Electronic Tambourine

Jie Qi
Goal:

Make a fun self-powered, energy-harvesting device where power and sensing comes from the same source.
Two modes of play

• Mode 1:
  Yellow jingle LEDs light up when the tambourine is shaken. The harder the shake, the brighter the light.

• Mode 2:
  Blue and red band LEDs light up only when tambourine is shaken above a minimum threshold force.
Power/sensor choice: piezo discs

- Flat
- Light
- High-voltage
- Simple activation mechanism (impact)
- Cheap
- And pretty!
Mode 1 circuit: no threshold

Piezo connects directly to bridge rectifier, which outputs to 8 yellow LEDs in parallel. Though the voltage produced by the piezo is very high, the impulse is so brief that the LEDs are able to handle the resulting current.
Mode 2 circuit: requires threshold!


- http://www.media.mit.edu/resenv/power.html

Figure 12: Schematic diagram showing power conditioning electronics and encoder circuitry for the self-powered RF tag.
After much experimenting...

- Charging capacitor turns off going latch if not crossed
- Keeps latch helps chip run better
- Decoupling capacitor helps discharge faster
- Note: Need resistor for voltage drop?
... customized the piezo-powered shoe circuit for the tambourine
5 uF capacitor
charges and discharges faster than larger capacitors, but still stores enough charge to power the LEDs brightly

5.6 V zener diode
Creates charging threshold high enough to power the Max666 regulator, but low enough to be reached with one tap of the tambourine

24K ohm discharge resistor
Allows circuit to discharge more quickly so that circuit unlatches quickly, ready for next impact
Mode 2 circuit in all its breadboarded glory!
Circuit scaled down to fit the tambourine:
Cardboard prototyping...
Making the jingles
Mode 1 circuit
Adding resin for insulation
Making band LEDs
Two halves of the tambourine
¼" nuts and washers to impact piezos
Gluing the halves together
Gaps in band for circuitry
Adding the band LEDs
Securing band LEDs
Completed tambourine!
Thank you

To Joe Paradiso, Mark Feldmeier, Brian Mayton and Sebastian Palacios for their patient advice and guidance!