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Modeling of Traffic Light Control Using LABview

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ABSTRACT

As the problem of urban traffic congestion spreads & occurrence of road accidents increase, there is a pressing need for the introduction of advanced technology and equipment to improve the traffic control algorithms to better accommodate this increasing demand. The simplest way for controlling a traffic light is using timer for each phase. Another way is to use electronic sensors in order to detect vehicles, and produce signal that cycles. In this paper we propose the LABVIEW simulation model for controlling the traffic lights based on time interval. This simulation model can extended to control the time interval of the traffic light based on traffic density system for controlling the traffic light by any other suitable method.

Keywords :- Traffic Light Controller, Traffic time controller, Labview

I. INTRODUCTION

In recent years, due to rapid increase in number of vehicles, traffic congestion has become a significant problem in many parts of the world. Due to this problem, there has been decrease in average velocity of the vehicles. People lose time, miss opportunities, and get frustrated. Traffic congestion directly impacts the companies. Due to this traffic congestions there is a loss of money, productivity from workers, trade opportunities are lost, delivery gets delayed, and thereby the costs goes on increasing. To solve these congestion problems, we have to build new facilities and establish latest infrastructure but at the same time make it smart. Expansion of roads and lanes is not possible all the times, but building intelligence into the roads and lanes with advanced technology is certainly possible. Hence, there is need for a better and efficient traffic control system.

Automatic traffic light is controlled by timers and electrical sensors. In classical traffic light system each phase has a constant numerical value loaded in the timer. The lights are automatically getting ON and OFF depending on the timer value changes. When properly used, traffic control signals are important devices for the control of vehicular in road. They assign the right-of-way to a choice of traffic movements and there by deeply influence traffic flow. Traffic control signals that are properly designed, located, operated, and maintained will have one or more of the following advantages:

a) Provide orderly movement of traffic
b) Minimize completing movement
c) Coordinated for continuous movement
d) Provide driver confidence by assigning right way.

It is possible to design such system to overcome daily problems of traffic congestion using graphical programming language Lab VIEW. Among a variety of general purpose programming platforms National Instrument's LabVIEW is widely used graphical code development environment which allows system level developers to perform rapid prototyping and testing. It is supported by a powerful and rich collection of pre written library functions and programming tools meant to accomplish various tasks related to user controlled applications for equipment interface, laboratory measurements, data visualization and analysis.

II. LITERATURE REVIEW

N.Dinesh Kumar, G.Bharagava Sai, K.Shiva Kumar [1] explained that as vehicular travel is increasing, the problem of urban traffic congestion spreads and as such there is a pressingneed for the introduction of advanced technology andequipment to improve the raffic control.Traffic problems now-a-days are increasing because of the growing number of vehicles and the limited resources provided by current infrastructures. So a simulating and optimizing traffic control algorithms for increasing demand is needed of the time. The simplest way for controlling a traffic light is to use a timer for each phase and the LabVIEW Simulation model for controlling the traffic lights based on time interval. This Simulation model can be extended to control the time interval of the traffic light basedon traffic density. This can be even extended to integrated traffic management system for a metropolitan city based on the density of traffic."

Smart Approach to Traffic Management using LabVIEW[2] described that according to the World Health Organization report, India records the highest number of road accidents deaths per year. About 5 lakh accidents take place on Indian roads killing about 1.3 lakh people and injuring about 5.2 lakh each year. These numbers translates one accident every minute and one death in road accidents every four minutes which is an alarmingly high number. Hence, the demand of the time is to design a system that makes the driver of the vehicle vigilant all the way about the current road conditions. Apart from it, the implementation of the proposed system is an effort to use the existing technology smartly in our day-to-day life and hence communicate the on-road traffic constraints dynamically to the driver.

III. PROBLEM FORMULATION

A. MOTIVATION

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphical programming language that uses icons instead of lines of text to create applications. In contrast to text-based programming languages, where instructions determine the order of program execution, LabVIEW uses dataflow programming, where the flow of data through the nodes on the block diagram determines the execution order of the VIs and functions. VIs, or virtual instruments, are LabVIEW programs that imitate physical instruments. Though there are conventional methods that are still useful and relevant, LabVIEW based Traffic control system is relatively easier approach in operators point of view who operate the traffic control system because it is very easier to design, redesign, debug in LabVIEW as it is a Graphical Programming language.

B. OBJECTIVE

The traditional method for traffic control uses a fixed time controller. They have predefined cyclic time which schedules off-line on a central computer based on average traffic conditions. Present Traffic Light Controllers (TLC) are based on microcontroller and microprocessor. These TLC have limitations because it uses the pre-defined hardware, which is functioning according to the program that does not have the flexibility of modification on real time basis. Due to the fixed time intervals of green, orange and red signals the waiting time is more and car uses more fuel. The fixed time controller only detects the vehicles not count the number of vehicles. Due to this there is wastage of time by a green light for same time on a less congested road as compare to more congested road, as the time being wasted by the green light on the empty road. Some advanced Traffic Light Controllers are being designed using Fuzzy expert systems and artificial neural networks. Though they may be efficient in their working, they are not designer friendly and they can be easily hacked or manipulated by any one. So, to overcome the above disadvantages it is highly beneficial to design and implement Traffic Light Control system using Lab VIEW, a User friendly, Graphical programming Language. The different types of system used for solving traffic congestion problems are: 1. Fuzzy Expert System 2.Artificial Neural Network 3. An Intelligence Decision-making system for Urban Traffic-Control (IDUTC) [3]

