ELECTRONICS MINI-PROJECT

Chasing lights with Variable Speed

ABSTRACT
THE PRESENT TEXT EXPLORES ONE ARTWORK OF ELECTRONIC HOBBYISTS, CHASING LIGHTS, USED AND ADMIRED EVERYWHERE WITH ONE PRESUMABLY ADVANTAGEOUS ADDITION: THE SPEED OF CHASE CAN BE VARIED. THIS HAS BEEN ACHIEVED BY INTEGRATING A POTENTIOMETER IN THE IMPLEMENTATION THUS VARYING THE VOLTAGE SUPPLIED TO THE TIMER.THIS YIELDED ALTERNATE LIGHTNINGS OF THE LEDS, THE PACE OF WHICH CAN BE VARIED MANUALLY.

DOOBORY Amreena ID 1712321
CHUTTOO Wasil ID 1710383
DHOMAH Gawrav ID 1714198

BSc (hons) Electronics with Computer Science

Introduction

This project was assembled by Mr. CHUTTOO Wasil[1], Mr. DHOMAH Gawrav[1] and Ms. DOOBORY Amreena[1] in the electronic laboratory under the supervision of Mr. Beekaroo.

It involved designing a circuit based on the title assigned at the onset of the coursework, implementing thus testing the latter on livewire and building the circuit on a breadboard and a Vero board for demonstration at a later point in time.

In addition, for the completion of the report, the software livewire, electronic textbooks and the internet were used for the referencing part.

[1] BSc (Hons) Electronics with Computer Science, cohort 2017/2018, Faculty of Engineering, UoM

Acknowledgments

Our sincere gratitude should be extended to our laboratory instructor Mr. Beekaroo and the practical training coordinator Mr. Samachurn for their valuable instructions, guidelines and assistance.

Table of Contents

Table of Figures

1. **Aim:** To implement a system of chasing lights with adjustable speed.

2. **Literature review:**

2.1 Historical significance

The electronics industry has provided a work of technology intended generally as an eye-pleaser or an alluring piece which serves to flash thus captivating the focus of a targeted audience. Widespread and often representative of a certain cultural chronology, chase lights have more often than not been integrated along with "home deco" than studied (fair enough).

2.2 Existing systems

1. Simple Led chase lights with one direction running pattern
2. LED chase lights with pattern from digital Johnson counter circuit
3. Floodlights with a chase effect, traditionally known as cyclorama lights.

2.3 Proposed system

Alongside the extensively used circuitry connecting a timer 555 and a digital counter and passive components, the current system supports supplying different amount of voltages by manually adjusting the potentiometer which is to be placed in series with the first passive components. Below is the circuit used to implement the visualized system.

