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Electronic Dice

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ABSTRACT

This mini project includes a 555-Timer, IC 4017, IC 4511 based analogue & digital dice game using an electronic digital dice with the help of LEDs & 7 segment display. The game designed is simple electronic circuit with a push button that can be used like a normal dice in games. The dice works by switching Light Emitting Diodes (LEDs) on and off just like the pattern of dots found on a traditional dice & also the number is displayed in 7-segment display, which make this game both analogue & digital. We show how 555-timer may be more or less dependable, and suggest some improvements to standard designs. The paper includes many recommendations for developers and purchasers.

Keywords : Electronic dice, 7-segment display, Digital Dice, IC 555_4017_4511, Light emitting diodes.

I. INTRODUCTION

A digital dice is an electronic dice in which we can generate any numbers from 1 to 6 using 7 segment displays. The distinction between traditional dice and digital dice is that we are able to solely get dice vary from one to six in traditional dice.

Here we are presenting a circuit to design a digital dice game using an electronic digital dice with the help of a seven segment display controlled by 555-timer, IC 4017 & IC 4511.

The game designed is simple electronic circuit with a push button that can be used like a normal dice in games. The dice works by switching Light Emitting Diodes (LEDs) on and off just like the pattern of dots found on a traditional dice & also the number is displayed in 7-segment display, which make this game both analogue & digital.The dice becomes biased if the form isn't cut well. Also, the dice will become biased because of deformations.

If it's a wood die, it can deform due to dampness in the atmosphere or due to mechanical stress.

To solve of these issues that we've with a traditional dice, we have made a dice circuit which solves all the problems of a conventional dice. Electronic LED dice is nearly unbiased. There is no chance to cheat as the circuit operates and pulsates at such a high speed that the circuit is almost imperceptible to the human eye. There is additionally very little maintenance and there's hardly any impact on aging of the circuit. The frequency may vary a bit with change in power supply voltage and varying the resistor, aging of the active and passive components but still the randomness will be preserved without any trouble.

The main brain of this project is IC 4017 with the help of IC 555 toggles the LEDs at a decent speed. IC 4511 is used to display and provide the 7-segment display a specific Number. The main work is that when we press the switch, it starts series toggling and when we release the switch it stops at a random digit next to the sequence giving you a random number as that for dice.

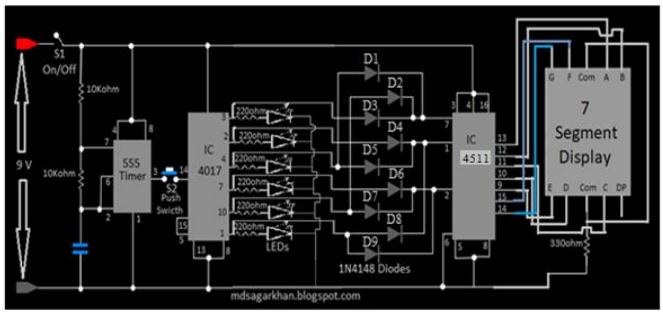


Fig-1: Conceptual Block Diagram of Electronic Dice

II. LITERATURE SURVEY

Jeena Joy proposed et al [1] in his paper that even certain aspects of the system can be modified as operational experience is gained with it. As the users play with the system, they develop various new ideas for the development and enhancement of the project. Number of players may be redoubled by creating little changes within the programming and incorporating few further hardware units.

Disha Kapoor [2] did other study that examined seven segment displays in depth, and provided a number of recommendations, numbered for easy reference.

III. METHODS AND MATERIAL

System Description

IC 4017 - CMOS Counter

IC 4017 is a 5-stage Johnson Counter having 10 decoded outputs. Used to build all kinds of the timer, LED sequencers and controllers circuits. Pin sixteen is positive power provides and pin eight could be a ground. The power provide vary of three volts to sixteen volts and most power provide voltage at pin one should not a lot of than eighteen volts. Pin thirteen has Clock enabled pins to controls the clock. When it's "0" logic, the clock is enabled and the counter advances one count for each clock pulse. When "1" logic, the clock input is stopped, and the 4017 counter does nothing even when a clock pulse is reached. Pin 14 is the clock triggers one count. Pin 15 is the reset pin. Normally, it is "0". When created "1", the counter is reset to "0". Pins 1-7 and 9-11 are the decoded output pins. The active count pin goes high and all others remain low. Pin twelve is Carry output, for the clock input of a further counter or associate degree external circuit that the count is complete.

