Federal Polytechnic Ilaro Journal of Pure & Applied Sciences

{FEPI- JOPAS}

Volume 3 Issue 1,
June, 2021 Edition.

Published by:

The School of Pure and Applied Sciences (SPAS)
The Federal Polytechnic Ilaro, Ogun State, Nigeria.
https://fepi-jopas.federalpolyilaro.edu.ng
E-mail:fepi.jopas@federalpolyilaro.edu.ng

ISSN: 2714-2531

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FOREWORD

I warmly welcome all and sundry to the volume 3 issue 1 of Federal Polytechnic – Journal of Pure and Applied Sciences (FEPI-JOPAS) which is a peer reviewed multi-disciplinary accredited Journal of international repute. FEPI-JOPAS publishes full length research work, short communications, critical reviews and other review articles. In this issue, readers will find a diverse group of manuscripts of top-rated relevance in pure and applied science, engineering and built environment. Many of the features that you will see in the Journal are result of highly valuable articles from the authors as well as the collective excellent work of our managing editor, publishing editors, our valuable reviewers and editorial board members.

In this particular issue, you will find that Joseph and Adebanji provided innovative technology on light traffic control system. Ogunkoya and Sholotan engaged standard method for microbiological assessment of shawarma from Igbesa metropolis for possible microbial contamination. Ilelaboye and Kumoye unveiled the effect of inclusion of different nitrogen source on growth performance of mushroom. Ogunyinka et al utilized Fletcher Reeves conjugate gradient method as a robust prediction model for candidates' admission to higher institutions. Omotola and Fatunmbi examined the impact of thermal radiation with convective heating on magnetohydrodynamic (MHD), incompressible and viscous motion of non-Newtonian Casson fluid. Aako and Are meticulously investigated factors affecting mode of delivery using binary dummy dependent models. Abiaziem and Ojelade successfully synthesized biologically active silver nanoparticles using *Terminalia catappa* bark as the eco-friendly source.

In addition, Olowosebioba et al. assessed the rectifying effects of various diodes in power supply units using multisim circuit design software programme. Olujimi et al. successfully accomplished the use of fingerprint based biometric attendance system for eliminating examination malpractices with enhanced notification. Alaba reported the nutritional status assessment of school age children (6-12 years) in private primary school in Ilaro. Muhammed-lawal et. al. assessed the execution and effect of corporate social responsibilities and return to marketing. Awolola and Sanni's research was about achieving quality of engineering education and training in Nigeria using Federal Polytechnic, Ilaro as the case study. Oladejo and Ebisin expatiated on virtual laboratory as an alternative laboratory for science teaching and learning.

Finally, Aneke and Folalu investigated the prospect and problems of the hotels in Ilaro, Ogun State.

I would like to thank and extend my gratitude to my co-editors, editorial board members, reviewers, members of FEPI-JOPAS, especially the Managing Editor, as well as the contributing authors for creating this volume 3 issue 1. The authors are solely responsible for the information, date and authenticity of data provided in their articles submitted for publication in the Federal Polytechnic Ilaro – Journal of Pure and Applied Sciences (FEPI-JOPAS). I am looking forward to receiving your manuscripts for the subsequent publications.

You can visit our website (https://www.fepi-jopas.federalpolyilaro.edu.ng) for more information, or contact us via e-mail us at fepi.jopas@federalpolyilaro.edu.ng.

Thank you and best regards.

E-Signed
Prof. Olayinka O. AJANI

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https://fepi-jopas.federalpolyilaro.edu.ng *Experimental*

Innovative Technology on Light Traffic Control System.

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Abstract

The movement of motorists at junctions could be controlled by traffic light control, which is a form of artificial control system. Vehicular traffic, which is the movement of vehicles across junctions on the road, could be controlled effectively using this electronic traffic control system development, for T-junctions, to avert accidents on these junctions. In developed states, artificial traffic control has been a great success in this part of the world due to their attitudes to the use of roads. On the part of the developing states, like Nigeria and allied, with their peculiar motorists such as the on-lookers, wearied, fatigued and slumbered motorists, have made the electronics light control system ineffective in some cases in relation to its objectives. This work takes care of this inefficiency by designing and developing a solar powered electronics light traffic system which incorporates an innovative sound system which comes on the same time with the "READY TO GO" light in the traffic light system, to alert the indiscipline, slumbered, wearied and on-looker motorists in this peculiar environment in order to allow for smooth running in the traffic system. The prototype construction of this work finds application at the Federal Polytechnic, Ilaro, Ogun State, Nigeria.

