National Institute of Technology Karnataka Surathkal

Engineer – 2018

Strong Man

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Abstract/Aim of Project:

Strong man is the classic arcade game where you hit a surface hard with your hands or a hammer, and the one who scores high wins!

Parts Needed/Used:

Components:

- Arduino Uno
- TI TLC5916 Shift Registers (1 per 8 LEDs/strip)
- Load Cell (40kg should be enough)
- HX711 24-bit ADC
- LED strips

Tools:

- Perf board
- Soldering station

How it works:

The working is quite simple. The load cell is the point where the player shall hit with hammer or hands, it is connected to HX711 ADC which sends the weight values to Arduino Uno over serial interface. Depending on those values the LED board can show several patterns, where Uno communicates with TLC5916 over SPI interface.

Steps:

1. A custom PCB was made (by soldering on perf-board) which houses both the shift registers plus HX711. We made it like a stackable shield, so that the Uno board can be changed easily in case of any issues.

2. We made use HX711 library (https://github.com/bogde/HX711) which basically communicates via serial interface with the HX711 ADC and provides functions to get the weight directly in required units.

3. TLC5916 registers communicate with Arduino via SPI interface. Also multiple units of those registers can be cascaded depending on the number of pins required. We used 2 of them, to control 16 LED strips. (Datasheet: http://www.ti.com/lit/ds/slvs695d/slvs695d.pdf)

4.

Uno Pin No.	Denotes	TLC Pin No.	Denotes
D11	MOSI	2	SDI
D13	SCLK	3	CLK
Any DPIN	OE'	13	OE'
Any DPIN	SS	4	LE(ED1)

5. All the LEDs connected to the pins of the shift registers can be manipulated simply by sending 16 bit numbers over SPI interface.

6. There were two driving functions implemented:
   ○ When the value instantaneous weight on load cell is less than a user defined minimum threshold, the LEDs show random patterns (Knight rider mode).

   ○ Also, a maximum reachable weight point is set (depends on calibration of the setup), and then this entire range is divided into 16 divisions.

   ○ Instantaneous weight is calculated by running a while(1) loop as long as weight reading is greater than threshold, to get the maximum peak point.

   ○ Once this point is determined, the LEDs can be turned on by deciding in which division the current impact falls, here also various patterns can be employed.

Troubleshooting:

Loose connections can be the most common issue.

If the components are individually checked beforehand, there should not be any issues.

Problems Faced

The code in this case is very straight to implement, but the problem that we faced, was the mechanical part was not upto the mark.

In spite of your code being accurate if the platform made for hitting doesn't damp and distribute the impact properly, results may not come as expected.
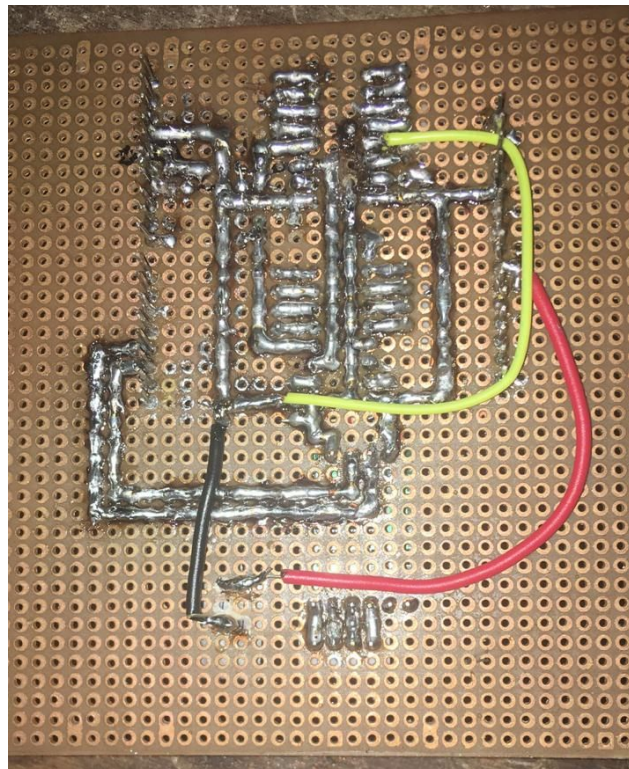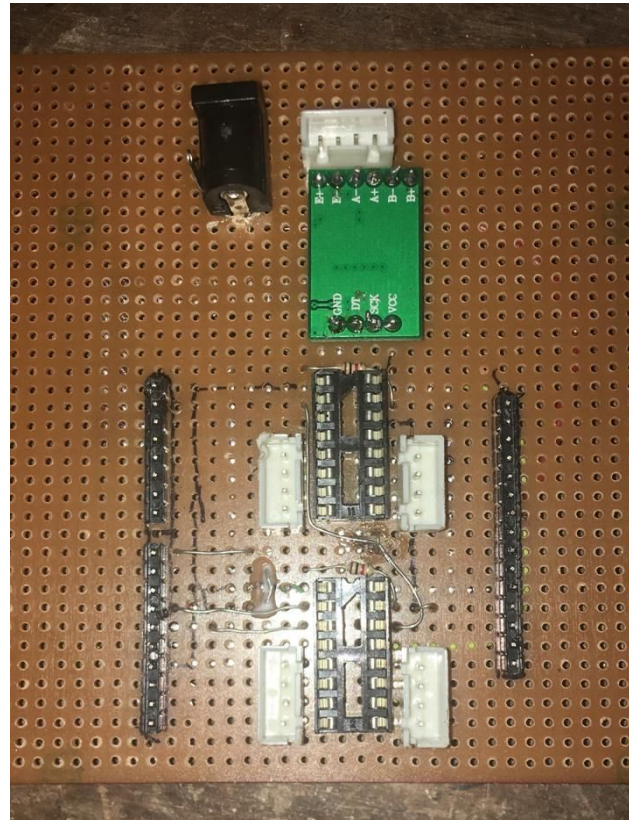
Demo and Pictures

Important Links:

- Git Repo:

  https://github.com/shivampotdar/technites_strong-man#strong-man

- Video: https://youtu.be/dESNBdJKTY8

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