

The Best of



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What is Gadget Freak?

Gadget Freak highlights reader-created inventions that incorporate electronic components and involve sensing, motion, timing, and/or networking elements. We are always on the lookout for new, unique gadgets that may be useful for our readers or that they want to create themselves! If we select your project, we will pay you \$500 and the gadget will be featured in an upcoming issue of Design News or on DesignNews.com. You will also be entered in our next Gadget Freak of the Year contest! In 2013, Design News and Allied Electronics, longtime sponsor of Gadget Freak, crowned its first-ever Gadget Freak of the Year with the help of our readers — will you be next?

Send your design via email to Design News' Assistant Managing Editor [Lauren Muskett](mailto:Lauren.Muskett@alliedelectronics.com)—and don't forget to include photos, build instructions, parts list (which must include parts from Allied), and a short video. Happy inventing!

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A Gadget's Call for Assistance

Friends of Andrew Morris needed a device that could detect a stroke victim's groan and convert the sound into a signal so caregivers would know when help was needed.

After trying unsuccessfully to create a device that could detect the characteristics of the victim's groan, Andrew remembered an answering machine—from 30 years ago—that could detect gaps and brief interruptions in the audio that helped the machine detect the difference between a dial tone and a human voice. So Andrew designed a circuit to do just that, thus giving the stroke victim the voice to call for assistance.

→ Click here to see more of what you need including build instructions, a full parts list, and more photos



Allied Parts List

Amt	Part Description	Allied Part #
2	Conn; AV; Power; Jack; Mini; 2.0mmPinDia; Str; SldrLugs; LongBushing; forS760, S760K, S761K	70214189
2	PowerSupply; AC-DC; 5V@1A; 90-264V In; WallPlug; Retail; Switching; 5W; GS Series	70069886
1	Switch; Panel; 250 mA; Solder Terminal; Copper Alloy (ROHS); Mount hwr supplied	70214234
1	Switch, Pushbutton; Panel Mount; 1000 V(RMS) (Min.); 0.5 A; Wire Lug	70156111
2	Toggle Switch; SPDT; RoHS Compliant	70155934
1	SWITCH, TOGGLE, SUBMINIATURE, BAT LEVER, THREADED BUSHING, SOLDER LUG, DPDT	70192084
1	Knob; Control; Dia 19/32in; Line or Slot; Thermoset	70097796
1	Knob; Phenolic, Brass (Bushing); 21/32 in.; 1/4 in.; 15/32 in.; 6-32	70097793
1	Transducer; 40 mA (Max.); 5 VDC; 2400 Hz; -40 to degC; Pin Termination	70115802
1	Pot; Cnd Pl; Rest 10 Kilohms; Panel; 1 Turn; Linear; Pwr-Rtg 0.5W; Shaft Dia 0.25In	70153802

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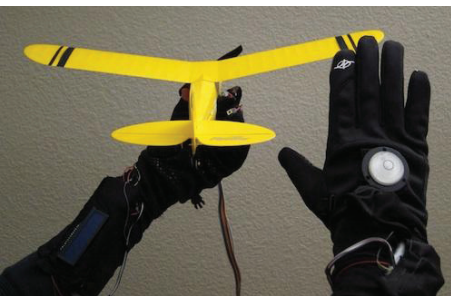


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Gloved Hand Controls Airplane's Flight

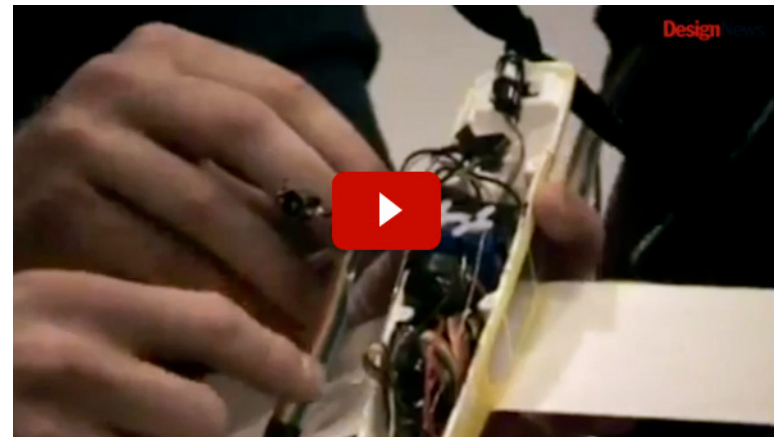
Using an **accelerometer** and a handful of sensors, a team of Colorado State University students has created the Spatial Hand Remote. The gadget controls the flight of a remote control airplane through the sensors in a glove.



The movement of the plane follows the movement of the glove.

As the hand in the glove tilts to the

right or left, so does the plane. Sensors attached to fingers are used to control the throttle, roll reverse, and the on-off switch. The user's hands control the plane like a maestro controlling an orchestra.



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Allied Parts List

Amt	Part Description	Allied Part #
2	Battery; BR Lithium-Coin; 3 V; 48 AH; 0.45 lbs.	70196996
3	Diode, Small Signal; 300 mA; 100 V (Min.); 1 V (Max.); 440 mW; 350 K/W; 100 V	70061726
1	Capacitor; Al Electrolytic; 100 uF; 20%; 50VDC; Radial; ESR 1.59 Ohms; 8x11mm	70186501
3	Capacitor; Al Electrolytic; 10 uF; 20%; 50 VDC; Radial; ESR 15.92 Ohms; 5x11mm	70186496
1	Display, LCD; 80 mm H x 36 mm W x 11 mmD; 5 V (Typ.)	70157090
12	Resistor; Carbon Film; Res 1 Kilohms; Pwr-Rtg 0.25 W; Tol 5%; Axial	70183341
3	Capacitor; Ceramic; Cap 1 uF; Tol -20, +80%; Vol-Rtg 50 VDC; Radial; Y5V; Tape & Reel	70122939
1	Proto Board .1 Grid .042 Holes 4.0 X 5.0	70012507
2	Switch, Slide, Subminiature, Straight PC Terminal, SPDT, On-None-On	70192157
3	Switch, Sub-Mini Tactile, 0.169 Height, 6x6MM, 50MA@12VDC, 130 Operating Force	70128182
2	TRANSISTOR NPN SILICON 70V IC-0.1A LO NOISE HI-GAIN PRE-AMP	70214932

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Analog Camera Built From 3D Printed & Laser Cut Parts



Marin Davide designed, built, and assembled an analog camera with laser cut and 3D printed parts. The gadget is a real camera—with lens, shutter, sonar autofocus, and touch control. It is all controlled by a microcontroller.

The design is modular. Magnets hold the main parts together, providing easy opening and easy camera assembly. Photos can be taken on photosensible paper and then developed at home.



To follow up on this camera, Marin is planning to build a paper tray that will allow users to load multiple sheets. Then, he plans work on a camera that can develop its photos inside the camera box. The result should be a real instant camera.

Be sure to check out the video to see the camera assembled and some of the earliest photos developed.

Allied Parts List

Amt	Part Description	Allied Part #
1	Strap, Battery; 9V, 4 in lead wires, Phos Bronze, Nickel plate, PVC, 26 AWG	70181690
1	IC, Dev Kit; Arduino, Uno32; 128KB; Boards-PIC32	70048429
6	LED; Red; 30mcd; T-3mm; 150mA If; 2V Vf; 60deg; 635nm; Diffused; 5V Vr; 105mW	70127527
1	LCD, CHARACTER MODULE, 16X2, TRANSFLECTIVE, LED BACKLIGHT, GRAY MODE STN, BOTTOM VIEW	70157090
1	Switch; Panel; 250 mA; Solder Terminal; Copper Alloy (ROHS); Mount hdwr supplied	70214234
1	Board to Board, 1 Row 36 Contact Header(2.54mm), Gold or GTX Contacts	70089033

→ [Click here to see more of what you need including build instructions, a full parts list, and more photos](#)



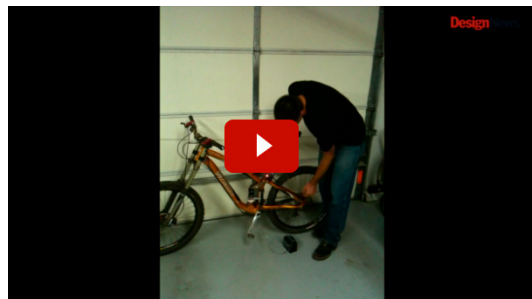
MR Shock Improves Biking



Here's a **bike shock** system than can be controlled—soft or rough.

Jason Brack and his fellow Colorado State engineering students, David Dang and Broc SommerMeyer, created a magnetorheological (MR) bicycle shock absorber that can be adjusted using a touchscreen to affect the bike's ride. The MR fluid reacts to a magnetic field. In this case, the viscosity can be increased or decreased to change the dampening rate of the shock absorber. Using the touchscreen display, the user can select the ride quality of the bike.

→ Click here to see more of what you need including build instructions, a full parts list, and more photos



Allied Parts List

Amt	Part Description	Allied Part #
1	Electronic, Configurable, Graphic TFT, 2.8 Inch, Analog Multi-Function, 4-30VDC	70101409
1	18-Pin, 7 KB Flash, 368 RAM, 16 I/O	70045634
2	RECTIFIER 600V 40A DO-5 CATHODE CASE	70215817
1	Speaker; Mylar- Plastic Frame; 8 Ohm; 0.25 Watts; 81 DB; 900 HZ; 23X5 MM	70186757
1	WIRE, MAGNET, HIGH-TEMPERATURE, 18AWG, POLY-THERMALEZE COATED CLEAR (TRANSPARENT	70004234
1	Pot Membrane 100mm Standard Linear 2.5KOhm 30% 5V TO 30V	70089214
1	POWER MOSFET N-CHANNEL 60V ID=50A TO-220 CASE HIGH SPEED SWITCH ENHANCEMENT MODE	70215908

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Ignition Control Unit for Harley Davidson Panhead Engine

One of my riding partners rides a 1957 Harley FLH (Panhead) that runs on gasoline. It is a classic motorcycle with the look and feel of what real adventure riding is all about - the epitome of the outlaw biker style.



their motor starts on the first kick, which is probably true for the most part. But they will also tell you everything must be just right for it to come off on the first kick. I've also watched a few guys kick until they were blue in the face when things weren't just right.

[Click here to read the full article](#)



Allied Parts List

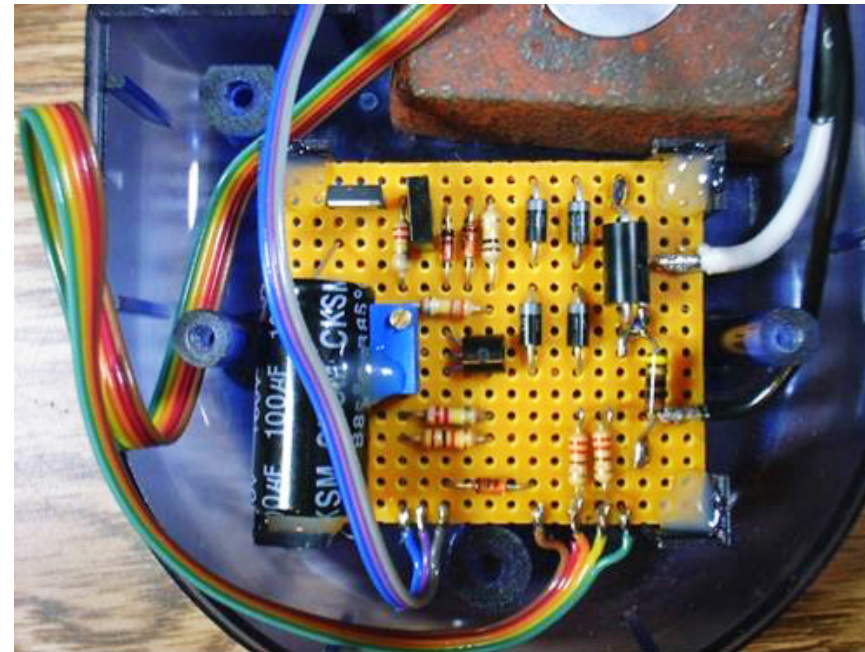
Amt	Part Description	Allied Part #
2	100Uf, 25 v ELECTROLYTIC	70067793
4	CAP CER 0.1UF 50V 20% RADIAL	70095201
1	Diode, Switching; 100V; 200mA; DO-35; Cut-Tape	70055538
3	CONN TERM BLOCK 2.54MM 2POS	70054335
1	CONN TERM BLOCK 2.54MM 4POS	70054337
1	TRANSISTOR, SWITCH; NPN; 40VCE; 75VCB; 6VEB; 0.6A	70014158
1	LED; Blue; 400mcd; T-1-3/4; 10deg; Radial; Panel; Clear;	70079132
1	MCU, 8-Bit, CMOS, 28-Pin, 8 KB Flash, 768 RAM, 22 I/O	70046277
1	VOLTAGE REGULATOR, TO-220; 5V	70013702
1	10 PIN HEADER CONN.	70054662
	ENCODER MODULE , ROP=11MM, 3CH, 500CPR	70134064
	Codewheel, 2 and 3 Ch for use with Optical Encoder Modules, 500 CPR	70030297

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The Inexpensive Dimmable LED Desk Lamp

With the cost of high-brightness LEDs coming down, Andrew Morris decided he wanted a dimmable LED desk lamp. Yet he found the ones on the market were very expensive, and few of them were dimmable. So he decided to use his engineering skills to build his own.

He installed his circuit into a fluorescent desk lamp he had picked up years ago at a flea market. He also discovered the LED driver circuit was dirt cheap and simple to assemble.



Allied Parts List

Amt	Part Description	Allied Part #
1	Capacitor; Aluminum Electrolytic; Cap 100uF 100V 20%; Radial 10X20 LS 5 mm	70187597
1	Capacitor; Al Electrolytic; 100uF; 160VDC; 20%; Radial; 12.5mmDia.; 25.0mmL; 200VDC	70111732
1	Capacitor; Ceramic; Cap 0.1 uF; Tol 10%; Vol-Rtg 50 VDC; Radial; BX	70186301
4	DIODE; 1 A (MAX.) @ 25C IF; 1.1 V (MAX.) @ 25C; 5 UADC (MAX.) @ 25C IR	70015972
3	Diode, Small Signal; 300 mA; 100 V (Min.); 1 V (Max.); 440 mW; 350 K/W; 100 V	70061726
1	Diode, Zener; 9.1 V; 500 mW; DO-35; 10; 3; 300; 20 mA Test Current	70061641
1	DIODE, TVS 400V 1500W 5% BI, AXIAL	70013813
1	Diode, Zener; 3.9 V; 500 mW; DO-35; 23; 10; 300; 20 mA Test Current	70061633
72	LED; 5MM WHITE LED	70052942
1	Transistor: 200mA 625mW NPN General-Purpose Amplifier, TO-92	70055539
1	MOSFET, Power; N-Ch; VDSS 500V; RDS(ON) 3 Ohms; ID 2.4A; TO-251AA; PD 2.5W; VGS +/-20V	70078969

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MEMS Mics Up Telescope

One of the problems with wildlife video photography is that you can get close to the animal with a telescopic video lens, but what about the sound? It's still far, far away.

Jerald Cogswell came up with a solution. He created a sonic telescope to grab sound

and bring it as close to the user as the visual image. Biologists can also use this MEMS microphone to listen to insects and burrowing animals. The microphone can take the sound and match it to the proximity of the image.

→ [Click here to see more of what you need including build instructions, a full parts list, and more photos](#)



Allied Parts List

Amt	Part Description	Allied Part #
1	Jack, Dual Stereo; 3.5mm; Shielded; Vertical PCB mount	70214219
1	Pot; Cnd PI; Rest 50 Kilohms; Panel; 1 Turn; Linear; Pwr-Rtg 0.5W; Shaft Dia 0.25In	70153803
4	Resistor; Metal Film; Res 100 Ohms; Pwr-Rtg 0.125 W; Tol 1%; Axial; Military	70200810
4	Resistor; Metal Film; Res 100 Ohms; Pwr-Rtg 0.125 W; Tol 1%; Axial; Military	70200659
4	Resistor; Metal Film; Res 100 Kilohms; Pwr-Rtg 0.125 W; Tol 1%; Axial; Military	70200898
1	Resistor; Metal Film; Res 220 Ohms; Pwr-Rtg 0.125 W; Tol 1%; Axial; Military	70205983
1	Capacitor; Polyester Film; Cap 2.2 uF; Tol10%; Vol-Rtg 310 VAC; Radial Suppression	70053945
1	Capacitor; Al Electrolytic; 220 uF; 20%; 16VDC; Radial; ESR 1.09 Ohms; 8x11mm	70186464
1	Capacitor; Al Electrolytic; 1 uF; 20%; 50 VDC; Radial; ESR 159.24 Ohms; 5x11mm	70186492
1	Capacitor Ceramic; Radial 68pF; 100V; 5%; COG	70195703

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We Love This Automated Mailbox

At the elementary school my children attend, students exchange Valentine's Day cards with one another, and they compete to decorate or build the most interesting mailboxes. My 11-year-old daughter came home one afternoon with an idea for her mailbox.



She asked me to help her design one so that a sensor would open the box automatically when someone walked by.

I started with a servo motor (and some mechanical linkages) taken from a broken remote controlled car, connected it to an Arduino UNO microcontroller development board, and connected a light sensor to one of the microcontroller's analog inputs. We wrote the code to monitor the sensor and track the average light level. The box would open only when the light level



changed suddenly. Then the box would close slowly over a period of time.

I used the Arduino software tools to create the firmware, and the Arduino board served as my MCU chip programmer. But I assembled the components, including the MCU chip, on a piece of perforated breadboard material, rather than using the Arduino UNO development board in the final project.

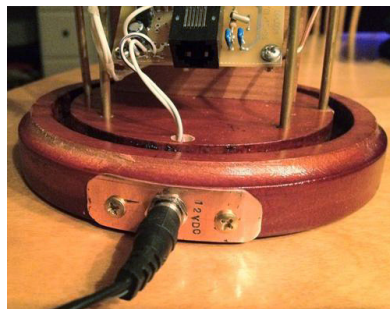
Allied Parts List

Amt	Part Description	Allied Part #
1	Atmel Microcontroller, AVR, 32k Flash, 2k SRAM	70123979
1	CdS Light Sensor, 100 kohm	70136770
2	5V Linear Regulator	70047430
2	0.01 uF Capacitor, Ceramic, 50 VDC	70195648
3	10 uF Capacitor, Aluminum Electrolytic, 35 VDC	70186121
2	15 pF Capacitor, Ceramic, 100V	70195689
1	10 kohm Resistor, Carbon Film, 5% (optional)	70022898
1	20 kohm Trimmer Potentiometer	70041146
1	1 Mohm Resistor, Carbon Film, 5% (optional)	70023761
1	Prototyping Board	70012507
1	Microprocessor Crystal, 16 MHz	70025614
1	Switch, Toggle, SPST	70131568
1	28-Pin Socket, DIP	70206331

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Inline Clock with Incandescent Display

Lots of clocks make use of Nixie Tube displays, but a much rarer type of display exists. It's an electromechanical incandescent display based on an array of tiny projectors, all sharing a ground glass rear projection plane.



