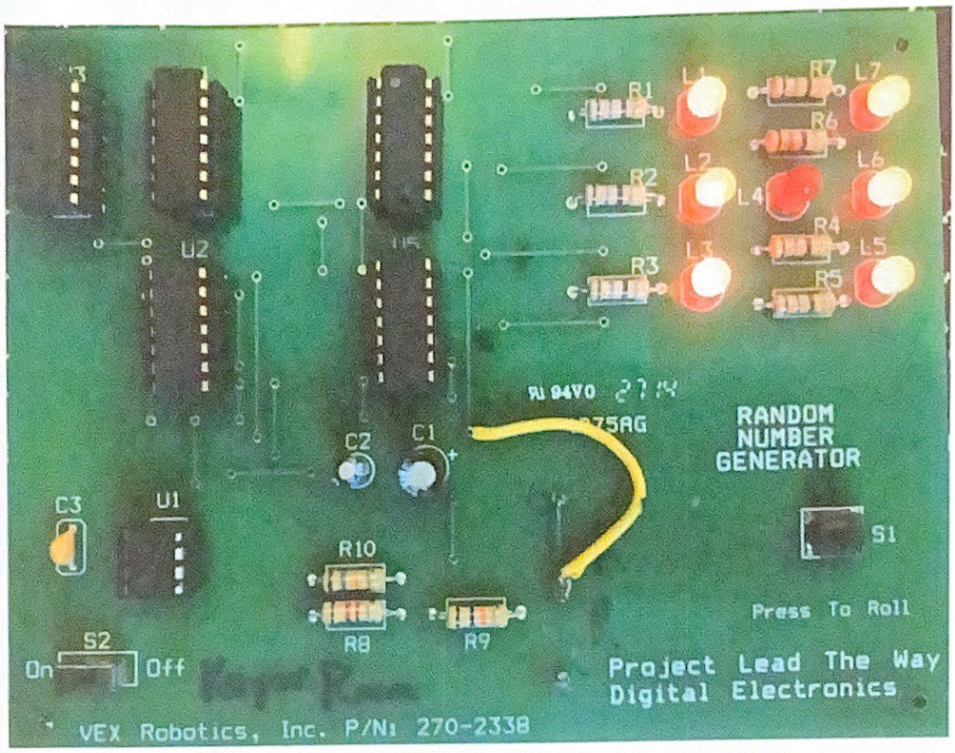
Random Number Generator



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Project Lead the Way

Digital Electronics

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Table of Contents

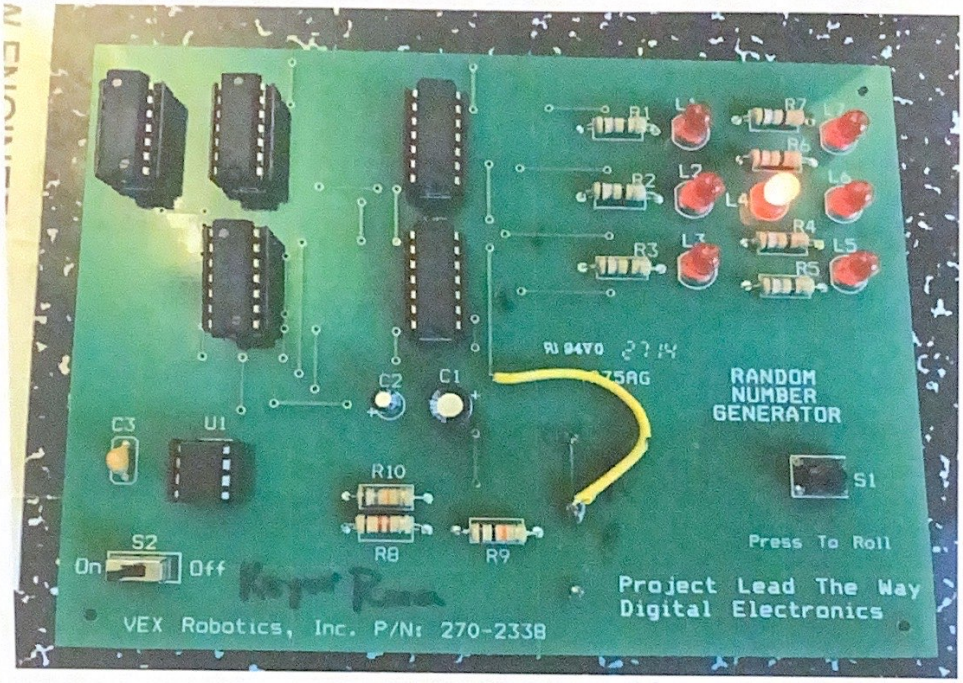
Introduction

To solder and build a working number generating circuit that can generate numbers from 1 to 6 randomly. The *random number generator* thought to output 1-6 equally but as we recorded the number of times the numbers landed, we discovered that it's really not random, each number from 1-6 landed different percent of times. The skills students learnt from this are time management and getting better at building and visualizing the circuits.

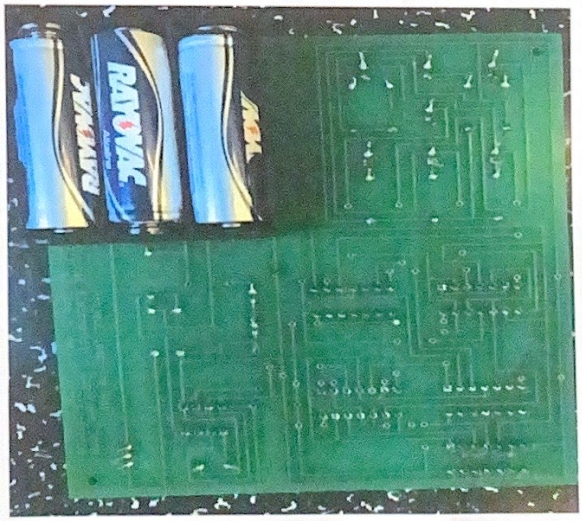
