Human problem solving: Plenary talk

Zyg Pizlo
Department of Psychological Sciences
Purdue University
&
Ed Chronicle
Department of Psychology
University of Hawaii at Manoa
Topics

• Complexity theory in cognitive modeling
• Graph theory in cognitive modeling
• Optimal decision making under uncertainty
• Individual differences in problem solving
• Traveling salesman problem
• Variants and applications of TSP
The New Approach

• It is clear that we – the assembled company – have developed a new approach to human problem solving

• Emphasis on human cognitive successes, as opposed to cognitive failures

• Emphasis on cognitive functions that are computationally difficult
  – The set of currently available models is small (often empty)
Cross-fertilization

• Psychologists can learn from mathematical/computational scientists how to formulate computationally efficient model.

• Mathematical/computational scientists can learn from psychologists about what is computationally possible (existence proof for cognitive functions).
Interdisciplinary Work

• Psychologist tries to provide evidence about human cognitive abilities that at present cannot be replicated by a computer. When she succeeds:
  • Computational scientist will have to try to figure it out. When he succeeds:
  • Psychologist will test the new model and will try to figure out under which conditions the model is not “smart” enough. When she succeeds:
  • Computational scientist will have to try to figure it out…
Continuing and future issues

- The range, limits and individual variation in human performance. Relatedly, are there easy classes of problem for humans?
- Expanding the range of problems studied
- Influence of instructional variation and mode of data collection: engagement of serial vs. parallel cognitive/perceptual processes?
More of them

• Models and heuristics: bridge-building between formal mathematical accounts and cognitive (and even neuroscientific) accounts. Tractability as a major issue here
• Relationship between the fields of sequential decision-making and optimization
• Still only a limited amount we can tell Richard: he needs us to do more basic work to help him keep Cumbria gritted. How do humans deal with constraints added to problems?
Mahalo nui loa

• Thank you all for coming and contributing so vigorously and enthusiastically
• We hope that we have achieved our goal of having this meeting produce “more than the sum of its parts”
• We are hoping to run this meeting again in two years.