***Keywords*:** Traffic Control, Sound System, Motorists, Solar-powered, Innovative sound.

INTRODUCTION

Traffic light system is a device that has been realized to help man control the flow of traffic for easy and convenient use at road junctions by motorists, motorcyclists and even pedestrians. This is due to increase in vehicular and man activities at these junctions, therefore, to avert accidents at road junctions, a controller system, which is void of fatigue, to enable continuous monitoring of traffic at road junctions was developed to remove the fatigued type of man traffic which has, for long been abandoned by developed world like Unite Kingdom, United States etc.

In developing states, like Nigeria and allied few societies have adopted the usage of light traffic control. Here, the motorists are of peculiar nature, they might have over-worked themselves, thereby becoming fatigued and slumbered and/or being an indiscipline on-looker motorist at the point when the electronic controller says "Ready to Go", and then "Go" but being a slumbered or an on-looker motorist, other serious minded motorists are blocked, leading to exchange of abusive languages/terms that could hurt the natural machinery of the body system or bring about unnecessary delay leading to unwarranted waste of time as regards an appointee. To avert this situation, this work was designed and developed with an incorporated sound system (boozing sound), to alert and re-align the wearied, slumbered or the indiscipline on-looker motorists at the point of "Ready to Go", in order to set and ignite the vehicle for onward motion.

This developed traffic light system has three control light components, which send signal to motorists and other user of the road. They are; i). The Red light which tells the driver to stop at the intersection ii). The Green light which orders motorists to move through the intersection, while iii). The yellow/amber light gives order of readiness to either stop at or go through the intersection.

Review of Literature

The first traffic lights were installed in 1868 outside the British Houses of Parliament in London. The design combined three semaphore arms with red and green gas lamps for night-time use, on a pillar, operated by a police constable. The gas lantern was

turned with a lever at its base so that the appropriate light faced traffic. (Askerzade & Mohammed, 2010).

The first electric traffic light was developed in 1912 by Lester Wire, an American policeman of Salt Lake City, Utah, who also used red-green lights. On the 5th of August 1914, the American Traffic Signal Company installed a traffic signal system on the corner of East 105th Street and Euclid Avenue in Cleveland, Ohio. (Devados, 1998). The first four-way, three-color traffic light was created by police officer William Potts in Detroit, Michigan in 1920. In 1922, T.E. Hayes patented his "Combination traffic guide and traffic regulating signal" (Valdes-Perez & Pallas-Areny, 2009).

The first interconnected traffic signal system was installed in Salt Lake City in 1917, with six connected intersections controlled simultaneously from a manual switch (Greenfield, 2000). Automatic control of interconnected traffic lights was introduced March 1922 in Houston, Texas. The first traffic lights in England were deployed in Piccadilly Circus in 1926. In 1923, Garrett Morgan patented his own version. The Morgan traffic signal was a T-shaped pole unit that featured three hand-cranked positions: stop, go, and an all -directional stop position. This third position halted traffic in all directions to give drivers more time to stop before opposing traffic started. It's one "advantage" over others of its type was the ability to operate it from a distance using a mechanical linkage (Harms, 2001). In the 1930s throughout the 1950s, they utilized a beaded prismatic lens with a "smiley" pattern embossed into the bottom of each lens (Morris, 2007).

An intelligent traffic light monitoring system using an adaptive associative memory was designed by Abdul Kareem and Jantan (2011). The research was motivated by the need to reduce the unnecessary long waiting times for vehicles at regular traffic lights in urban area with 'fixed cycle' protocol.

An intelligent traffic light controller based on very-high-speed integrated circuit hardware description language (VHDL) was given and simulated using hierarchical design thought. VHDL is a hardware description language used in electronic design automation to describe digital and mixed-signal systems, such as field-programmable gate arrays and integrated circuits (Shou, Tian & Zhai, 2009).

A distributed, knowledge-based system for real-time and traffic-adaptive control of traffic signals system was a learning system in two processes: the first process optimized the control of steady-state traffic at a single intersection and over a network of streets while the second stage of learning dealt with predictive/reactive control in responding to sudden changes in traffic patterns. Priority does not guarantee that transit vehicles always get a green light the instant they arrive like preemption does (Haronitz, 2001).

In the United Kingdom, 12-inch lights were implemented only with Mellor Design Signal heads designed by David Mellor. These were designed for symbolic optics to compensate for the light loss caused by the symbol. Consequently, lights of 12 inches (300 mm) are no longer approved for use in the UK and all lights installed on new installations have to be 200 millimeters (8 inches) in accordance with TSRGD (Traffic Signs Regulations and General Directions). Exemptions are made for temporary or replacement signals. (Mehta & Mehta, 2008).

