

ADAPTIVE TRAFFIC CONTROL SYSTEM USING MODIFIED ROUND ROBIN AND GENETIC ALGORITHM

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ABSTRACT

Adaptive Traffic Control System (ATCS) serves as a main element in the constituents with which traffic control flow is achieved in fast developing, and developed urban areas. ATCS, however causes more delays on vehicles due to the fact that it is made up of intersecting points. Ensuring maximum efficiency at intersections has remained a challenge due to its dynamic nature of traffic. Additionally, a number of different methods that can be used to achieve higher performance at road traffic intersections have been recently proposed to engineers. In this study, a new and different method based on modified round robin scheduling algorithm through genetic algorithm technique to optimize the performance (in terms of timing) of a signalized intersection in one of the busiest and most crowded roads of Minna, Niger State - Nigeria (at Obasanjo shopping complex area). The technique uses an initial timing pattern to generate newer offspring (in terms of delay duration) to analyze cost function and to check if a global optimum is reached. This technique outweighs current techniques because the data upon which the nature of the system is built is relatively more phenomenal, as it puts into consideration the exact nature of the lane in many possible occurrences. In this work, a global optimum was reached at only a few number of iterations on the whole Genetic Algorithm process.

Keywords: Component, Optimization, Round Robin, Genetic Algorithm, Signalized Intersection.

INTRODUCTION

The continuous rise in the growing number of automobiles on the road has necessitated the need to have a control system that can better manage the population upsurge experienced in the traffic domain (Vahedha & Jyothi, 2017), which is an efficient way to optimize the utilization of road capacities. Exorbitant fuel costs, road accidents, nonchalant attitude of road users, and environmental concerns have necessitated the provision of a traffic system with minimized traffic delay timings. In this disposition, computer technology and its paradigms have been largely and widely used to curtail road excess and to come forth with optimized traffic control system with better timing system to enhance traffic transitions.

Gündoğan et al., (2014) analyzed the performance of an adaptive traffic control system in one of the busy road networks in Turkey. The traffic control system was based on

the fuzzy logic, and genetic algorithm, which handled traffic exceptions and signalized optimization, respectively. It was observed that the performance of the adaptive control system was 10% improved as concerned with cycle time and also, an improvement of 15% was recorded in terms of travel time.

Also, (Hasan, Saha, Hoque, & Majumder, 2014; Pandit, Doshi, Mehta, Mhatre, & Janardhan, 2014) worked on proposing a technique that can be used in determining congestions in traffic through the application of image processing. A model that can be used for the control of traffic signals as a function of traffic data received from video camera was developed. Traffic density extraction of the road was based on the area occupied by the vehicles in the pixels of acquired image. Two parameters were used as output in the proposed model such as traffic cycle and time for every lane in terms of how dense the