

## ABSTRACT

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A sewerage system is a closed underground conduit which carries the sewage from house to treatment plant. Sewer networks are an essential part of the infrastructure of any society. Due to a rapid increase in the population and the corresponding increase in load of sewerage system make it necessary to design the sewer network properly and as it is the basic need for every individual hence cost optimization is very important for better service. Since, the investment required for construction and maintenance of these large scale networks is so huge and, thus any reduction in the cost of these networks may result in considerable reduction of total construction cost.

Without using the concept of optimization, the design is simply based on the idea of keeping pipe slopes as flat as possible, giving a feasible but over-expensive solution. Optimal sewer design aims to minimize the network construction cost whilst ensuring a good system performance. More recently, a significant amount of research has focused on the optimal design or upgrade of the sewerage system. Some of the earlier studies uses linear programming, while later studies applied nonlinear programming, dynamic programming or a heuristic approach. ACO and PSO also gained much popularity in optimizing the design of sewerage systems. However, much of the recent literature has utilized Genetic Algorithms for the determination of low-cost sewerage system designs and they have been shown to have several advantages over more traditional optimization methods.

The objective of this thesis is to show that the genetic algorithm can be used successfully in the design of sewerage system to minimize the overall cost of the system. In this thesis, a new and powerful intelligent evolution method, called genetic algorithm (GA) is adopted for solving the optimization problem. The proposed method was searched algorithms based on the mechanics of natural selection and natural genetics. Genetic Algorithms are part of evolutionary computing. Genetic Algorithms are the heuristic search and optimization techniques that mimic the process of natural evolution.

In this research, a new algorithm for GA has been proposed. The proposed algorithm is coded using FORTRAN. Then, GA algorithm has been applied to the design of sewerage system through the optimization of the objective function. The performance of a hypothetical case has been evaluated using FORTRAN to test the effectiveness and validity of the proposed algorithm. The GA tool in FORTRAN is used to find the optimal cast of the sewerage system. The obtained results show that the proposed method is promising in the optimal design of the sewerage system.