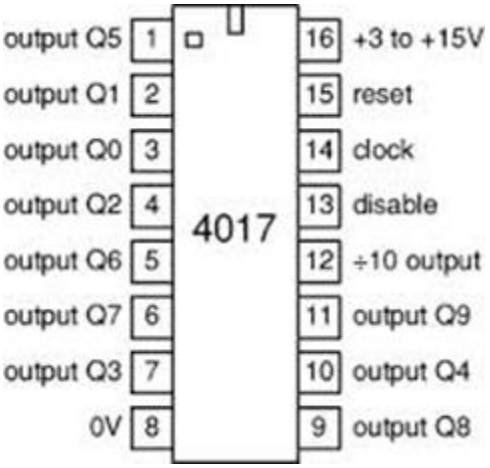


Fig-2 : IC 4017_Decade Counter

IC 555 – Timer:

The 555 timer datasheet specifies that 555 IC could be an extremely stable device for generating correct time delays or oscillation. Additional terminals area unit provided for triggering or resetting if desired. In the time delay mode of operation, the time is exactly controlled by one external electrical device and capacitance. For astable operation as associate degree generator, the free running frequency and duty cycle area unit accurately controlled with 2 external resistors and one capacitance.

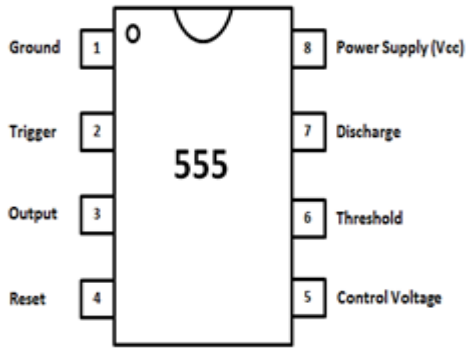


Fig-3 : IC 555_Timer

IC 4511 –CMOS BCD to 7 Segment Latch Decoder Driver:

The 4511 datasheet specifies that this IC may be a BCD to 7-segment latch/decoder/driver with four address inputs (DA to DD), a vigorous LOW latch alter input (EL), a vigorous LOW ripple blanking input (BI), a vigorous LOW lamp check input (LT), and 7 active HIGH NPN bipolar semiconductor phase outputs.

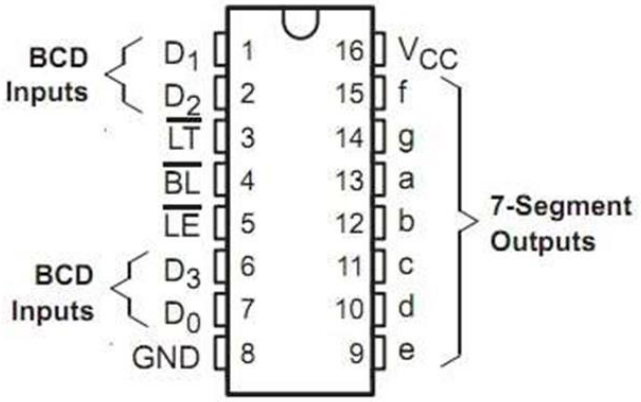


Fig-4 : IC 4511 –CMOS BCD to 7 Segment Latch Decoder Driver

7- Segment Display

A seven-segment show (SSD) could be a wide used electronic show device for displaying decimal numbers from zero to nine.

They are most ordinarily employed in electronic devices like digital clocks, timers and calculators to show numeric info.

As its name indicates, it's fabricated from seven totally different illuminating segments that square measure organized in such how that it will type the numbers from 0-9 by displaying different combinations of segments. It is also able to form some alphabets like A, B, C, H, F, E, etc.

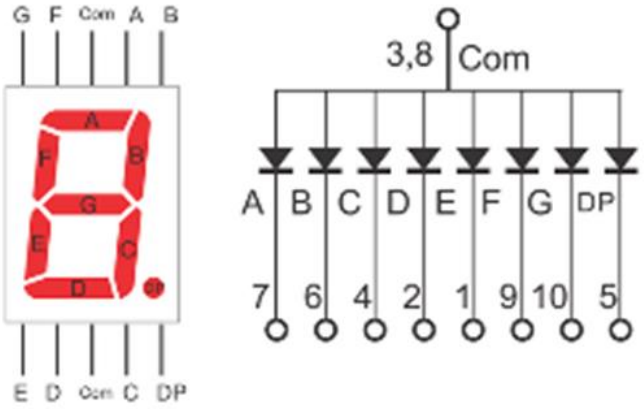


Fig-5: 7-Segment Display

The remaining components on the breadboard are as follows:

