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Feng-hsiung Hsu: Behind Deep Blue

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CHAPTER 1

Show Time!

In late April 1997, posters for an unusual chess event were appearing on the streets of New York. They showed a somber and pondering gentleman in his early 30s peering over a chess set at the viewers. The small caption under his chin said, “How do you make a computer blink?” The gentleman on the poster was the World Chess Champion Garry Kasparov, possibly the strongest chess player who has ever lived.

Off the street, in the basement of the Equitable Building, I was staring at the blank screens in an empty auditorium. In a few days, the auditorium would be filled with an overflowing crowd; TV cameras would be entrenched at vantage locations and the three huge projection screens at the front would come to life. The left screen would be showing a live image from a TV studio on the 35th floor of the building, serving as the game room. The live image would usually show the two contestants sitting across a specially designed playing table. The contestant on the left would be Garry Kasparov. The contestant on the other side would be one of my two colleagues, Murray Campbell and Joe Hoane, or me. Garry’s real opponent was the chess computer, Deep Blue, that the three of us had designed and programmed. During the games we acted merely as extensions of Deep Blue and made moves for it on the physical chessboard. In the auditorium itself, three chess commentators, sometimes with a guest commentator or two, would be using the center screen to show their analysis of the ongoing game. The right screen would be displaying the overhead shot of the chessboard. This way, the audience in the auditorium would have a clear view of the present game position.

It had taken me almost twelve years to reach this point. When

I started, Garry was not the World Champion; it was a few months yet before he was crowned. For the past eleven years, since 1986, my partners and I had been building successively more powerful chess computers. Our eventual goal was to beat the World Chess Champion, whoever he or she was.

Before us, many pioneers, some famous and some not so famous, had made their contributions to the “Computer Chess Problem”. In 1949, Claude Shannon made his proposal on how to program a computer to play chess. Since then, thousands of computer scientists, engineers, hobbyists, chess players, and even commercial organizations had worked on the problem. Some wanted to use chess as an experimental tool to find out how human intelligence worked. “If one could devise a successful chess machine, one would seem to have penetrated to the core of human intellectual endeavor,” said Allen Newell, Cliff Shaw and Herbert Simon in one of the early computer chess papers. Other people viewed chess as a clear-cut, well-defined example of a complex problem. “Solving” chess could conceivably provide new techniques to solve other complex problems. The commercial entities did it for profit, of course, and some people, especially the hobbyists, did it just for fun.

We approached the problem from a different direction. We, or at least I, viewed the problem as a purely engineering one. Since the late 1970s, it had been established that chess computers became stronger as their hardware speed increased. By 1985, when I started my small project that eventually become Deep Blue, the extrapolation from the experimental data indicated that a one thousandfold increase in hardware speed might be sufficient to produce a World Champion-class chess machine. Our project began with a simple goal, namely, to find out whether a massive increase in hardware speed would be sufficient to “solve” the Computer Chess Problem. Building this “Mother of all Chess Machines” was an interesting problem by itself. Of course, it would be an added bonus if our machine could indeed defeat the World Champion.

The previous version of Deep Blue, lost a match to Garry Kasparov in Philadelphia in 1996. But two-thirds of the way into that match, we had played to a tie with Kasparov. That old version of Deep Blue was already faster than the machine that I conjectured in 1985, and yet it was not enough. There was more to solving the Computer Chess Problem than just increasing the

hardware speed. Since that match, we rebuilt Deep Blue from scratch, going through every match problem we had and engaging Grandmasters extensively in our preparations. Somehow, all the work caused Grandmaster Joel Benjamin, our chess advisor, and one of the best chess players in the US, to say, “You know, sometimes Deep Blue plays chess.” Joel could no longer distinguish with certainty Deep Blue’s moves from the moves played by the top Grandmasters.

The press covered this new match with much anticipation. If the new Deep Blue won the match, then it would be a momentous occasion in the long history of men as toolmakers. It would also be the completion of a long-sought-after milestone for computer scientists and artificial intelligence researchers. It was almost certain that this match would be bigger than any World Chess Championship match, with possibly the sole exception of the Fischer vs. Spassky match in 1972. If we did win, perhaps not even that Fischer vs. Spassky match would compare.

The new Deep Blue was much improved, but would it be enough? Would the journey begun by my partners and me so many years ago finally be over?