Models of Complexity for Dynamic Decision Making Derived from Cognitive Informatics, Complexity Theory, and Psychophysics

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Abstract: Dynamic Decision-Making (DDM) is interested in the study of complex decision-making involving dynamic systems and problem spaces. Through the use of human in the loop experimentation in an interactive learning environment, we endeavour to observe the impact of complexity on human performance. Our research presents some preliminary efforts in determining objective models and metrics of complexity to measure the impact of system complexity on comprehension and performance, drawing on research in applied cognitive psychology, cognitive informatics, and complexity theory. By using serious games scenarios of varying degrees of complexity, psychophysical measures have been collected and benchmarked, such as prediction and decision performances, subjective measures of confidence and assessment of problem complexity, etc., according to a number of objective measures of complexity. Additional critical factors of DDM are modeled, such as the goal distance to reach objectives, in order to establish criteria for an objective measure of difficulty, beyond problem complexity.