- ✓ 6*LEDs,
- ✓ 9*1N4148 Diode,
- ✓ 6*220ohm Resistors,
- ✓ 2*10Kohm Resistors,
- ✓ 1*300ohm Resistor,
- ✓ 1*0.1uf Capacitor,
- ✓ 1* 9V battery & battery clip,
- ✓ 1* power switch &
- ✓ 1* push swicth.

Fig-6: Other Components Required

Circuit & Methodology

The clock pulses area unit given to a counter humour decoder circuit IC 4017 with the seventh output given to reset.

It has 9 attainable outputs out of that, the seventh is given to reset as a result of we tend to solely would like a count up to six as a dice has six faces solely.
The first six outputs area unit is given severally to the crystal rectifiers so the several LED can glow for the corresponding count.

If the count is 0, LED-1 will glow. If the count if 1, LED-2 will glow and so on until the sixth count that is 5.

When the count is 5, the sixth crystal rectifier can glow and afterward for subsequent clock pulse the counter can advance and also the count increments to seven.

In this count, the circuit resets itself because the seventh count is given to the reset pin that is PIN-15.

Circuit Diagram:

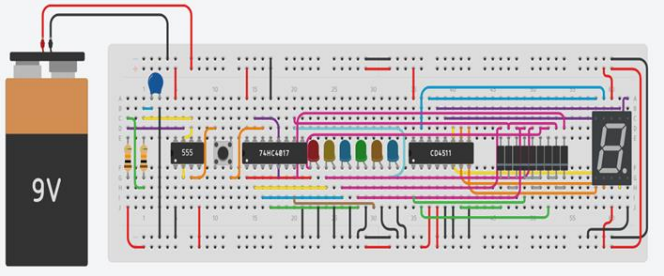


Fig-7 : Simulated Circuit Diagram in Software

The leds are controlled by a 4017(IC 2) decade counter IC. Of this IC six outputs are used to drive the LEDs and a seventh & sixth output are used to reset the counter. This way it only counts up to five. To light up the correct LEDs, LEDs are connected with corresponding output with 220ohm resistors. The same is connected to 7-segment display with the help of diodes. These block the current in one way so other outputs of the IC aren't affected when 7-segment display is connected to multiple outputs.
To make the IC count, a clock supply is required. For this an IC 555(IC 1) timer is used. This IC generates a clock pulse of around five kc. To roll the dice you have got to press the button on the PCB. This button enables the IC 4017 counter IC which then starts counting.

When you unharness the button, the IC is disabled, but it keeps showing the current output state in LEDs (DIS-1). Because the clock is therefore quick, the output is totally random.

The outputs of the decade counter are fed to BCD-7Segment Display decoder IC 4511 (IC3), which, in turn, is connected to common-anode, 7-segment display LTS542 (DIS-2).Here the outputs of decade counters are used as Q0 as 1(glows 1st Led & displays '1'in 7-segment display).Likewise Q5 as 6(glows 6th Led & displays '6'in 7-segment display),wherein Q6 to Q9 are remained disconnected(not used).

Here D of the IC 4511,BCD to 7-segment converter is grounded. So MSB bit D=0 always. LSB bit= A.

When Q0 is high then diode D3 will only conduct while other diodes don't conduct, hence only A=1 & B=C=0. Hence the sequence is C B A (0 0 1) [Decimal Equivalent=1]

When Q1 is high then diode D4 will only conduct while other diodes don't conduct, hence only B=1 & A=C=0. Hence the sequence is C B A (0 1 0) [Decimal Equivalent=2]

When Q2 is high then D1 & D5 conducts while other diodes don't conduct, hence A=B=1 & C=0. Hence the sequence is C B A (0 1 1) [Decimal Equivalent=3]

When Q3 is high then D6 will only conduct, hence C=1 & A=B=0. Hence the sequence is C B A (1 0 0) [Decimal Equivalent=4]

When Q4 is high then D2 & D7 conducts, hence C=A=1 & B=0. Hence the sequence is C B A (1 0 1) [Decimal Equivalent=5]

