Traffic Light Control System using Genetic Algorithm

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Abstract

Genetic Algorithm (GA) technology in the traffic control system to provide intelligent green interval responses based on dynamic traffic load inputs, thereby overcoming the inefficiencies of the conventional fixed traffic controllers.

In this paper, the authors explore the use of genetic algorithm and implementing the technology to improve the performance of traffic light and Road control in a four-way, two-lane traffic. The algorithm resolves the limitations of traditional fixed-time control for passing vehicles. It employs a dynamic system to control the traffic light system that monitors two sets of parameters: the vehicle and upstream and downstream lane queues behind a red light and the number of vehicles that passes through a green light. The algorithm dynamically optimizes the red and green times to control the flow of the vehicles. Performance comparisons between the Dynamic traffic controller and a fixed-time controller reveal that the genetic algorithm controller performs significantly better. The authors compare the performance of their algorithm with the unimproved one for different simulated data. Results show that, the algorithm increases the
traffic efficiency and decreases the waiting delay by 30 minute compared with the unimproved one.

References

1. Goldberg, D. E. 2008. Genetic Algorithms in Search, Optimization, and Machine Learning. Upper Saddle River, NJ: Addison-Wesley.
2. Haupt R. and G. Panchal. 2012. Classification and Optimization to Evaluate the Fitness of an Algorithm. Lap Academic Publisher, Germany, 2012.
3. Gerla, M., et al. 2005, “Internet of vehicles: from intelligent grid to autonomous cars and vehicular clouds,” in Proceedings of the IEEE World Forum on Internet of Things (WF-IoT '14), pp. 241–246.
4. Abedinnia, H. 2016, “New simple constructive heuristic algorithms for minimizing total flow-time in the permutation flowshop scheduling problem,” Computers and Operations Research, vol. 74, pp. 165–174
5. Branks, J. and Carson J. 2005. Discrete-event system simulation (4th Ed.). Upper Saddle River, NJ: Pearson Prentice Hall. ISBN 978-0-13-088702-3.
6. Assad, A. A., 2002. Models for rail transportation. Transportation Research Part A: General Volume 14, Issue 3, 205-220
7. Aldrich, C. 2003. Learning by Doing: A Comprehensive Guide to Simulations, Computer Games, and Pedagogy in e-Learning and Other Educational Experiences. San Francisco: Pfeiffer - John Wiley & Sons. ISBN 978-0-7879-7735-1.
8. Ayad, M. 2009. Use of Genetic algorithm for Traffic Light and Pedestrian Crossing Control, (2009). pp.1-2.
9. LiviuOana (2017). Use of Genetic Algorithms in Numerical Weather PredictionInternational Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC), 78-84
10. Peter, M. 1988; Search for articles Herbivores and plant 132: 869-883.
11. Oppenheim, A. 1992. Questionnaire Design, Interviewing and Attitude Measurement, London, Pinter. Pp 303.
12. Gaurav, K. and Pradeep, K. 2012. Impact of Agile Methodology on Software Development Process: International Journal of Computer Technology and Electronics Engineering (IJCTEE) Volume 2, Issue 4

Index Terms

Computer Science  Algorithms
Keywords

Genetic Algorithm, Traffic Control System, Traffic Light, Optimization.