Materials

Quantity	Part number	Description
7	180Ω	Resistor
1	1.2 kΩ	Resistor
1	10 kΩ	Resistor
1	18 kΩ	Resistor
7	Red	LEDs
1	100μf	Capacitor
1	0.47μf	Capacitor
1	0.01μf	Capacitor
1	N.O. Pushbutton	Switch
1	SPST Slider	Switch
1	555	Timer
1	74LS74	IC
1	74LS74	IC
1	74LS04	IC
1	74LS32	IC
1	74LS08	IC
5	14 Pin	IC Socket
1	8 Pin	IC Socket
1	Printed Circuit Board	270-2338
1	Battery Holder	Battery Holder
3	AA	Battery
1	30 Watt	Soldering Iron
1	Lead Free	Solder

Evidence of working design



Pictures of working circuit that can roll a number from 1-6. The yellow wire is a jumper wire that resolved the problem that this circuit had.



Results

Number Rolled	Tally count	Distribution
1	𝍸 𝍸 𝍸 𝍸 𝍸 |||	28%
2	𝍸 𝍸 𝍸 𝍸 |||	23%
3	𝍸 ||||	9%
4	𝍸 𝍸 |	11%
5	𝍸 𝍸 𝍸 |	16%
6	𝍸 𝍸 |||	13%