This work in its inclusive incorporates an innovative sound system in the traffic light, to alert the slumbered and on-looker motorists in peculiar environment in order to allow for smooth running in the traffic system.

MATERIALS AND METHODS

The major attribute of this work is its innovative ideology which incorporates a buzzing sound system into the already existed traffic control, to alert the slumber, weary or on-looker motorists to get ready for motion.

In the system design, there are three major sub-circuits as shown in Figure 1.

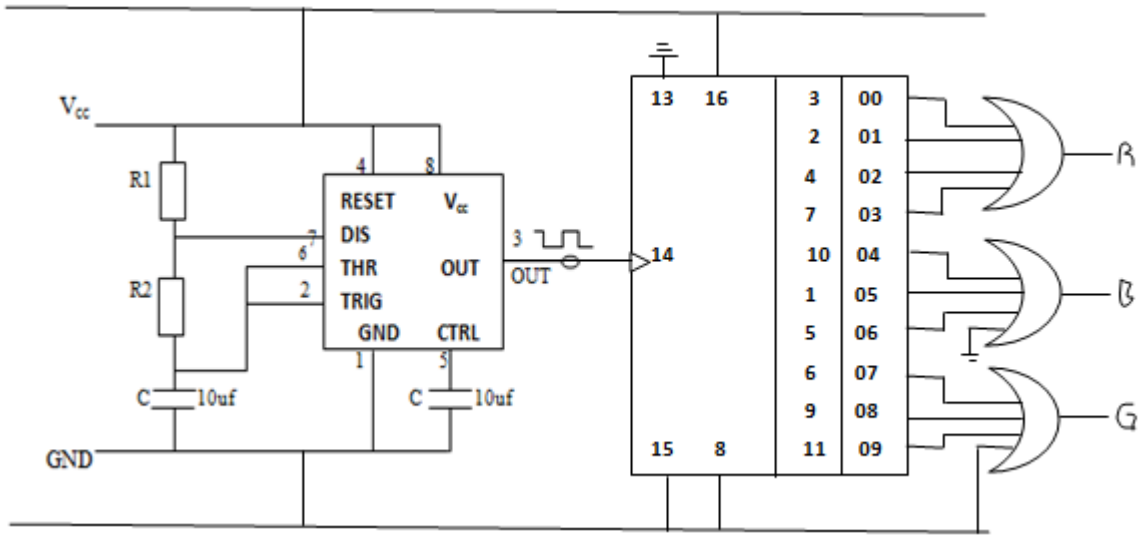

Figure 1: System circuitry

The sub circuits are:

IC555: This is the timer circuit, responsible for the generation of the clocking signal, which acts to clock the decade counter.

Decade Counter: This is a component which employs the binary coded decimal (BCD) system. In its operation, it comes on in succession from 00 – 09, to give the required signal to run the display light system.

Gate: In this work, the OR gate was used. This is due to its ability to give an output whenever any of its input in high. This gate allows the signal from the output of the decade counter to be incorporated to give the required control lighting output for the traffic control.

Giving an instance of this, the outputs from the decade counter goes from Q_0 to Q_9. Once the system is activated, Q_0 will get high, while others are low. At the moment Q_0 gets low, Q_1 comes on, while others are off, until Q_9 in succession.

Other sub circuits not shown in Figure 1 are:

Power Supply: This energizes (as food energizes the human body), the other sub circuits, such as IC555, decade counter and the gates. This power supply unit consists of the following:

- 12v DC Battery
- Charge controller
- Solar panel

Display: This is the interconnectivity of light emitting diodes (LED), to give the various traffic display control

These functional units are simplified and structured as shown in Figure 2

- The Power Supply
- IC555 (Clock signal generator)
- Decade Counter
- The output unit.

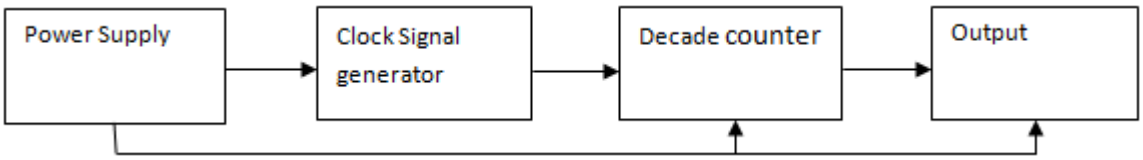

Figure 2: Comprehensive block diagram of traffic light using timer and decade counter

Clock pulse generation

For timing the traffic lights, a timer circuit is required, which is majored by a 555 timer. These 555 timers give out a trimmed square wave of a particular frequency which can be calculated by the resistor and capacitor values of the timer circuit shown in Figure 3.