IV. METHODOLOGY

In this section, we concentrate on the design of the traffic light using Labview. The Block Diagram contains the graphical source code that defines the functionality of the VI. The block diagram contains this graphical source code, also known as G code or block diagram code. The LabVIEW template VIs include the sub VIs, functions, structures, and front panel objects

you need to get started building common measurement applications. LabVIEW programs are called virtual instruments, or VIs, because their appearance and operation imitate physical instruments, such as oscilloscopes and multimeters. Every VI uses functions that manipulate input from the user interface or other sources and display that information. [4]
A VI contains the following three components:

- **Front panel** —Serves as the user interface.
- **Block diagram** — Contains the graphical source code that defines the function of the VI.
- **Icon and connector pane** — Identifies the VI so that you can use the VI in another VI. A VI within another VI is called a subVI. A subVI corresponds to a subroutine in text-based programming languages.

This simulation model of Traffic Light is designed using Local Variables and Flat Sequence Structures[4].
Local variables: Local Variables provide a way to access front panel objects from several places in the Block diagram of a VI in instances where you can't or don't want to connect a wire to the objects terminal.
Flat Sequence Structure: A Sequence structure is an ordered set of Frame that executes sequentially. A Sequence Structure executes frame 0, followed by frame 1, then frame 2, until the last frame executes. A sequence structure contains one or more sub diagrams, or frames, that execute in sequential order. Within each frame of a sequence structure, as in the rest of the block diagram, data dependency determines the execution order of nodes. The Flat Sequence structure, shown as follows, displays all the frames at once and executes the frames from left to right and when all data values wired to a frame are available, until the last frame executes. The data values leave each frame as the frame finishes executing. Using controls, three booleans named RED, YELLOW, GREEN are placed in front panel. In block diagram panel, use Flat sequence structure and place three block diagram objects associated with three booleans in it.

A. PROCEDURE

- Create a constant for each RED, YELLOW, GREEN object and wire each of them with corresponding object.
- Add "frames after" and extend the flat sequence to two more frames.
- Create the Local variable for each object and place each three in next two frames.
- Again, create constant for each of these local variables and wire them.
- In 1st frame, change the constant value of RED to T and rest as F. Similarly, change the constant value to T of YELLOW and GREEN in 2nd and 3rd frame respectively, keeping rest to F.
- Add time delay in each frame and set it to desired value (in seconds).
- Create a while loop subdiagram and encase the flat sequence structure in this loop and wire the iteration termial to Flat sequence structure.

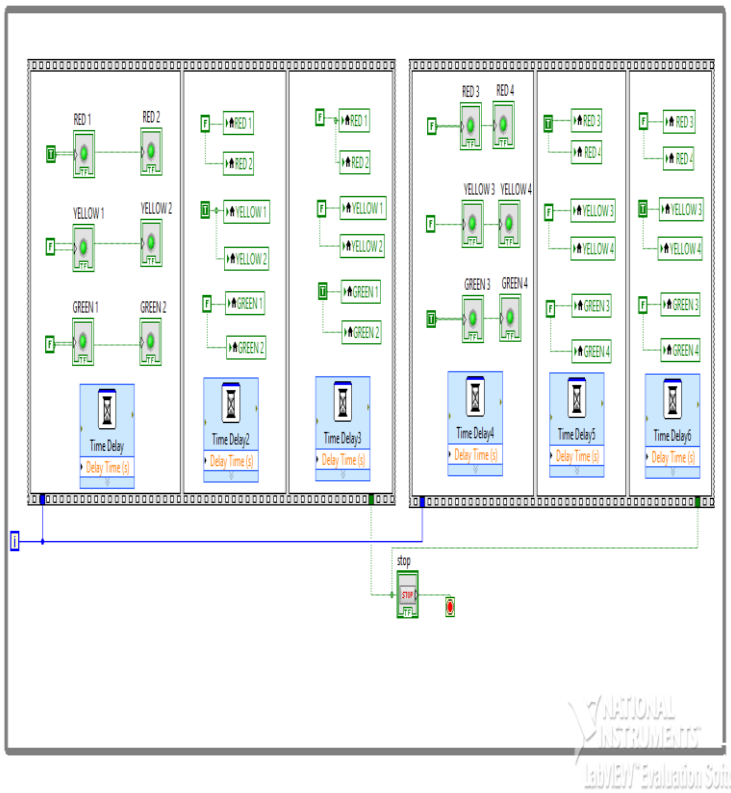

Figure 1. Block Diagram

V. CONCLUSION

An automatic Traffic control system is very important for traffic management in rapidly growing metropolitans and cosmopolitans. Though there are conventional methods that are still useful and relevant, LabVIEW based Traffic control system is relatively easier approach in operators point of view who operate the traffic control system because it is very easier to design, redesign, debug in LabVIEW as it is a Graphical Programming language. This model can also be extended to program the timers depending on density. Also this project can be extended to design

Traffic control using an image processing techniques. The Design and implementation of a LabVIEW based Integrated Traffic Management system would be very useful and successful.

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