How to Win

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Humans have been playing games for thousands of years, whether to learn necessary survival tactics, ease the tediousness of labor, or in modern times, just to have fun. From all of these games, however, we can draw a couple of defining characteristics inherent of a balanced and thus arguably more fun game: Information (or lack thereof), Weighted Decisions ,but perhaps more importantly, the Human Factor.

Without mathematics, a pair of Layman's eyes see Tic-Tac-Toe as a child's game. Each decision is simplistic yet calculated, but require deep strategy from the human. However, with the application of the most basic of mathematical concepts, he can see that as many as 23,129 possible combinations of the board are possible, and with the help of a computer, he can win from any given situation using a combination of the most basic Bayesian(and-or) Game theory(Schaefer 2002). Our protagonist proclaims the game solved, and proceeds to his next endeavour: Chess.

Though optimistic, he quickly realizes that the number of positions achievable overwhelm his own, or even human comprehension. Despite every position having a definite set of win conditions, achievable through various move order, both of which are calculable and able to be objectively evaluated by Chess Engines like Fritz, the human limits of chess are bound to the Human's ability to process the information given in the board and choose the proper Weighted Decision associated with the most benefit. To study Perfect-Information, sequential games the Branch of Combinatorial Game Theory describes the outcomes of Chess, Go, and others (10^{123} and 10^{360} combinations respectively) through massive decision trees of varying length, taking each decision into account and dehumanizing chess through the power of raw numerical computation. To place into perspective how *in*-human and objective these numbers are, the number of *atoms in the visible universe* "only" sums to 10^{81}. The power of raw computational capability has crushed the human intellect with silicon, losing only to the flexibility of a cerebral cortex molded by eons of evolution. We have taken a game and simplified into a tree of uncounted numbers of pluses, minuses, and zeroes through math alone, laying bare the secrets of a game as old as civilization.

From there we depart from games of perfect systems and information. Our hopeful protagonist moves onwards to the world of imperfect systems, looking to games such as Poker and Blackjack. What's beautiful about card games is that each individual system played out by the players handles its own unique set of probabilities, leading to the formation of a probability tree rather than a defined path of moves to take. What's different then is that card games carry a memory, a memory exploitable by the calculating mind. From the research of Doctor Edward Thorpe, the first man with access to a computer for the purposes of Game Theory, a computer simulation yielded that the perfect player had anywhere from a .5 to 2.5% advantage of the house, overall averaging a profit of $50 an hour with a standard-deviation of $1,400. This type of return based on probabilistic Weighted Decisions is exactly why your average human cannot solve for a game of Blackjack. Returns to the untrained human cannot see the upward trend of profit, only the variation provided within the game itself. But to the eyes of a computer with the oversight of MILLIONS of hands and the analytical ability of mathematics, the jumbled train of mathematics associated with each card turn can distilled into a definite strategy.

All games contain 3 main points: Information, Weighted Decisions, and the Human playing the game, but as we've seen, the Human has been getting less and less relevant in the jumble of data proposed as a game, more of an imperfect medium of execution rather than the pinnacle of strategic dominance. Non-traditional strategy games like Starcraft and Warcraft have risen to the front of another generation of strategy games, but we have yet to see complete mathematical perfection of games that a definite value cannot be attached to. Will we see the end of gaming in the future, where every game has been solved with new developments in Game Theory computing?

Sources Cited

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