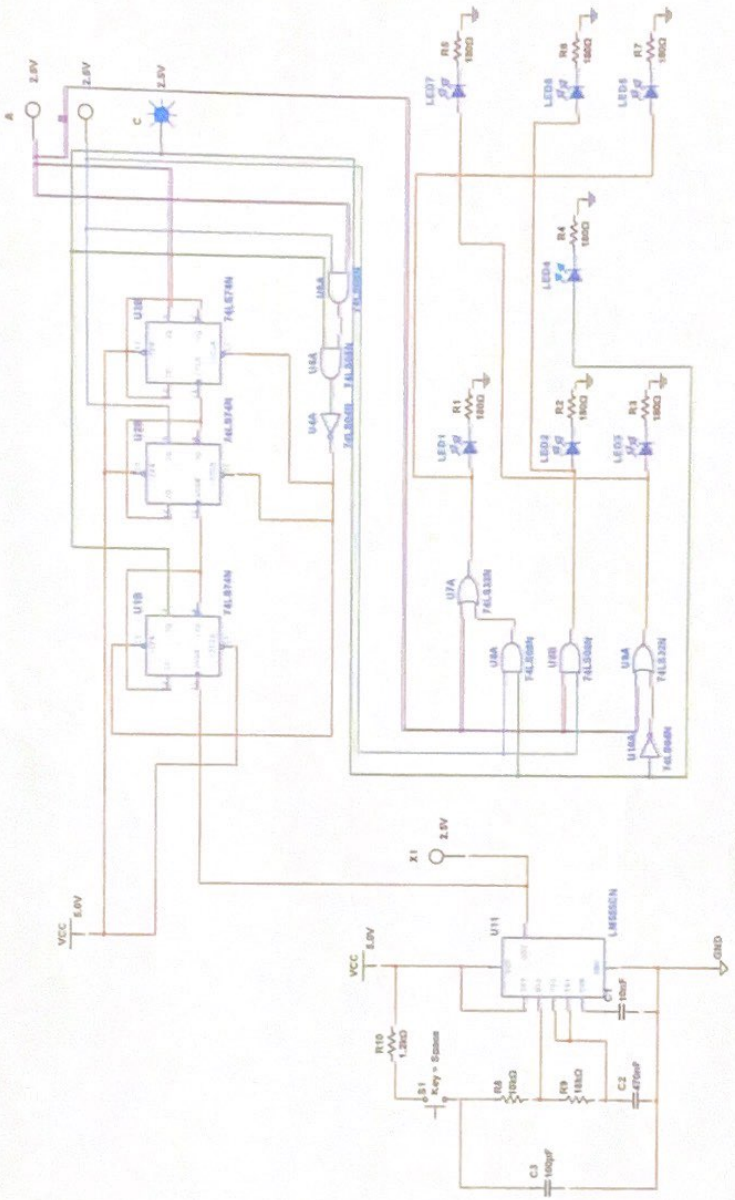
The circuit rolled a random number from 1-6. 7 was one of the options but it was optional as it required students to do some editing on the circuit board.

Conclusion

In this activity, students were to a build a working Random Number Generator that can generate numbers from 1-6 randomly. I thought the activity was easy, but the over confidence led me to make a mistake at the end making my circuit not work, however, I was able to get it working at the end using some jumper wires. Firstly, in this activity, we were given different types of Resistors, Capacitors and other components that we had to correctly solder into the circuit board. I found the soldering part easy as I had past experiences from Engineering club. We soldered easy components such as Resistors, Capacitors and LEDs first. We made sure that the LEDs terminals were put correctly. Then we soldered the button and the switch. Shortly after, we soldered the IC sockets. We made sure that we put the sockets correctly. The sockets didn't matter as long as you put the ICs correctly. Next we put different types of ICs into the correctly socket. Many kids messed this part up. After that, we soldered the battery holder. This is the part where I accidently misplaced the terminals of the Battery holder into different holes. When I put the batteries in to test my circuit, the batteries got super-hot as there was a short. I realized this and unsoldered the batteries holder and soldered back into correct holes. When this happen, I lost connection from one of the holes that connected to another that powered the circuit. This made me very frustrated. I asked my teacher for help and she helped me find how I could make the circuit work. I made a jumper from the hole to the other hole. After this my circuit was working! I learned from my mistake that never be overconfident and follow directions. I had little experience and didn't struggle as much as the other students in my class, but what I saw was that the other students were soldering the components wrong, they were completely ignoring the terminals/leads and putting the polarity wrong. This caused their circuit to not work such as LEDs. They also messed up on the ICs because they didn't read the direction that all of the ICs were different. When they were soldering, the made a lot of bridges. Some put the button wrong. I guess they messed up because the directions were

put the button wrong. I guess they messed up because the directions were long. Overall, this activity was fun and I would do anything that involves soldering because I love soldering. I think what makes the circuit work or make the numbers generate is the different ICs, one of them is a timer which was probably did some counting in binary and stopped at one of the ICs making the ICs power the LEDs. The button triggers the 555 timer and the process repeats.

Appendix



Random Number Generator Circuit built on Multisim.