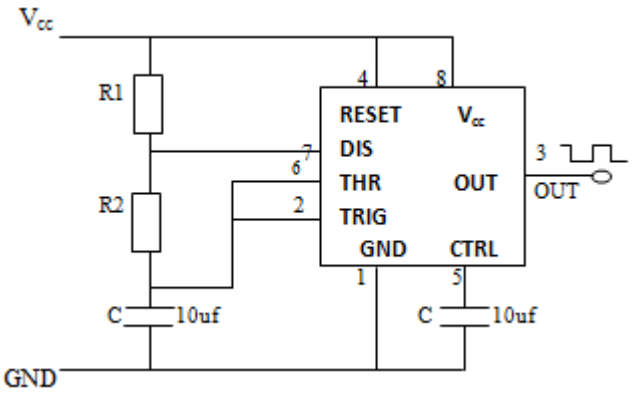

Figure 3: 555 astable circuits

The system designs

Resistors, R_1 and R_2 and Capacitor, C were predetermined and the frequency of oscillation (*f*) was determined using the Equation 3.1

$$f = \frac{1.44}{(R_1 + 2R_2)C} \quad \text{---------- (3.1)}$$

Thus, the square wave generated by the 555 timer was used as clock pulse by the counter. Also, the period of oscillation (T) was determined using Equation (3.2)

$$T = \frac{1}{f} \quad \text{---------- (3.2)}$$

Therefore, the timer oscillation time was derived in second.

Counter

This work was developed using the decade counter, it has a ten (10) count output, which comes on in succession from Q_0 to Q_9. At the activation of the system, Q_0 comes on, with others in the off state. At Q_0 off, Q_1 comes on, with others in the off state, it continues in this format until Q_9. The system initializes immediately Q_9 goes off to return to Q_0 for successive continuation in its output with each output coming on for 14 seconds (from Equation (3.2) per pin output. Incorporated to this yellow light circuitry was a sound circuit to alert any slumber, weary or on-looker motorist to get ready for motion, which is the main goal of this work as aligned to developing states like Nigeria and allied. This process counter continues until it gets to pin 11 looped with pin 15 and thereby reset to go back to the starting point as long as the input power is very much available. Figure 4 shows the diagram for a decade counter.

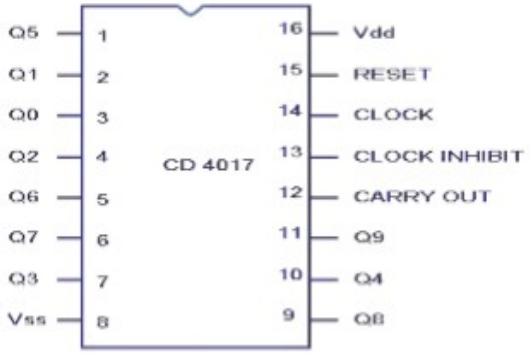

Figure 4: Diagram of a decade count

T-junction interpretation

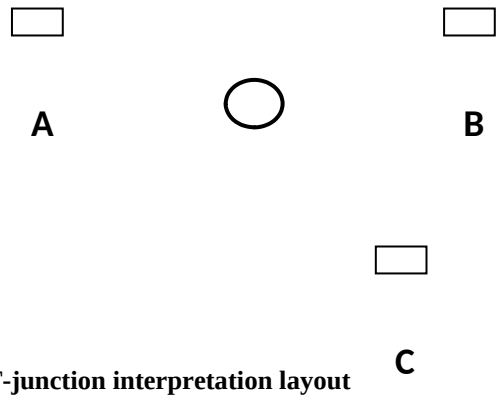

Figure 5: T-junction interpretation layout

The layout of Figure 5 shows a T-junction which could be interpreted based on how the counter works

Table 1: Binary digit interpretation

A	B	C
1	0	0
0	1	0
0	0	1

In Table 1, the number 1 indicates GO, while the number 0 indicates GET READY/STOP.

At point A, it takes about 42seconds by calculation for vehicles along that direction to move straight to B and at the same time some to C and thus gives signal to stop B and C since we can only have active lane at a time.

