Research Review – Deep Blue

This paper highlights the journey made by the people, hardware, software, chips, algorithms and tools used by Deep Blue in 1997 to defeat the World Champion Gary Kasparov in a game of chess. The origins of Deep Blue go a long way back in the 1980s at Carnegie Mellon University. The university was focused on building a chess machine to defeat humans in a game of chess.

Chip test and Deep Thought were the two machines that were built in the university. Deep Thought is supposedly the first machine that could defeat a Grandmaster in a tournament game of chess. In 1989-90 the team from Deep Thought moved into the IBM Watson research center. The evolution of this was Deep Thought 2, Deep Blue I and Deep Blue II.

Deep Thought 2 and Deep Blue I did achieve victories against humans in chess championships. Deep Blue I did tie 2-2 with Gary Kasparov in 1996 but eventually lost 4-2 in the process. Deep Blue II made significant improvements in terms of hardware, software, chips, algorithms and tools. The improvements done across are summarized below:

- Hardware: 30-node (30-processor) IBM RS/6000 SP computer and 480 single-chip chess search engines, with 16 chess chips per SP processor. Average speed was 126 million positions per second. Highest speed was 330 million positions per second.
- Hardware evaluation was built in with as many as 8000 features being tuned.
- Combination of hardware and software search was used.
- There was massive parallel search capability built into the system
- A new search method called ‘Dual Credit with Delayed Extensions’ was constructed.
- Depth search, parallel search was used extensively.
- A huge opening book was created with the help of Grandmasters along with extended books, endgame databases and time control.

Conclusion

As is evident from the discourse in the paper, the success of Deep Blue II was dependent on a multitude of reasons. As is the case with such innovations, a number of things were an improvement over the past. But there were also many limitations in the system and design that could have been improved upon.

It is also important to note that along the way, it was humans which helped Deep Blue II become what it is. A number of matches were played with other Grandmasters to validate and learn before the final ones with Kasparov. Deep Blue II is a significant achievement in the field of artificial intelligence for us humans and laid the foundation for success for other initiatives in AI.