The Effect of a Genetic Algorithm on Traffic Efficiency

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This research aimed to see if a genetic algorithm could optimize the traffic light timers at a traffic intersection, modeled after Route 15/17/29 Warrenton Interchange. The null hypothesis was that the vehicle trip time would not be affected by the genetic algorithm. The alternative hypothesis was that the vehicle trip time would be improved by the genetic algorithm. A Python computer program was created to generate a traffic pattern for the simulated intersection. There were three traffic pattern types: heavy, normal, and light. A separate program was created to run the traffic pattern through the intersection and capture results for both the control group and the genetic algorithm. The control group used a static value for the red and green timer for all the traffic patterns. The genetic algorithm used 100 generations to identify one elite solution of a red and green timer value. The control group had a mean heavy trip time of 190 seconds, normal trip time of 97 seconds, and light trip time of 84 seconds. Comparatively, the genetic algorithm had a mean heavy trip time of 147 seconds, normal trip time of 77 seconds, and light trip time of 80 seconds. For heavy, normal, and light traffic, the difference between the control and experimental group was determined statistically significant by a two tailed t-test. This means that the null hypothesis was rejected, and the alternative hypothesis was supported. Further research would explore the effect of a genetic algorithm on multiple connected intersections.

Awards Won:
Third Award of $1,000