Project Title: ELECTRONIC DICE

Dice is used to play many games like snake ladder, Ludo etc. Generally, dice is made up of wooden or plastic, which gets deformed with time and become biased. A Digital dice is a good alternative of old-fashioned dice, it can't be biased or deformed. It operates at such high speed that no one can cheat. To create this digital dice circuit, we have mainly used 555 timer IC and 4017 IC. You can also check this digital dice circuit using Arduino.

INTRODUCTION

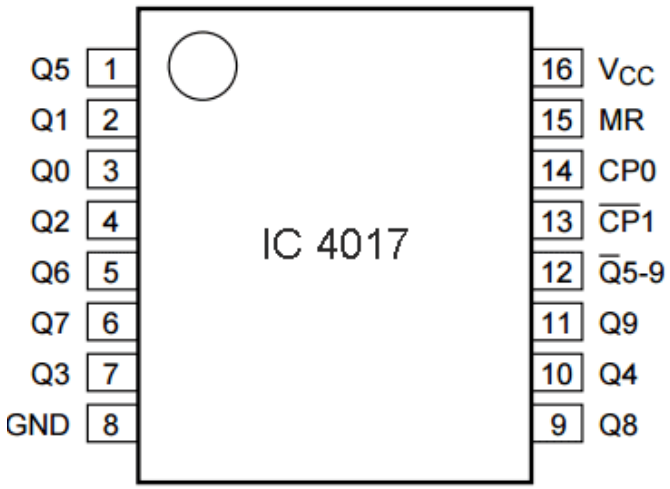
Components Used:

- CD4017 IC
- 555 Timer IC
- 2 Resistor- 1k
- Capacitor- 10uF
- Variable Resistor- 10K
- Push Button
- 6 LEDs
- Battery - 9v

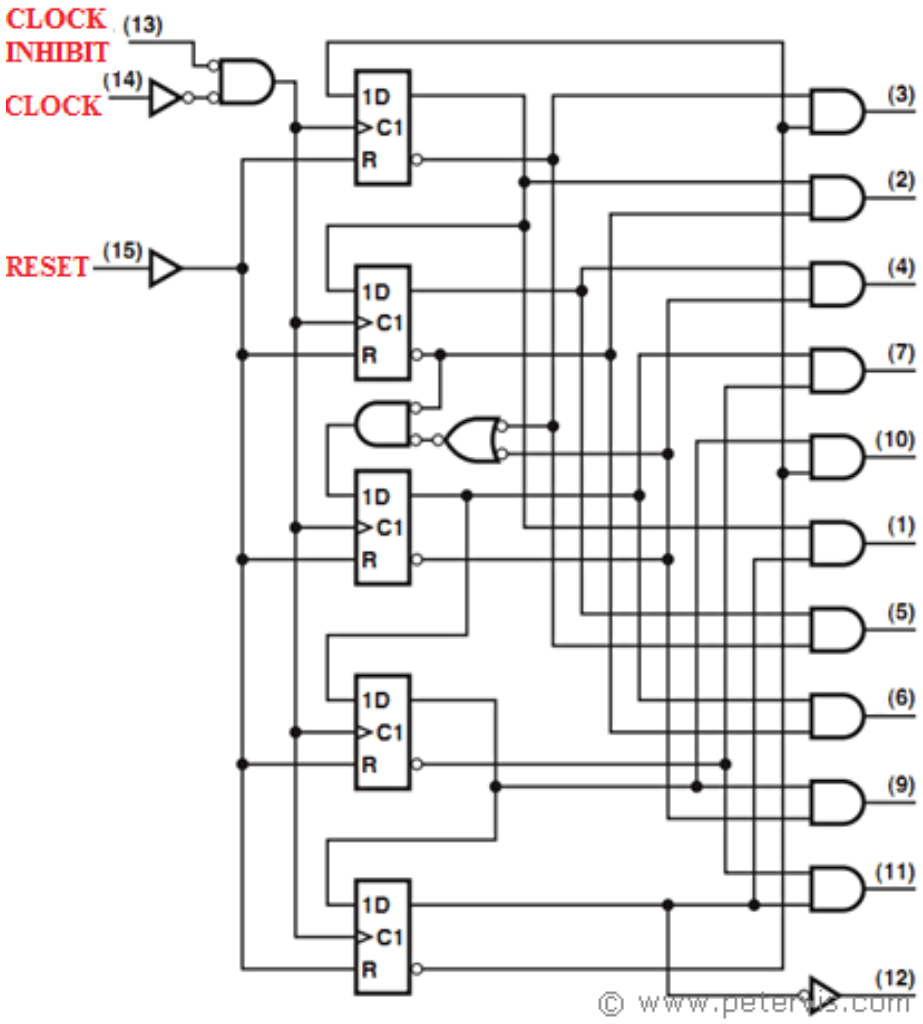
Components Working and Explanation:

