One of the most fundamental and challenging computational problems is to find an answer to the question: *Can the given propositional logic formula be satisfied?*, or how to determine the existence of any assignment of TRUE or FALSE value to variables so that the given logical formula becomes TRUE. Such decision problems are known as the boolean satisfiability problem (SAT), and it has numerous applications in many different areas of computer science, including mathematics, engineering, and artificial intelligence. SAT is proven to be NP-complete, meaning that if an efficient algorithm for solving this problem in polynomial time exists, then all NP problems can also be solved in polynomial time.

Over the last decades, many remarkable progresses in algorithmic improvement of SAT solvers have been made, including advancing basic SAT solver algorithm DPLL to CDCL, or developing various of new techniques based on heuristics and optimization strategies. Some of these SAT solvers are extremely efficient that able to solve multiple different massive instances, which contain hundreds of thousands of variables and millions of clauses. Despite such many efforts, no known algorithm can guarantee to find the optimal solution in polynomial time.

A new type of completely deterministic logic system, called Noise Based Logic (NBL), is introduced recently, where the logic values are represented by independent noise processes. It is also possible to utilize the NBL for realizing logic circuits. A theoretically robust property of NBL that it can easily construct the superposition of 2^n noise sources within only one input operation, meaning that only an n input NBL circuit is required. With this key property, a potentially novel SAT solver using Noise Based Logic is proposed by PCK Lin, A Mandal and SP Khatri. Their approach avoids a significant assumption and limitation present in the conventional method of solving SAT. Since there is no existing NBL circuit, the algorithm is verified through many simulations.

The contribution of our work in this thesis is fundamentally based on this new SAT solver of Lin et al.:

- Implement the algorithm in simulation
- Experiment with various SAT instances to evaluate the scalability of the algorithm

The thesis will continue with introducing related information and basic definitions in Chapter 2.Chapter 3 provides the concept of the algorithm, detailing its two components: the checker and the satisfying assignment determination. We also discuss the theoretical analysis of the checker's complexity, and the impact of input size on the result is presented. In Chapter 4, our implementation of the algorithm is covered. Experiments are conducted in Chapter 5. We carefully examine the challenges faced during the implementation phase and analyze the results obtained from these experiments. We also evaluate the scalability of our algorithm and compare its performance with other state-of-the-art SAT solvers to understand its potential. Chapter 6 concludes the thesis and provides insights on potential areas for future research.