Searching to beat a Grandmaster: Deep Blue

In 1957, a leading pioneer of artificial intelligence, Herbert Simon, predicted that a computer will defeat a human chess champion within a decade. On February 10, 1996, IBM-developed “Deep Blue” beat world champion chess grandmaster Garry Kasparov.

IBM’s goal in the Deep Blue project was to develop a computer that could beat a chess Grandmaster. To do this, IBM consulted several grandmasters, including Joel Benjamin and Miguel Illescas, loading the computer with 4,000 opening positions and 700,000 grandmaster games for comparison and analysis. Deep Blue’s algorithm was a selective brute force algorithm, which ranked only a select group of possible moves (ignoring obviously non-productive moves) and played with the best ranked move. To rank possible moves, Deep Blue considered the categories of material, position, king’s safety, and tempo, and “thought” six to eight moves ahead, and even more than twenty at key moments in the game. Material ranking considered the possibility to capture an opponent’s pieces, rating the “value” of a captured piece. Position ranking considers how valuable a certain position can be in the future of the game. King’s safety ranking was to make sure that good attack move would not compromise the safety of the king (the most valuable piece in the game). Tempo ranking considered how fast the opponent could develop his position in contrast to the computer. Ideally, the computer would develop faster than the human opponent. With this algorithm developed, the remaining task for the IBM team was to integrate hardware that could compute fast enough to compete in a real chess match.

In order for deep blue to compete in an official chess match, under fixed time pressure, Deep Blue needed to perform its algorithm extremely quickly. Deep Blue’s hardware had parallel processing capabilities that allowed the computer to compute 200 million positions per second. In June 1997, Deep Blue was rated “the 259th most powerful supercomputer according to the TOP500 list” (Wikipedia, Deep Blue). When combined, Deep Blue’s algorithm and hardware was able to achieve what no other computer before had achieved. For the first time in history a computer beat a chess Grandmaster.

Works Cited

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