4017 IC

4017 IC is a **CMOS decade counter chip**. It can produce output at the 10 pins (Q0 – Q9) sequentially, means it produce output one by one at the 10 output pins. This output is controlled through the clock pulse at PIN 14. At first, output at Q0 (PIN 3) is HIGH, then with each clock pulse, output advance to the next PIN. Like one clock pulse makes the Q0 LOW and Q1 HIGH, and then the next clock pulse makes the Q1 LOW and Q2 HIGH, and so on. After the Q9, it will start from the Q0 again. So, it creates sequential ON and OFF of all the 10 OUTPUT PINs. Below is the PIN diagram and PIN description of 4017:



Internal circuitry of 4017 IC:



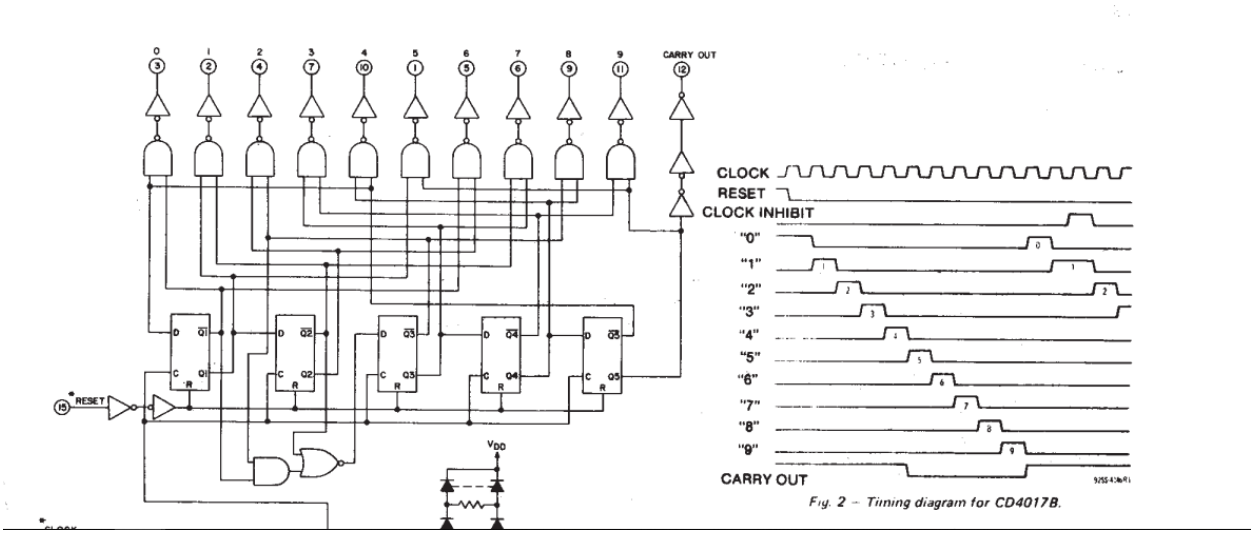
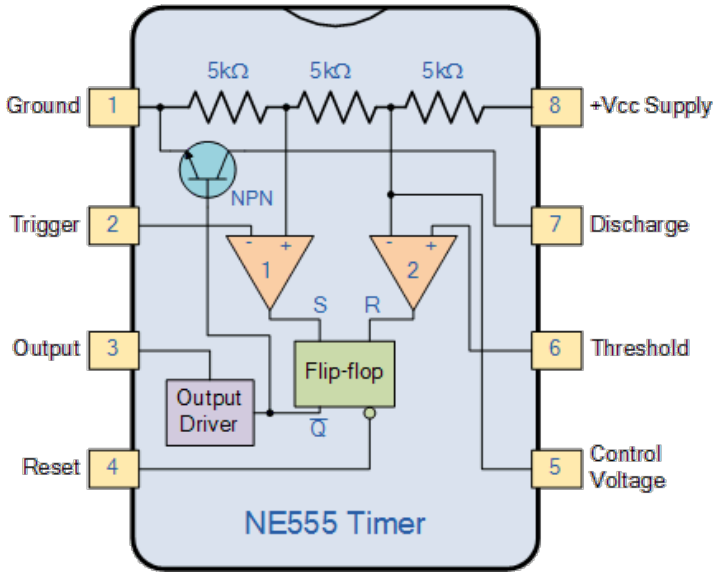