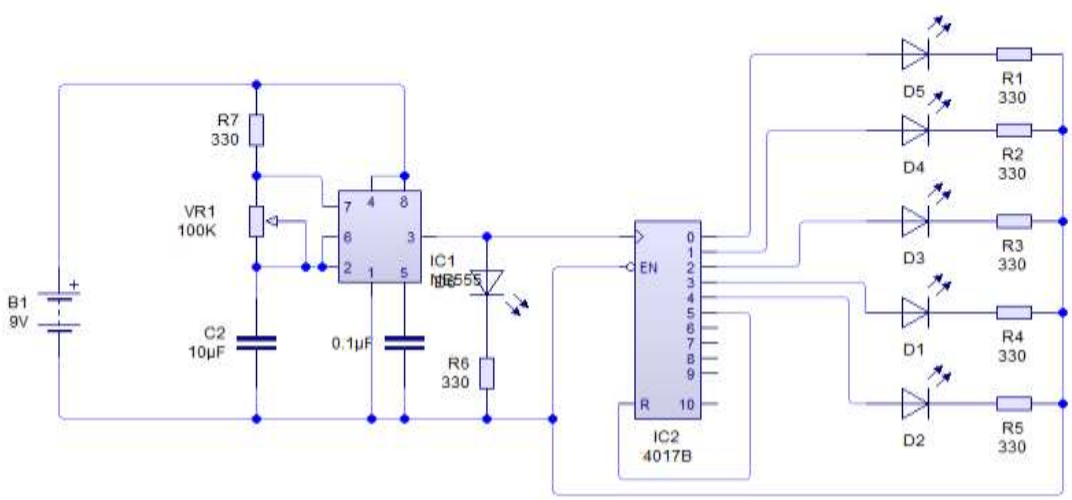

Fig 1. *Circuit drawn on livewire*

3. **Methodology**

   1. The circuit was designed on livewire as shown in fig 1.

   2. It was then implemented on a breadboard and debugged as shown below.

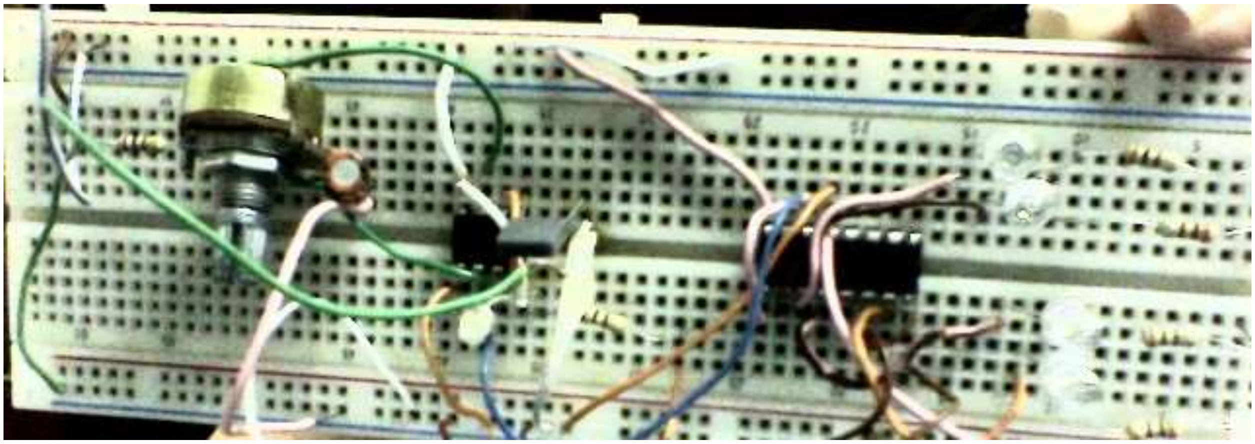

Fig 2. *Implementation on breadboard*

3. The circuit was then implemented and soldered on a Vero board.

   (A few passive components were omitted due to the negligible differences their absence make) [1]

4. The more voltage supplied to the circuit (by correctly adjusting the potentiometer), the faster the chase is.

5. The circuit soldered in shown below:

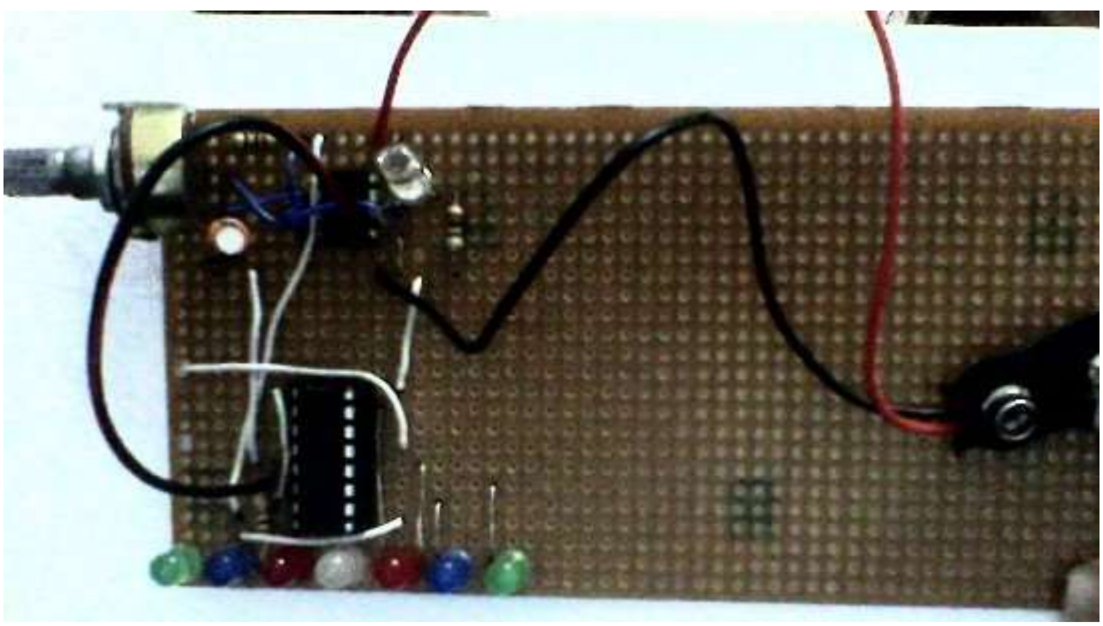

Fig 3. *Implementation on a Vero Board*

[1] To be justified at a later stage

6. A chase is an electrical application where strings of adjacent light bulbs cycle on and off frequently

7. It gives the illusion of lights moving along the string.

8. In this project, the frequency of the apparent motion of light is controlled manually and reset digitally.

3.1 Theoretical frameset

Timer 555

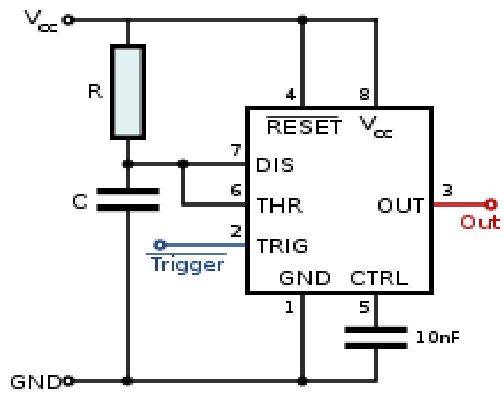

Fig 4. Configuration of timer 555 representing a monostable mode

1. In monostable mode, the output pulse ends when the voltage on the capacitor equals 2⁄3 of the supply voltage.

2. The output pulse width can be lengthened or shortened to the need of the specific application by adjusting the values of R and C

