CV

Mirko Čubrilo was born in September 1953 in Josipovac, Croatia. He received his M.Sc. in mathematics (specializing in the field of mathematical logic) at the Faculty of Mathematics and Natural Sciences, Zagreb University, Croatia, and his Ph.D. in Computer Science, at the Faculty of Electrotechnics (now Faculty of Electrical Engineering and Computing), Zagreb University. He holds full professorship at the Zagreb University. At the Faculty of Organization and Informatics in Varaždin he teaches several courses on graduate as well as on postgraduate studies, including Data Structures, Introduction to Formal Methods, Advanced Formal Methods, Logic Programming, Selected Topics in Artificial Intelligence and Selected Topics in the Logic of Conflict. His research encompasses applications of mathematical logic and the theory of algorithms in modeling and solving wide range of problems, and as of recently also includes deep learning. He has published over 50 papers and the book Mathematical Logic for Expert Systems (in Croatian). He was the leader of, and chief researcher on, several research projects.

Title:

Some logical and related formalisms, programming paradigms, and development environments for the (new) AI

Abstract:

Since its very beginnings, AI has developed in parallel on the lines of two research method paradigms. The first paradigm could be called *statistical* (pattern recognition, machine learning, recently also deep learning, which has in the last few years entered into a quite vibrant phase of development). The second paradigm can be called *logical*, and it (mostly) deals with automatic deduction systems and tools development in the environment of coressponding formal methods, which in particular encompass formal logical calculi. This paradigm partially uses these systems for the requirements of modeling and solving problems from the AI domain.

There are many logic calculi that have found application in modeling and solving a wide range of AI problems. These range from classical propositional calculi, their fragments (such as calculi of functional and multivalued dependencies, without which the relational data model wouldn't be possible), intuitionistic propositional logic and its many fragments and variants, superintuitionistic logics, multiple valued logics (Lukasievicz logics), discrete as well as continuous, systems of modal propositional logics, first order predicate calculus (logic) and its variants, second order predicate Logic, F-Logic etc. Here we also cannot circumvent mentioning a whole spectrum of contextual domain logics such as fuzzy logics.

Many of the logic calculi mentioned above have themselves become foundations for building logic programming languages such as Prolog (and its relatives), hybrid programming languages and tools, which

next to the logical component encompass classical linear programming (constraint logic programming languages) and also specialized tools such as SAT-solvers, languages that implement 2nd order predicate logic (HiLog) or tools such as Coq, based on a fragment of lambda calculus, which has for thirty years been developed by INRIA, the world renown computer science institute based in France...

The purpose of this lecture is to present a concise and consistent overview of (in author's opinion) the most important logic systems that find application in modeling and solving a wide range of problems from the AI domain, as well as some other tools that have successfully passed the test of time (together with some of their most successful applications). A few remarks will also be made on the problems that accompany the development of such systems, from both the theoretical and practical standpoint. And finally, the lecture will present author's views of the upcoming sythesis of the statistical and logical approach to AI domain problem solving.

Keywords:

AI development paradigms, logic calculi, logic programming languages, SAT-solvers, HiLog, F-logic, Coq