Fig. 2 – Timing diagram for CD4017B.

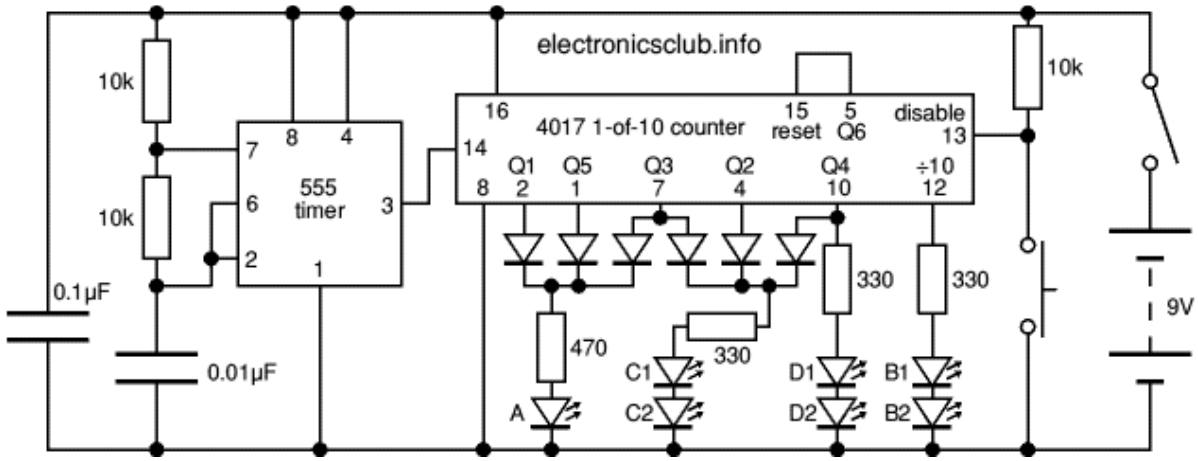
555 IC:

The 555 timer chip is extremely robust and stable 8-pin device that can be operated either as a very accurate Monostable, Bistable or Astable Multivibrator to produce a variety of applications such as one-shot or delay timers, pulse generation, LED and lamp flashers, alarms and tone generation, logic clocks, frequency division, power supplies and converters etc, in fact any circuit that requires some form of time control as the list is endless.



Circuit Diagram and Explanation:

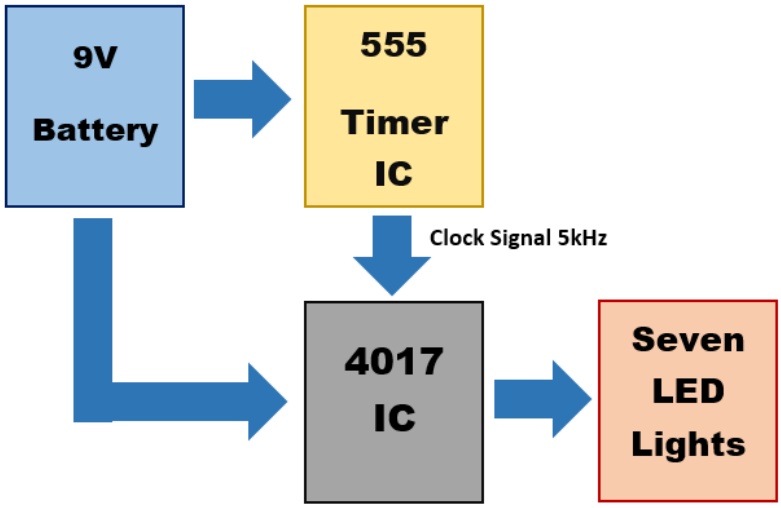
In this **digital dice circuit,** we have used 6 LEDs, each LED represent a number (1-6) of Dice. LEDs start flashing as we press the Push button and stops when we release it. After release, illuminated LED tells the numbers, you got on Dice. Like if fifth no. LED remains ON after releasing the button, means you got 5 on Dice. We have connected 6 LEDs to the output Q0 to Q5, and the seventh output Q6 is connected back to the RESET PIN 15. So that after LED 6 it starts from the First LED at Q0.