3. The voltage across capacitor is given by :

$$V_c = V_{cc}\,(1-e^{(-t/RC)}) \text{ at } t = T$$

$$V_c = (2/3)V_{cc}$$

therefore,

2/3Vcc = Vcc(1-e(-T/RC))

T= RC ln(1/3)

T=1.1 RC (seconds)

The output pulse width of time *t*, which is the time it takes to charge C to ⅔ of the supply voltage, is given by

t = ln(3). RC ≈ 1.1 RC

Where t is in seconds, R is in ohms (resistance) and C is in farads (capacitance).

4. The output waveform is shown below.

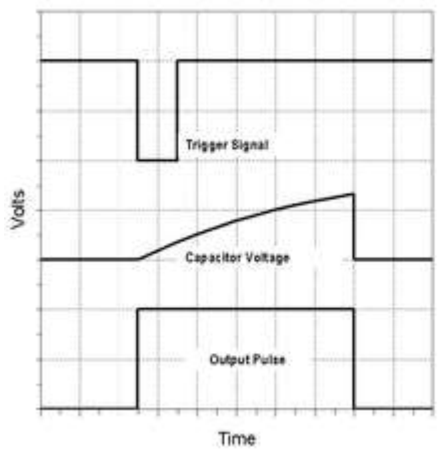

Fig 5 *waveform in a monostable mode*

5. The correct workings of the timer is shown by a LED connected to it such that the latter goes through 2 states in the required time lapse.

6. The IC 555 in the circuit operates at a frequency of 14Hz, which means that it produces about 14 clock pulses every second to the IC 4017.

<u>IC 4017</u>

1. It is a CMOS decade counter cum decoder circuit which can work out of the box for most of low range counting applications.

2. It can count from zero to ten

3. Its outputs are decoded

4.

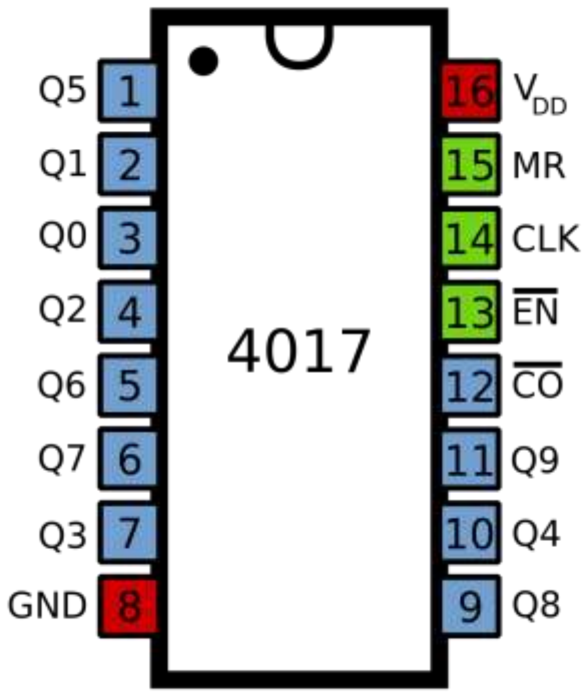

Fig 6 *configuration used for IC 4017*

4. <u>**Advantages**</u>

1. This piece of technology is used widely by many a one with no or little background in electronics and the design requires no handbook for mounting.

2. It is relatively reliable and will quite obviously provide a lifetime of maintenance free operation.

3. The compact design can be easily integrated in signs and displays.

4. It will have comparatively low heat dissipation hence no need for a heat sink.

5. Applications

Chasers are used in casino signs and slot machines, small signs and marquees, merchandizing showcases, holiday props and decorations, carnival floats, theme parks, fair rides, cars, boats and much more.

6. Preventions and precautions

1. The passive components were omitted in the implementation on the Vero board for the following reasons:

Less passive components amounts to less power consumption and dissipation favoring a positive skew towards an ideal circuit.

Less soldering was required, hence less heat and lowered risk of damaging heat-sensitive components.

2. A LED was used to ensure the proper functioning of the timer 555.

3. Point-to-point testing was made during implementation and debugging while the circuit being preemptively and virtually divided into three segments: input, processing part and output; to prevent damage of the components and ensure a smooth flow to building up the circuit.

4. Personal (and extensively mentioned) lab-related personal care was taken.

Breakdown of costs

	First implementation	Second implementation	Total
Hard cost (MUR)	134.00	110.00	245.00
Soft Cost (MUR)	0.00	0.00	0.00
			245.00

Workload Ratio assignment

This is to attest that ALL project partners worked and cooperated equally and equitably in this work. The agreed upon ratio is thus a 1:1:1.

Bibliography

1.**VAN ROON, Chapter "Monostable Mode". (Using the 555 timer as a logic clock)**

2."LM555 Datasheet" . Texas Instruments. January 2015,original: June 2017

3.Practical Electronics IC 4017, 2012