

The Diegesis of Deep Blue

The tales of mankind versus machines or robots has been one of the most fascinating kinds. For a while it was thought that *AI* can never surpass human intelligence. However, the first biggest waves of *AI* finally occupying the pedestal, one that was widely watched and witnessed by the world was in the year 1997, when an *AI* program called **Deep Blue** developed by IBM defeated World Champion Chess player **Gary Kasparov**, in a series of games of Chess.

A number of factors were responsible for this event, including both software and hardware advances:

1. A single chip chess engine
2. A multiple level parallel system
3. Advance search algorithms and complex evaluation functions
4. A database that Chess Grandmasters helped build which contained effective opening moves.

Deep Blue's first version played against the GrandMaster in the year 1996, in which the GrandMaster won the game by a score of 4-2. The computer had used 216 chess chips, each capable of searching across 1.6 – 2 million chess positions per second. After its defeat at the hands of Gary Kasparov, a number of problems were identified, which were later rectified during the preparation for the rematch in the year 1997. A significantly enhanced chess chip along with a completely redesigned evaluation function was designed. These design changes improved the search speed to over 2-2.5 million chess positions per second. The number of chips that were used were also more than doubled. Finally, to prepare for the rematch, software tools were developed that helped in assessing, debugging and visualizing the performance of the machine.

The second version of Deep Blue defeated Gary Kasparov by a score of 3.5-2.5.

What were the factors that led to the success of Deep Blue?

1. The Chess Chip:

This Chess chip was derived from two predecessors and could generate evasion moves and certain kinds of attacking moves., while also supporting search extensions. The move generator was embedded as an 8x8 combinatorial array in silicon. It also had effective ordering of moves for an efficient search.

2. Evaluation function:

This consisted of a “fast evaluation” and a “slow evaluation”, which could be programmed to adjust their relative importance. The fast evaluation was used when approximations were good enough and time was of the essence, the slow evaluation scanned the board for various chess combinations and analyzing things like square control, king safety, blockades, trapped pieces etc which costs more time.

3. Search Control:

This performed AlphaBeta search, a technique to prune certain unnecessary moves and thereby eliminating the need to perform additional calculations. It also kept a record of already explored moves along with a repetition detector, that detects what moves could possibly result in repetitions.

Deep Blue had several other techniques, along with the aforementioned ones, that contributed to its success. Some of the other techniques that worked in its favour was having a database of opening moves, an extended book in case of absense of opening book information, and also an endgame database. These techniques, along with complex search and evaluation functions coupled together with a hardware that had parallel processing capabilities helped the computer ultimately win the showdown in "*The Brain's Last Stand*".