

Deep Blue Beats Kasparov in a Rematch

A Victory for Machine over Man

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Last year, I had written an article on computer chess for *Resonance*. The article described the general trends in computer chess and in particular about a system named *Deep Blue* which IBM was developing. Deep Blue had played Kasparov in February 1996. It lost the match, though it won one of the games. That was the first time a computer had beaten Kasparov in a game with real tournament conditions. In May this year Kasparov agreed to play a rematch with Deep Blue. Deep Blue won the rematch, 3.5 points to 2.5 points. Kasparov and Deep Blue went into the last game level at 2.5 points each. Deep Blue played white in this game. The game lasted less than an hour and in 19 moves Kasparov resigned. This is the first time he has lost a match to an opponent since becoming world champion in 1985. Post-match analysis showed that Kasparov made a blunder on move 7 which led to his quick defeat. Deep Blue (rather it's team) got the first prize of \$700,000 and Kasparov got \$400,000.

The victory of a computer system over Kasparov was eventually expected, but not so soon. It has sparked a big debate about its future implications. Does this mean that computers have conquered yet another domain?

The significance of the defeat seems to have been enhanced since Kasparov was the

opponent. Gary Kasparov is ranked as one of the best chess prodigies in the world. He was USSR Junior Champion at age 13, an International Grandmaster at 17, and the second strongest player in the world at 19. Kasparov has consistently exhibited chess abilities beyond his age. In November 1985, at the age of 22, he became the youngest World Champion in history by defeating Anatoly Karpov, a title he still holds today.

How was this year's Deep Blue different from last year's version? C J Tan, the director of the IBM research team said: "Three things were improved this time around; it's more powerful, we added more chess knowledge and we developed a program to change the parameters in between each game." The system, which is two times faster than the one used last year, runs with 32 P2SC processors each with 8 dedicated VLSI processors.

A number of reasons have been given for Kasparov's loss:

- Kasparov did not play his natural game and tried to use a strategy which was intended to throw off Deep Blue.
- Deep Blue's earlier win in game 2 of the tournament had a psychological impact on Kasparov. Would Kasparov have won if it were not for this psychological impact?
- Deep Blue knew everything about Kasparov's game – data about a very large number of games Kasparov had played in the past including the games he played last year with Deep Blue. Kasparov on the other hand had little information about Deep Blue and its strategies.
- Kasparov being human was fallible, while computers are not!

Some Issues

In fact, in 1957, Herbert Simon a pioneer in the field of AI had predicted that in ten years a computer would become the world chess champion. Though it took 40 years instead, we have nevertheless achieved the target. In these 40 years the power of computers has increased a million times! Deep Blue in this year's match was estimatedly examining 200 million moves a second. It uses a number of interesting techniques viz. a large database of previous games, interesting search techniques, powerful evaluation techniques to choose moves, parallel processing etc. These techniques are different from those which human beings use, but nevertheless produce intelligent chess behaviour. Kasparov summarized it well by saying: "Deep Blue shows us that machines can use very different strategies from those of the human brain, and still produce intelligent behaviour."

IBM argues that their goal in developing Deep Blue is not merely to evolve a chess grandmaster system but to be able to tackle other problems which are also amenable to similar techniques. Others argue that many of the problems which Artificial Intelligence researchers are tackling e.g. identifying objects in a scene, understanding human speech, translating from one language to another, etc., cannot be handled by similar techniques. The powerful processing speeds may help in these applications, but the techniques would have to be no doubt different.

This victory of Deep Blue may be regarded not as a victory of machine over man, but a

victory of men over man. A group of dedicated scientists with a single minded determination were able to create Deep Blue. The work which started as a research endeavour at Carnegie Mellon University nearly twelve years ago, has led to the development of the world's strongest computer chess system. They were out to prove a point: that a computer system could beat the world champion, and they did just that.

What's Ahead?

Deep Blue's victory would have no doubt boosted the egos of its developers. But there are still many hard unsolved problems left to be tackled. Is it possible for a system to adapt itself to the specific opponent it is playing, by capitalizing on the opponents 'known' weaknesses? Could the system improve its performance over time on its own? Such learning is still sometime away.

Now that chess is 'conquered', which is the next game? Many point out to the Japanese game *go*. The search space in *go* is much more than that of chess and so throws up new challenges in coping with large combinatorial spaces. Only time will tell if we can win this challenge too!

Suggested Reading

- ◆ KSR Anjaneyulu. *Will the Computer Become the World Chess Champion? Resonance*. Vol. 1. No. 9. September, pp. 59-65. 1996.
- ◆ Monty Newborn. *Kasparov vs. Deep Blue: Computer Chess Comes of Age*. Springer-Verlag, 1996.

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