When Q5 is high then D8 & D9 conducts, hence C=B=1 & A=0. Hence the sequence is C B A (1 1 0) [Decimal Equivalent=6]

Working Model:

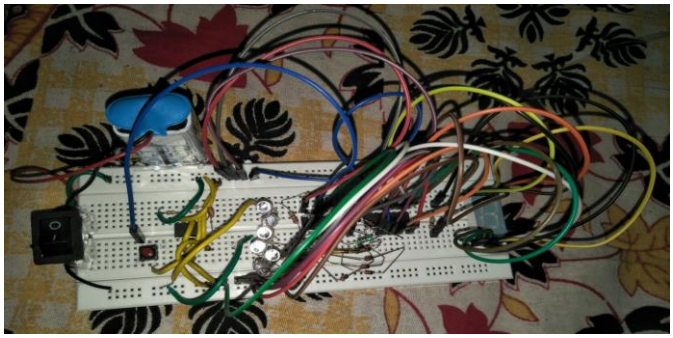


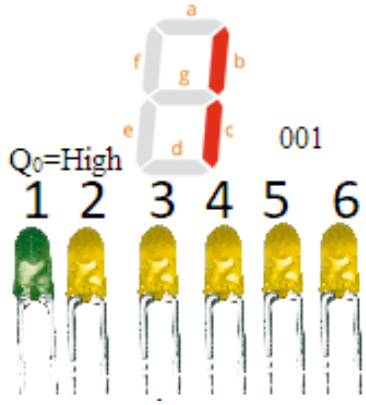
Fig-8: Build working model of Electronic Dice

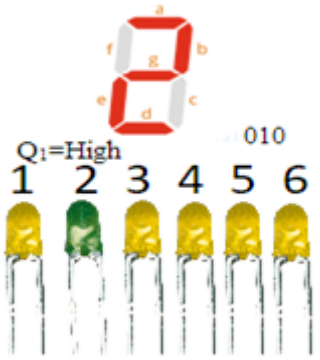
IV. EXPERIMENTAL RESULTS

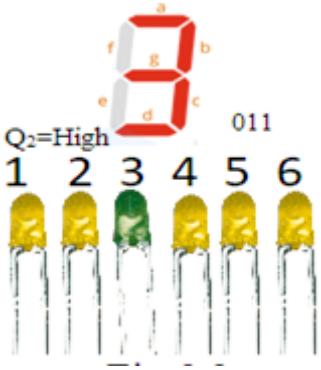
The experimental results are shown in various images below which depicts the various patterns of the LEDs & 7-segment display. The project's different stages of operation are as follows:

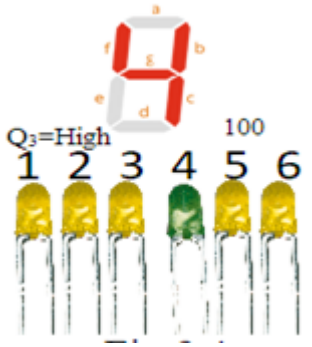
At initial stage when the supply is given to the circuit, the previous data is displayed.

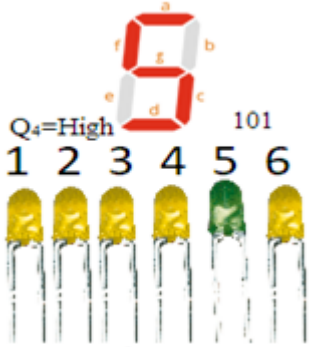
As the clock pulses are given with the help of a push button the stages are as follows:

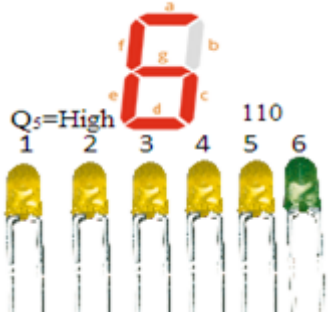












Application

- ✓ Designing and implementing a digital instruction-assisted system
- ✓ It can be used as a normal dice in any board games
- ✓ It can give any random value from 1 to 6.

V. CONCLUSION

The working of IC 4017 & IC 4511 along with IC 555-timer have been observed with implementation of the 'Electronic Dice'.The desired digital dice game has been designed and the complete system (including all the hardware components and software routines) is working as per the initial specifications and requirements of our project. Even sure aspects of the system are changed as operational expertise is gained with it. As the users play with the system, they develop various new ideas for the development and enhancement of the project.

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