At point B, it also takes about another 42 seconds for vehicles along this direction to move to A and across C. this also stops vehicles at A and C so as to avoid any form of collision

At point C, it also takes 42 s for to and fro movement of vehicles and thereby stop vehicles from going or coming through B and A. This indicates that vehicles at C can only move to A and as well to B and all other vehicles stop.

Output display

In this work, the output (lighting) display is made up of light emitting diodes (LEDs); which control the movement of traffic. The LED comes on in succession with respect to the decade counter, to indicate 'Red for Stop', 'Yellow/Amber for Ready to Go/Stop' and the Green, for Go'. This is shown in Figure 6.

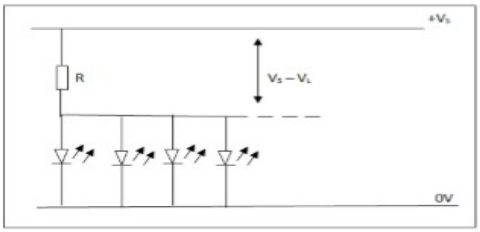

Figure 6: Light Emitting Diode Unit

Solar rechargeable battery in traffic light control

Due to the problem of electricity in many parts of the developing world, such as Nigeria, this work is based on solar power system for its energy supply, instead of the irregular mains supply, which could render the work unpalatable.

In its nutshell analysis, the solar powered system comprises of a 26 AH, 12 V battery, which was used to power this project, which is rechargeable using the solar energy. Therefore, energy stored in this battery when fully charge is 26 AH × 12 V = 312 Wh. Thus, working with 24hours, by calculation, the battery could supply the wattage required for 7hours without recharging before being completely drained. This battery is charged by a 50 W solar panel, mounted on a carrier at the top of the construction. It should be noted that this rating could be improved upon for longer supply duration. This is another innovative aspect of this work.

RESULTS AND DISCUSSION

In the analysis of the results and discussion, a T-junction traffic light was considered. In this consideration, one of the three phases making up the "T-junction" construction work was analyzed as follows:

At the switch on of the traffic light system, the Green/ Red light may come on, which represents "Go/Stop", depending on the system setting.

In the first case, the Red light comes on first which represents "Stop". In its explanation, it tells the motorists at the concerned leg to stop at the junction in order to pave way for other motorists to move. This lasted for about 42secs through the setting of the clock, before change over to the next light. This time represented the setting on the generator circuit (IC555), and the successive "on" of the counter.

At the change-over, the Amber/Yellow light which represents "Ready to Go" comes on. In its explanation, it tells the motorists at the concerned leg to get ready for motion at the junction, by kick-starting their vehicles for motion, in order to ease their continuous waiting, while other motorists in motion should be ready to hold motion. This takes place for about 14secs before change over to the next light. This time represented the setting on the generator circuit (IC555), and the successive "on" of the counter.

Immediately the Amber comes on, which represents "Ready to Go", a sound "PINNNNNNNNNNNNNN", through a boozer, which was chosen and incorporated into the Amber circuit also comes on alongside this Amber light, in order to alert the slumber, on-looker wearied and or indiscipline motorist(s) to get set for motion for the period of its on time. This is the remarkable innovative aspect of this work. This is incorporated due to the peculiar nature of inhabitant of the developing world. Some are indiscipline, while some over-labour themselves, getting tired in the process of driving and so on.

At the change-over, the Green light which represents "Go" comes on. In its explanation, it tells the motorists at the concerned leg to move through the junction in order to ease their continuous waiting, while other motorists are made to hold motion. This takes place for about 42 s also, before change over to the next light. This which alert slumbered, on-looker or weary motorists on the road to avert obstructions and unwarranted damages in time represented the setting on the generator circuit (IC555), and the successive "on" of the counter.

Note: Each phase could be analyzed to give its various light change effect, to allow the control of traffics at the other two legs making up the T-junction traffic control.

CONCLUSION

This work was developed mainly to avert accidents at road junctions, a controller system, which is void of fatigue, to enable continuous monitoring of traffic at road junctions was developed to remove the fatigued type of man traffic which has, for long been abandoned by developed world like UK, USA etc. Conclusively, it incorporates an innovative incorporation of sound system the case of the developing countries and elsewhere. Other level of sound could be used, such as voice tag sound according to languages. This has already been done/completed in another research work as a peculiar case of Nigeria, using the borrowed language (English) incorporated with the three major indigenous languages (Hausa, Igbo and Yoruba).

Contribution to Knowledge

The major contribution to knowledge of this innovative work is as summarized; Light control system with innovative sound technology to alert slumbered, on-looker or weary motorists to move at the appropriate

time, in order to avert time, energy, life and other unwarranted waste/damages.

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