Streamlined Traffic Control System for the Urban Cities in Misamis Oriental

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Abstract:
The study of microcontroller-based traffic light system is a typical example of an electronic and industrial system. An initial structure was designed and built. Traffic light materials and devices specifications were methodically made for a comprehensive output. Existing energies of dynamic model were observed separately to generate the model of the traffic light. State – space model of traffic light was developed and microcontroller was used as a programming medium according to state-space model. Microcontroller-based system has some key parameters that are directly engaged with system performance and response. System starts with the Microcontroller which will be the main control, Integrated Circuit which is used to link the signal send by the microcontroller to the mechanical relay being energized to light the outputs which are the traffic lights. Proximity sensors are added to measure the volume of vehicles passing in order to adjust the set time of the traffic lights. Parametric studies were done and system responses were observed by variation of key parameters. Observed results from parametric studies were applied into physical model to improve the traffic light performance.

Keywords — Microcontroller based traffic light, proximity sensor, Automated traffic control, Traffic Control, Traffic Light

I. INTRODUCTION

Traffic light is one of the vital public facilities that play an important role to the road users. Traffic light system consists of two parts, first part is traffic light and the second part is controller unit, which is used to control traffic flows at the busy intersection (Oshevire, 2014).

The world’s first electric traffic signal is put into place on the corner of Euclid Avenue and East 105th Street in Cleveland, Ohio, on this day in 1914(history.com, 2015). The UK is the latest European country to introduce ‘soft’ speed enforcement techniques, using existing traffic signal arrays that have been equipped to detect that an approaching vehicle is exceeding the speed limit and stop it in its tracks. The aim is to deter

With detection equipment located at safe distances – the technology it is designed to integrate with company’s ADIMOT (adaptive multi-algorithmic optimization techniques) urban traffic control product. When a vehicle reaches a loop detector, the system knows how long. Once the vehicle exceeds the limit, the alerted signal flashes intermittent amber for a fixed minimum period (six seconds). If there are no following vehicles, the signal flashes three seconds of fixed amber and then returns to red, its resting state (Crawford, 2012).
These developments in Europe led the researchers to pursue a similar study to improve the traffic light system of the urban cities in the province of Misamis Oriental. Automating the traffic light system of the city may be of greater significance to the pedestrians, drivers and the community as a whole.

II. METHOD

The figure above shows the flow diagram of the traffic light control system. In fig. 2, the relay to timer/counter microcontroller and pin assignment is shown. Pin 0 and 1 used to communicate with other microcontroller, pin 2 to 5 sends signal to the microcontroller, pin A0 to A5 multiplexer transmits signal to the seven segment and pin 6 to 13 show the display signal from multiplexer. Therelay to microcontroller. Pin 0 and 1 used to communicate with other microcontroller and pin 2 to 9 send signal to energize and de-energize the relay. Microcontroller sends signal to lane 1 relay 1 to energize and light the go signal while the other lights are stop. When the relay de-energize stop light will light.

A. Design and Development
Fig. 4 shows the walk signal and the seven-segment for the timer. The red pedestrian light signals the pedestrian to stop. The green pedestrian light signals to proceed across the road.

Fig. 5 Perspective View of the Traffic Light

Thenormal flow of the traffic light in one lane is always “go” if there are no vehicles on all lanes. If the sensor counted 5 vehicles or below, the timer is set to 5 seconds. If 10 vehicles or below but more than 5 vehicles, the timer is set to 10 seconds. If more than 10 vehicles, the timer is set to 15 seconds. If all lanes have the same volume, the timer is always 5 seconds. The default status of the traffic light is green light or GO signal and the pedestrian is STOP then ready/pedestrian stop and lastly red light/pedestrian go, and back to normal which is green light or GO signal.

In this phase, the researcher tested each material and parts of the system for a good quality prototype to improve implementation with regards and consideration to the recommendations cited from the searched studies and articles. Microcontroller is the main control of the automation system. It interprets the program installed. It sends signals to the integrated circuit based on the interpreted program.

The seven segment was used as display of the number of vehicles passing through the sensor. Also, a display of the time that the traffic light has given.

Infrared proximity collision sensor detects vehicles passing through it. The number of detected vehicles will be displayed on the seven segments on the upper part of the sensor.

RESULTS AND DISCUSSION

A. Design and Development

Instead of using 9012 transistor in the circuit for the signal 24V relay, 9013 transistor is used because the signal from the microcontroller that will pass through the transistor is converted to negative voltage and completed the loop for 24V supply isolated from the 5V supply of the microcontroller but the two supplies have common ground.

On the assembling process, wire tags were added so as not to confuse end users of the different components incorporated on the traffic lights. It was found out to be a vital addition since wiring the components on the microcontroller is a very sensitive activity that may result in a microcontroller and components malfunction.

Figure 6 shows the top view components of the traffic light which are the following:

a.) The traffic lights, the main component of the whole system
b.) The pedestrian lights, component that also serves as output
c.) Proximity sensor, used to detect the number of vehicles passing
d.) The seven-segment is responsible of the display of the volume of the vehicles passing through the proximity sensor.
As shown on the fig 7 the right side view of the traffic light system:

a.) The traffic lights, the main component of the whole system
b.) The pedestrian lights, component that also serves as output
c.) Proximity sensor, used to detect the number of vehicles passing
d.) The seven segment, responsible for the display of volume of vehicles passing through the proximity sensor

B. Implementation

In the final testing of the traffic lights system, the input program was achieved. The work process of the automatic traffic light system is shown in Fig 9.

![Microcontroller Diagram]

Fig. 9 Work Process

The program of the system must be uploaded first to the microcontroller; it is responsible for the switching based on the sensor's function. The microcontroller will send a signal to the integrated circuit which will also send a signal to the mechanical relay. If the relay is triggered, the 220V traffic lights will function as intended.

III. CONCLUSIONS AND RECOMMENDATIONS

The test and assessment conducted on the developed automatic traffic light system revealed that the traffic lights are able to demonstrate the program that is being downloaded in the microcontroller. The unit uses a microcontroller language for the program that is
The evaluation of the developed traffic lights system design showed that the unit is perceived to have good qualities on the evaluation parameters. The respondents found that the traffic lights system have good physical appearance with a mean of 3.6. This value suggests that the respondents found the traffic lights system’s design to be pleasing. The arrangement and physical outlook parameters were also given a good rating, reflecting an overall satisfactory evaluation of the way in which the wires and component layout are displayed. The mean response of the respondents with regard to technical functionality, which are generally found to be fair, with a mean of 3.4. The respondents found the input and output components to be working in order, evident, and that the traffic light functions as programmed.

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REFERENCES


