From Chess Moves to Legal Decisions: A Position Statement

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DEEP BLUE's victory over Kasparov has confirmed the ideas of the genuine artificial-intelligence researchers, but – and that is more important – it has also opened the eyes of the disbelievers. The latter group is now given to understand that (i) scientific progress in mimicking human chess performances can go as far as outperforming the World Champion, and that (ii) progress in one domain may be transferable to another domain.

In the Netherlands, the world of computer chess had two firm disbelievers, viz. Professor A.D. de Groot, a psychologist, and Hans Böhm, an international chess master (IM). Around 1980, they did not believe that a computer program could play at World-Champion level.

Their arguments can be summarized as follows.

Assumption 1: The playing strength of chess grandmasters heavily rests on intuition (intuitive knowledge).

Assumption 2: Intuition cannot be programmed.

Conclusion: Chess programs will never perform at strong grandmaster level.

The outcome of the match DEEP BLUE versus Kasparov proved them wrong. Moreover, the issue whether intuition is programmable turned out to be of marginal importance. Two tentative conclusions are worth to be formulated: (1) intuition defined as unconscious or subconscious knowledge is partly programmable; (2) intuition plays a minor part than assumed so far when deciding on a move in the choice-of-move problem. Future research must establish which conclusion is most important. For law-and-computer-science researchers, the main question reads: Is the empirical evidence as now obvious in chess transferable to the domain of law (or to any subdomain of law)?

For an answer to this question we would like to have some insight into the profitable findings of computer-chess research. The main contribution, of course, is substantiating the idea that a machine is capable of taking better decisions than human beings in a particular subdomain. Apart from this overall achievement, there are many contributions in the form of computer-realized ideas, implemented techniques, and proven methods which have shown to be beneficial in other domains. We mention the most important ones (in italics).

In the time frame 1950–1960 many search techniques have been developed. The techniques were based on (appropriate) evaluation functions. In the 1960s emphasis was laid on datastructures meant for suitable knowledge representations. The

1970s showed that exhaustive enumeration was possible, i.e., knowing the best move in any configuration, by producing databases with complete information. In the 1980s the common-subtree problem was solved by the introduction of transposition tables, a technique soon adopted in other domains. Moreover, this technique was extended to search tables, which stored additional relevant knowledge so that not only common subtrees were avoided, but also the search was guided in a heuristically-desired direction.

Next to these lines of searching, storing knowledge and representing knowledge, we acknowledge the development of machine-learning techniques. Another important technique is text interpretation, of which the newest techniques originate from the research by Baird and Thompson (1989). They used the domain of distinct chess notations as their application area. Other combined efforts have profited from fruitful cooperation between the world of psychology and the world of chess. In particular, we mention the contribution by De Groot (1946) on think-aloud protocols, a technique adopted and extended by Newell and Simon (1972) and nowadays widely in use in multi-faceted forms when knowledge acquisition is at stake.

A recent form of cooperation between AI researchers and psychologists is in the domain ofopponent modelling. Its formalization started in computer science and especially in computer chess, but it will be soon embraced by other domains, law and computer science among them.

Having mentioned ten contributions from computer chess, it should be fair to elaborate on them in the context of legal knowledge-based systems. Unfortunately, this position paper does not allow such a treatment of items. Therefore, I restrict myself to supplying four historical landmarks, finishing with a statement on opponent modelling.

Serious ideas on a computer judging court cases (Loevinger, 1949) originated almost simultaneously with the ideas on a computer playing chess (Shannon, 1950). In the Netherlands, an important contribution has been made in the Ph.D. thesis by Alida M. Bos (1967), formalizing several methods to define legal concepts. It has always surprised me that R.V. de Mulder (1984) did not arrive at the ultimate conclusion that his programs could be upgraded up to a level of making better decisions than judges. In 1991, the latter statement by Van den Herik (1991) was the start of a fruitful discussion. I regard the victory of DEEP BLUE over Kasparov as supportive to this statement. Moreover, I believe that tuning a program on a specific opponent is a mighty means of performing better than may be expected from an objective point of view. This strategy is called opponent modelling and – I am sure (cf. Van den Herik, 1997) – it will find its way in the lawyers' battles in court cases.

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