To apply the clock pulse at PIN 14 of 4017 IC, we have used **555 timer IC in Astable mode**. The oscillated output generated at PIN 3 of 555 has been applied to the PIN 14 of 4017, so that output can be advanced with each clock pulse. We can control the speed of flashing LEDs by using the potentiometer (RV1), rotating the potentiometer knob will change oscillation frequency of 555 timer, hence the rate of clock pulse. The frequency of the 555 can be calculated using this formula: F=1.44/((R1+2*RV1) *C1)

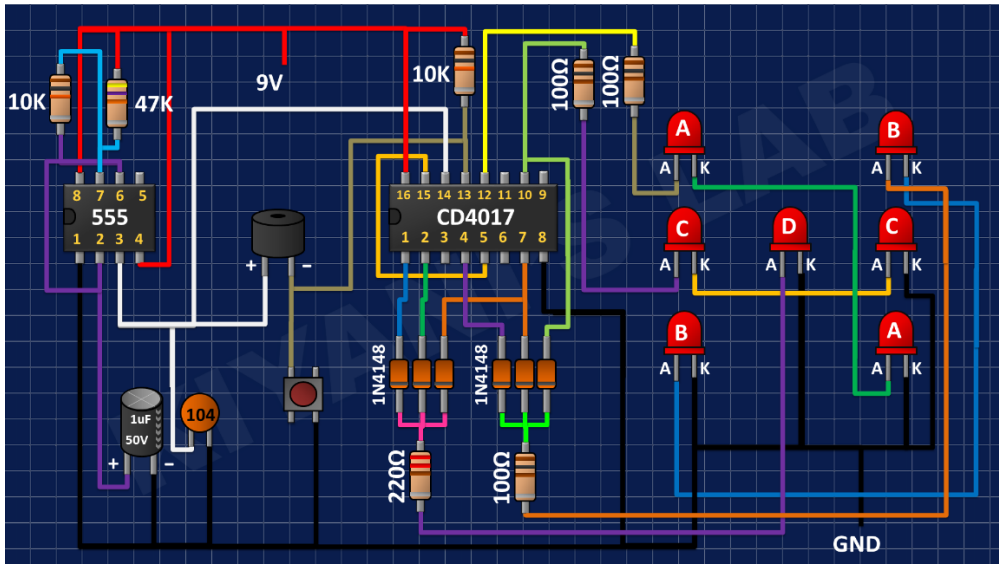
In this digital dice circuit, we have kept the oscillation frequency so high that no one can cheat. LED flashing speed is directly proportional to oscillation frequency of 555, as High the frequency, as high the speed of flashing. You can increase frequency according to you, by rotating the potentiometer.

Block Digram:



The 555 astable circuit provides clock pulses at about 5kHz for the 4017 counter which has ten outputs (Q0 to Q9). Each output becomes high in turn as the clock pulses are received. Only six counts (Q0-Q5) are needed so Q6 is connected to reset. Appropriate outputs are combined with diodes to supply the LEDs: for example, Q1, Q3 and Q5 are combined for LED A.

The dice sequence has been started at 2 so the 4017's ÷10 output can be used for LEDs B1 and B2, this saves diodes and simplifies the circuit. Pressing the push switch makes the disable input low so that counting occurs.



Hardware: