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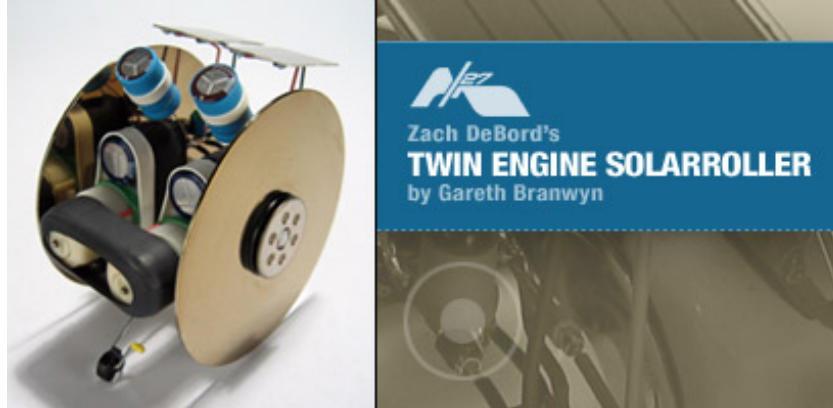
Street Noise

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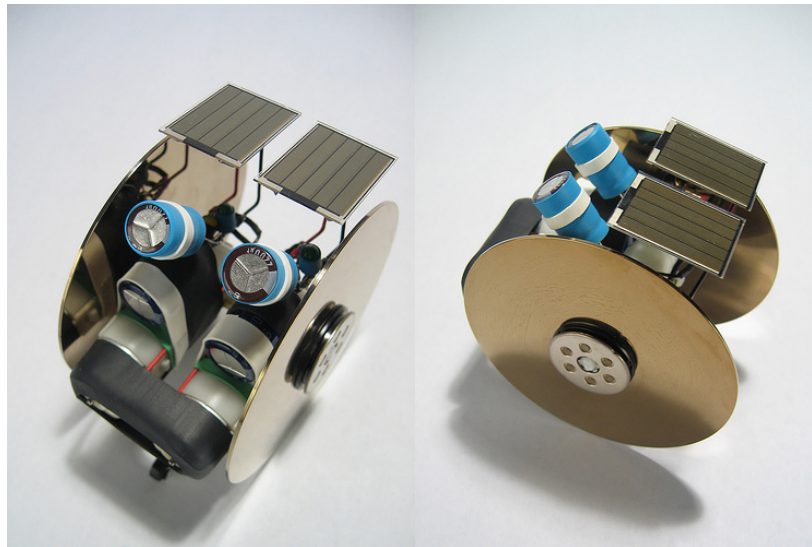
Utilities

Features: Twin-Engine Solarroller

Posted by: gareth



Gopod bless Flickr! While searching on it recently to see if anyone else had built [Mousey the Junkbot](#) or a Symet or Solarroller inspired by my recent [BEAM robotics articles](#) in MAKE, I discovered Zach DeBord and his amazing BEAM creations. A Chicago-based designer and Web developer who's done work for (among others) Comcast, Volvo and Yellow Tail (mmm...wine), Zach's bots put the "A" (as in "Aesthetics") back into BEAM, with gorgeous, meticulous designs that are as much *objets d'art* as autonomous robotcritters.



All of his robots are awesome-looking, but I was instantly attracted to this roller because it's bigger than any solarroller I've ever seen and it uses two solar cells, four storage capacitors, and two gearmotors. Ingeniously, this roller can be steered (sorta). Zach writes: "It is currently configured to go forwards, but by angling either solar panel, it will turn more in one direction since one panel will be getting more light. With both panels angled in the same direction, it is pretty phototropic."

The two large drive wheels on the roller where made from the discs in old SyQuest 270MB 3.5" removable cartridges. Of these, Zach sez: "The SyQuest platters make great wheels except that they are fairly slick. I plan on getting some rubberizing paint and putting beads along the edges to give the wheels more traction." The third wheel, an idler, "keeps the motors from dragging on the ground. It is actually a small plastic part also taken out of the

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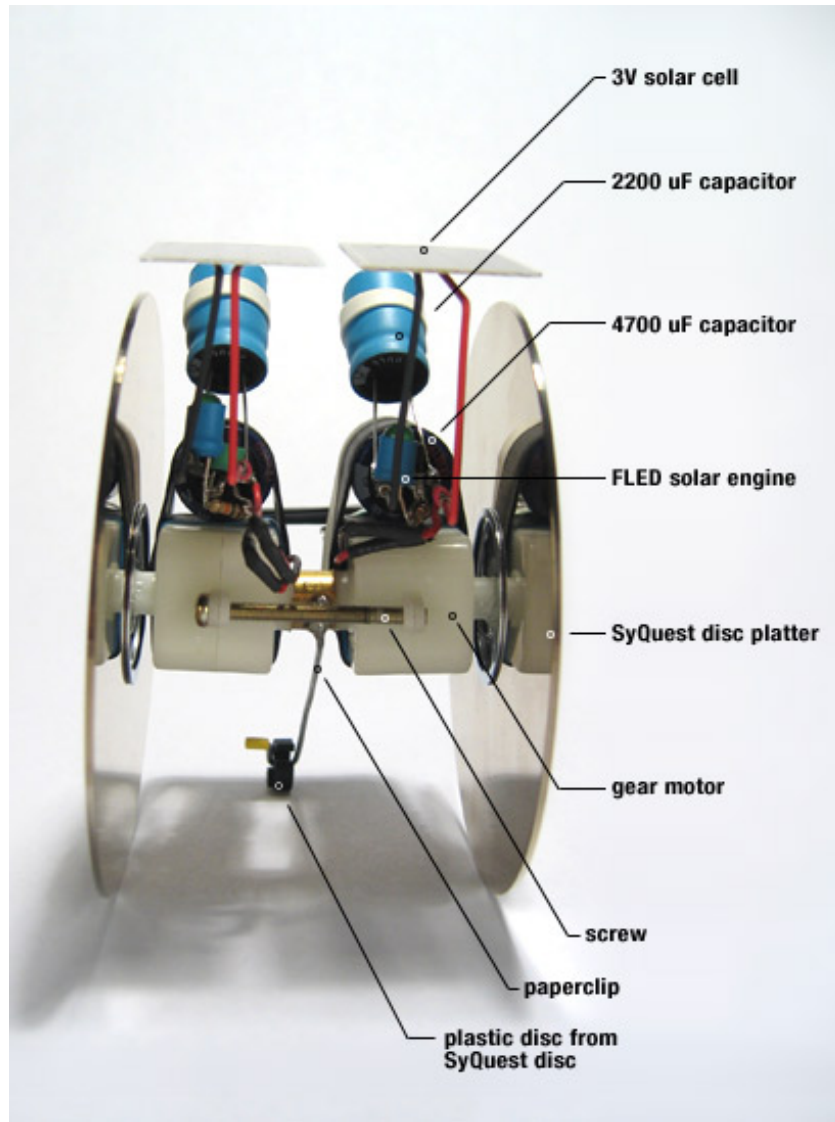
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SyQuest disc."



For this design, Zach used two FLED-based voltage-triggered Solar Engines (Type 1). In my "Beginner's Guide to BEAM" and the "Two BEAMBots" projects in MAKE Vol. 6, we also discussed and used voltage-triggered Type 1 SEs, but they used a 1381 voltage detector IC to control the circuit. FLED-based SEs use a Flashing LED (hence "FLED") in place of the 1381. On the [FLED SE page](#) on the Circuits Library on Solarbotics.net, this is how BEAM guru Wilf Ritger describes the way in which such a circuit works:

*"The solar cell charges the main capacitor until the voltage is high enough for the FLED to start flashing. When the FLED flashes, current flows through the FLED and the base of the PNP transistor and it turns on. Now current passes through the PNP into the base of the NPN transistor and it turns on. When the NPN turns on the collector which is connected to the motor and the 2.2K resistor goes low (to GND). This places a voltage across the 2.2K resistor which provides more base current for the PNP transistor which makes it turn on even more. That is called positive feedback or latching of the circuit because both the PNP and NPN transistors remain on until the main capacitor is discharged to less than 0.7V. When the capacitor voltage drops below 0.7V the PNP and NPN transistors both turn off because of the minimum voltage required to keep the base emitter turned on."*

Here is a schematic for the basic FLED SE circuit, taken from [Beam-Online](#).

#### Recent Articles

**Monday, August 28**

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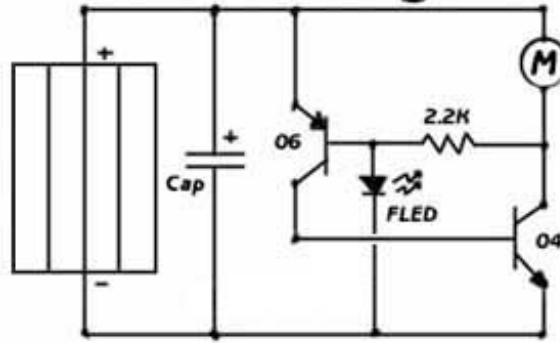
Reviewed by: Gareth Branwyn

##### Scientific Atlanta ...



Reviewed by: Andrew Sasaki

# BEAMSOLARengine ©



Zach on building BEAM Roller circuits: "I usually build engines in a batch for later use. In the image below, you can see that there are sockets on top of the engine circuits (made from IC socket pins). These are used to easily plug in the solar cells. The two leads (red and black) coming out of the back of the engines go to the motors. In this picture you can see the two types of engines that I make: one "classic" configuration with storage capacitors (the two engines on the left) and another config using Polyacene disk batteries in place of the caps (which deliver roughly .6 Farads of stored power). These are represented by the three engines on the right."



## Parts List

Here is a list of the parts that Zach used to build his bot. Solarbotics parts numbers are given, but you can also get many of these parts from your own techno-junk collection, from Radio Shack, or other electronics sources (see "Resources List" below).

Quantity	Part	Solarbotics Parts #	Notes
2	SyQuest Disc Platters	N/A	Dumpster diving, anyone?
2	3v Solar Cells	#SC2433	Any 3v cells, such as the 24mm x 33mm ones SB sells.
2	Gear Motor GM3	#GM3	These are 224:1 90-degree shaft motors
2	2200uF caps	N/A	N/A
2	4700uF caps	#CP4700uF	N/A
2	2N3904 NPN transistors	#TR3904	N/A

## How to Make Two

Typ...



Reviewed by: Andrew

## Special Features

- [Twin-Engine Solarroller](#) (Aug 30, 2006)
- [Blow Your Socks Off!](#) (The Bell Rocket Belt) (May 05, 2006)
- [The SCO Monkey Trial](#) (A Street Tech Intro) (Dec 08, 2003)
- [Gar's Tips on Sucks-Less Writing](#) (Oct 26, 2002)
- [Borg Like Me?](#) (Sep 26, 2002)

## Poll

What game is currently on heavy rotation on your console or PC?

- World of Warcraft
- GTA: San Andreas
- Call of Duty 2
- Burnout Revenge
- Battlefield 2
- Half-Life 2
- Halo 2
- Resident Evil 4
- Ninja Gaidan Black
- Guild Wars
- We Love Katamari
- Other

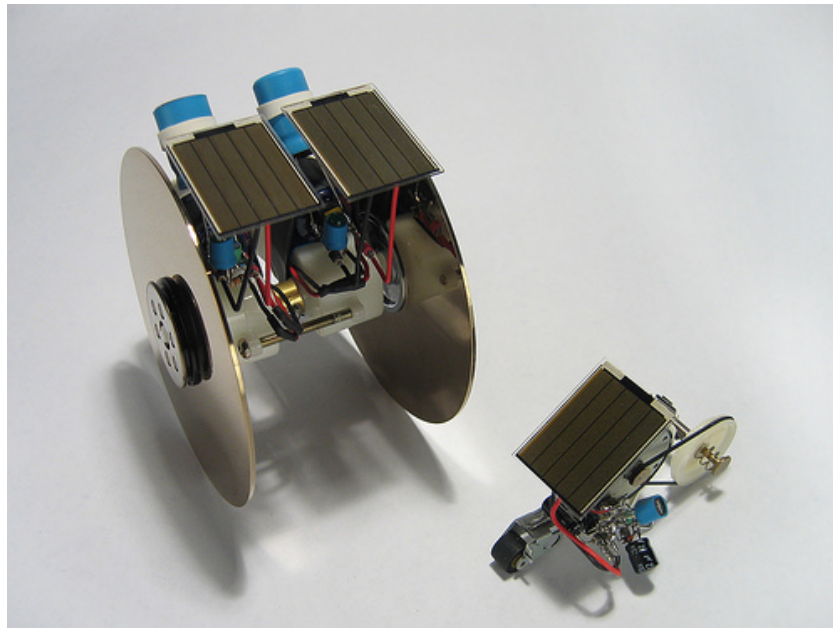
[ [Results](#) | [Polls](#) ]

Votes: **521**  
Comments: **3**

## The Federation



2	2N3906 PNP transistors	#TR3906	N/A
2	Flashing LEDs	#FLED	N/A
2	2.2K-ohm resistors	#R2.2k	N/A
2	IC Socket pins	#SPin24	These are on a 24-pin DIP that you pull off to use.
1	1/2" piece of 1/4" tube	N/A	Used as a spacer between engines.
1	1.5" screw	N/A	To fasten engines together (via hole on motor casings). You just need to find a screw that'll fit snugly.
1	Round plastic piece	N/A	To be used as back stabilizing wheel. Zach got his from the same SyQuest disc.
N/A	Heat Shrink Tubing	N/A	Radio Shack has an assortment in various sizes. You'll want it all the way up to 2" dia.
1	Heavy Duty "Jumbo" Paper Clip	N/A	N/A
Spool(s)	Hook-up Wire	N/A	Use red and black to keep things colorful and polarity-coded.



Zach's twin-engine roller next to a more common single-engine variety.

## Resource List

Here are a few of the parts suppliers and websites that Zach (and I) recommend when planning out a BEAM project.

### Solarbotics

These guys are the go-to source for everything BEAM. I've been buying from them (and working with them) for many years and have always been impressed with their intense devotion to the BEAM hobby (and their customers).

### Hobby Engineering

Good source for motors, robot kits, parts, and other geeky goodies.

### Goldmine Electronics

I've never met a hardware geek who didn't heart the Goldmine. If you're not on their free catalog mailing list, get on it! It's a treasure-trove of weird and wonderful parts and deep discounted gadgets.

### Mouser

Zach sez (and I concur): "Great for any extra parts you might need. You may be able to find parts a little cheaper elsewhere but I've found that their fast shipping and great packaging (every item comes in a clearly marked bag) makes it worth any savings you might find elsewhere."

### eBay

Several good places in Hong Kong offer cheap LEDs via eBay.

### Solarbotics.net

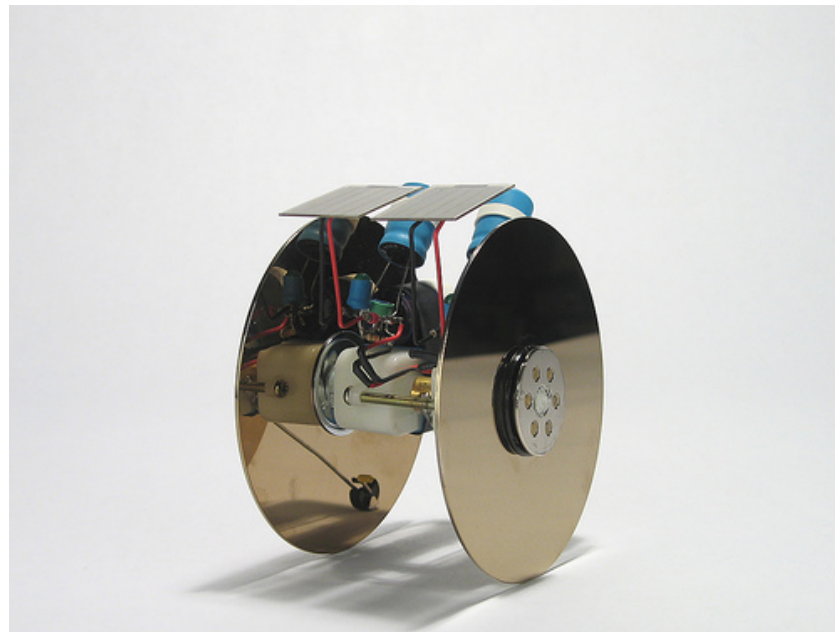
The BEAM community portal. The Library section drops all sorts of mad science on BEAM theory and practice.

### Beam-Online

Another venerable and useful site for all things related to BEAM.

### Zach's BEAM Bots on Flickr

To see additional (and hi-res) versions of these images, and Zach's other bots, check out his Flickr page. To learn more about his design and fine arts work, visit his [website](#).



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