# Proposal - Genetic Algorithms Improves School Transportations Performance

## Background

School Transportation problem is linked to a class of Vehicle Routing Problem. This problem consist of various vehicles to transport students to their destinations in an effective and efficient way. The solution to the problems is all about extracting optimal school routes by reducing the total number of buses, the amount of bus routes, and the distance among all the extracted or traversed routes. Manual scheduling of routes of school buses creates many routes, the amount of buses increased. It also lead to the buses transporting on the same route, increasing the cost and time.

The study will analyze the School transportation performance and solve the Vehicle Routing Problem by using genetic algorithm. Genetic algorithm can be related to the search heuristic that is evolved by the “Charles Darwin’s Theory of natural evolution”. The algorithm demonstrates a process, which consist of the selection of the healthiest or fittest individuals for further reproduction by using natural selection technique. These fittest individual the allowed to build up next generation by producing their offspring.

The main goal of the study is to extract a best possible solution of problems related to school transportation performance using genetic algorithms. The problem is complex “Combinatorial Optimization problems” and it belongs to the NP-complete category. As the nature of problems is complex, other methods are not suitable huge amount of instances, for this, it is required to use genetic algorithm to find the optimal solution. Genetic algorithms are based on search technique to identify and provide suitable optimized solution of a complex problem.

Plan**:**

To solve the problem related to school transportation performance, various research papers would be analyzed. Different techniques to solve vehicle routing problems would be analyzed. The solution would be implemented using C# programming language. The main advantage of this programming paradigm is that it provides object-oriented approach. Related work of various authors will be discussed by analyzing their work in the school bus routing problem and how they solved it. To test the algorithm further, we can also manage any data set to analyze results. Various charts can be constructed to show the performance of genetic algorithm and other techniques. The study consists of examining or analyzing the implementation results of genetic algorithm.

Genetic and non-genetic algorithms can be related to the stochastic and random phenomena. The stochastic is all about the things happens periodically and independently but there still exists some sort of dependency. The stochastic search algorithms such as genetic algorithms, ACO, PSO, the randomness is obtained and controlled by rules related to evolution or optimization process. But in case of random search algorithms, at each iteration, we can have local trial-and-error to escape local or general solutions. The other non-genetic algorithms includes, simulated annealing, ant-colony optimization, tabu search and clustering algorithm.

Various research papers and journals are analyzed to solve Vehicle routing problem. Ant colony colony technique has been used to solve dynamic school bus routing problem with immigrants’ schemes. Researchers have used exact and meta-heuristic methods to reduce the objective function and applying various constraints and suppositions on the formulation. Researchers also present a solution to the vehicle routing problem by implementing bio-inspired algorithm in which genetic material is vertically transmitted to offspring. Harmony search is also used to solve school bus routing problems by various researchers. It is a heuristic technique and “commercial optimization package” utilized as an exact approach to validate a proposed model.

Conclusion

The genetic algorithm is most effective and efficient technique to solve N-Complete problems like vehicle routing problems to enhance school transporting performance. The main reason behind this approach: various local optima, due to non-symmetrical objective function, large number of instances (buses and routes), and stochastic objective function. The genetic algorithms always returns solutions better with respect to time. It is inherently parallel and easy to use.

## References

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