Interval talks at the first El Paso Shell Oil Symposium

Интервальные доклады на первом симпозиуме Shell Oil в Эль-Паco

On November 5, 1995, the International Symposium *Theories of Logic Programming, Non-Monotonic Reasoning, and Their Application to Reasoning about Actions* was held in El Paso, Texas. This symposium was organized in honor of 50-th birthday of Michael Gelfond. It was the first symposium of the El Paso Shell Oil Symposium series, jointly sponsored by the Shell Oil Company and by the University of Texas at El Paso (UTEP).

Overall, 16 talks were presented by researchers from the USA (New Mexico State U., Southern Methodist U., Stanford U., Syracuse U., U. of Texas at Austin, and UTEP), Canada, and Finland. Reasoning about actions is usually done when we do not have the complete knowledge about the situation, and about the consequences of our actions. Therefore, uncertainty (including interval uncertainty) plays an important role in this area. At this symposium, the majority of the talks were dealing with various types of uncertainty, and two talks were mainly concentrating on interval methods.

In his talk "Program behavior models, assertion languages and debugging automation", Mikhail Auguston (New Mexico State U.) described the application of the so-called *interval temporal logic* to debugging programs. Program specifications can be written as statements about actions performed by a program, e.g., "All variables in the program must be initialized before being used in some expression". Such specifications can be rewritten as relations between time intervals during which different parts of the program are running. Other specifications are even easier to interpret in interval terms: they state explicitly that the values of certain variables must be inside certain intervals. Auguston has developed a compiler that enables the programmer to automatically check these type of specifications.

In a talk "Using Gelfond's epistemic specifications to justify heuristic methods of intelligent control and expert systems", Hung Nguyen (New Mexico State U.) and Vladik Kreinovich (UTEP) used intervals to describe the experts' degrees of belief in different statements A, B, C, etc, from the expert system's knowledge base: e.g., absolute belief corresponds to the degenerate interval $[1, 1]$, absolute disbelief to $[0, 0]$; equal amount of belief and disbelief to $[0.5, 0.5]$, and "I have no idea" is described by the interval $[0, 1]$. Logical operations ("and", "or", and "not") that are usually defined on the set $\{0, 1\}$ (= {True, False}) can be generalized to operations on such intervals. This generalization enables us to define interval degrees of belief for composite formulas (e.g., $A \vee (B\&C)$). The problem with this definition is that logically equivalent expressions can lead to different interval results. In other words, formulas that are equivalent in classical logic may not be equivalent in the "interval" logic. The main theorem of this talk shows that two formulas lead to the same intervals iff they are equivalent in the sense of "epistemic specification", a formalism based on logic programming ideas that was motivated by the analysis of common sense reasoning. This result shows that interval degrees of belief are indeed a reasonable tool for presenting commonsense reasoning.

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