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Development of Traffic Flow in a Mega City Using Neural Network Controller

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ABSTRACT

This paper focuses on improving vehicular traffic flow using neural network controller system. Such real time simulation software was currently used as a tool for optimizing the design of vehicular controls in traffic related matters. In this paper, field data were collected from Digital Security Company Enugu which included measurement from the average waiting time for the red light duration and different green light durations. The testbed environment is made up of a junction, ABCD. It was observed that the morning hour otherwise known as busy hour, more vehicles enters into the testbed environment through lane A and B while less vehicle queue in lane C and D respectively. With the introduction of neural network in the design, this will help in decongesting the vehicular problem both in the busy hour and less busy hour. This characterisation of testbed environment were neural network is used is not so with junctions where traditional traffic flow control is used, a lane with no vehicle on it is still has time allotted to it while those with long queues of vehicles are asked to stop and wait until they are asked to move.

Keywords : Traffic Flow, Artificial Neural Network, Traffic Light Management, Fixed Delay.

I. INTRODUCTION

It is obvious today that as the number of road users constantly increases while resources provided by current infrastructures are limited, intelligent control of traffic becomes vital issues. Vehicular traffic flow in mega city area are regularised by traffic light, which is in many cases which in many cases contribute to the unsatisfactory long waiting time cars if not efficiently configured. Data from the chartered institute of traffic and logistic in Nigeria revealed that about 75 percent mobility needs in the country is accounted for by road mode; and that more than seven million vehicles operate on Nigerian roads on a daily basis, (Ugwu, 2009).This figure was also confirmed by the Federal Road Safety Commission of Nigeria, safety on the roads, (Mbawike, 2007). The commission further affirmed that the high traffic density was caused by the influx of vehicles as a result of breakdown in other transport sectors and is most prevalent in the '+' road junctions. Several measures had been deployed to address the problem of road traffic congestion in large cities in Nigeria, namely among these are; the construction of conventional traffic light based on counters and the use of traffic wardens based on human efforts. These measures however, had failed to meet the target of freeing major cross intersections resulting in loss of human lives and waste of valuable man hours during the working days. This paper work described a solution to traffic light system for the purpose of traffic control system. The research showed how the new neural network traffic control system for "cross" junction, reduced the problems observed in the manual and conventional traffic control system through the simulation of the software developed using visual basic programming language. Usually, the red light contains some orange in its hue and the green light contains some blue, it provide some support for people with red-green colour blindness. Indeed, "green" lights in many areas in fact are blue lenses with a yellowish light behind (often accomplished by reducing the voltage to extend lamp life), the mixture of blue and yellow yielding a green appearance. This will be implemented on the simulated system.

II. METHODOLOGY, DESIGN AND IMPLEMENTATION

1. Characterization of Tested Environment

This research was conducted in Enugu Mega City, the testbed environment was Kenyetta junction, Uwani Enugu. The testbed environment is made up of a junction, which is lane A B C D. In the morning hours otherwise called busy hours, more vehicles enter into the testbed environment through lane A and B., while less vehicles queue in lane C and D. Likewise towards the evening, ie close of work hours, traffic queue changes to lane C and D with long queue showing that work has closed and markets are equally closing. With the introduction of neural network in the design those with fewer queues of vehicles and this will help to decongest the vehicular congestion at the tested environment, both in the morning hours and evening hours.

This characterization of testbed environment where neural network is used is not so with junctions where traditional traffic flow control is operated in that in cross-junction where traditional flow control is used, a lane with no vehicle on it still has time allotted to it while those with long queues of vehicles are as asked to stop and wait until they are asked to move.

2. System Implementation

The neural network traffic light system for road intersection control was developed to direct the movement of vehicles meeting at a road junction without any collision. To achieve this, the neural network allocates time for each path when the vehicles along that path will move and the other vehicles from the other part will stop. When the time allocated for a specific path has been exhausted, the red light will be ON meaning stop and the next line will be ON (green light) which means the vehicle in that path should start moving. When the time is about to be exhausted, the yellow light will be ON in the third path informing the vehicles in that path to be ready to move, and after some seconds the green light will be ON.

Microsoft Visual Basic provides direct supports for more Windows features than the rest. Visual Basic has a very powerful and enviable debugging facility that surpasses others. The researcher has a good working knowledge of Visual Basic 6.0. Besides Visual Basic has a wider use and developer coverage. It is indeed a language of choice among developers in this part of the world. Since it meets all the requirements and has a wider user base. Visual Basic is therefore the language of choice. The version currently installed in the developer's computer is version 6.0 and that is the version used.

III. RESULTS AND DISCUSSION

Data Presentation and Analysis

Table 4.1. The average waiting time for red light durations and different green light durations.

Days	Time	A1 Queue	A2 Queue	A3 Queue	A4 Queue
Mon	R = 38, G = 45 Y =5	38	27	28	22
Tues	R = 38 G = 46 Y = 5	15	34	31	26
Wed	R = 38, G = 47 Y = 5;	17	41	40	25
Thur	R = 38, G =48 Y = 5;	18	48	42	28
Fri	R = 38, G = 50 Y = 5;	25	56	45	30

Source : Digital Security Company Enugu, 2013

IV. CONCLUSION

Digital security company and information technology (IT) have transformed many industries, from education to health care to government and is now in the early stages of transforming transportation system. While many think improving a country's transportation system solely means building new roads or repairing aging infrastructures, the future of transportation lies not only in concrete and steel, but also increasingly in using information technology. This project has been successfully executed by designing traffic light traffic in our junctions. It also found out that the major traffic occur in Enugu city mostly on Monday and Friday as a result of economic and social activities. Therefore neural network was implemented in this research work to minimize the effect.

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