an invited professor in Paris (University of Paris VI), France; Hannover, Germany; Hong Kong; St. Petersburg, Russia; and Brazil.

His main interests are the representation and processing of uncertainty, especially interval computations and intelligent control. He has published six books, eighteen edited books, and more than 1,300 papers. Vladik is a member of the editorial board of the international journal *Reliable Computing* (formerly *Interval Computations*) and several other journals. In addition, he is the co-maintainer of the international Web site on interval computations http://www.cs.utep.edu/interval-comp

Vladik is Vice President for Publications of IEEE Systems, Man, and Cybernetics Society, Vice President for Publicity of the International Fuzzy Systems Association, Vice President of the European Society for Fuzzy Logic and Technology, Fellow of Mexican Society for Artificial Intelligence.

He:

- served as President of the North American Fuzzy Information Processing Society 2012-14;
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