The displays make use of a small piece of film and 12 lens systems to project whatever of 12 images you want to provide. In this case, the displays show the digits

zero through nine and lefthand and righthand decimal points.

In the 1960s, these displays would cost more than \$100 per digit. Since

the cost and size of these displays would have made building a clock with four or six digits prohibitive, I chose to make a single-digit display. In an added twist, I used a mechanical relay to sound out the hours and mark the quarter hours with variable-length clicks for quarter, half,



and three-quarters past the hour.

Mechanically, the clock was assembled under a craft store display dome. The esthetic is inspired by steampunk, with as much use of wood, copper, and brass as the budget allowed.

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Allied Parts List

Amt	Part Description	Allied Part #
2	Capacitor; Aluminum Electrolytic; Cap 10uF; Vol-Rtg 16V; Radial; nHg	70067785
1	Capacitor; Ceramic; Cap 0.1 uF; Tol 10%; Vol-Rtg 50 VDC; Radial; X7R; Bulk	70122993
2	Capacitor; Ceramic; Radial; 22pF; 5%Tolerance; 50V	70079242
1	DIODE, SWITCH 100V, SOD-27	70012012
1	MINIATURE POWER JACK; SOLDER LUGS; PLUGS760, 0.08" Diameter, S765	70214330
1	Modular Jack, RJ25, 6 Position, Right Angle PCB Mount, Cat 3, Black	70042934
1	Relay; Miniature; DPDT; 12VDC; 160 Ohm; 12A; 27.5 x 21.2 x 35.6 mm	70245545
1	PowerSupply; AC-DC; 12V@0.5A; 90-264VIn; WallPlug; Retail; Switching; 6W; GSSeries	70069887
12	SS T092 GP XSTR NPN 40V -LEAD FREE	70099744
13	Resistor; Carbon Film; Res 1 Kilohms; Pwr-Rtg 0.25 W; Tol 5%; Axial; Cer-Core	70022897
1	Resistor; Carbon Film; Res 47 Kilohms; Pwr-Rtg 0.25 W; Tol 5%; Axial; Cer-Core	70183356

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Speed Regulator for Rotary Tool

Andrew Morris had a problem with a small rotary tool built in China. The tool fit nicely in the hand and was useful for precision cutting, drilling, and

polishing. Yet for delicate work, the tool was in bad need of a speed regulator.

Andrew had developed an analog motor speed regulator back in the mid-1990s, but this time, he wanted the benefits of a digital regulator. The digital version was just as efficient, but it was less expensive to build and easier to assemble. The digital circuit also provided more torque.



→ [Click here to see more of what you need including build instructions, a full parts list, and more photos](#)



Allied Parts List

Amt	Part Description	Allied Part #
1	470uF, 16V electrolytic	70111686
2	1uF, 50V ceramic capacitor	70122939
2	.01uF, 50V 20% ceramic cap	70123005
2	1N5231 Zener diode	70061636
1	1N4148 diode	70061726
1	2 amp SCHOTTKY diode	70078698
1	Red 5mm LED	70079147
1	2N3906 PNP transistor	70055540
1	IRLU024NPBF MOSFET	70017115
1	2N3904 NPN transistor	70055539
1	680 ohm, 1/4 watt resistor	70023904
1	4.7K, 1/4 watt 5% resistor	70183356
3	10K, 1/4 watt 5% resistor	70022898
1	100K linear pot	70153811
1	Knob	70097794
1	100K, 1/4 watt 5% resistor	70022899
2	270 ohm, 1/4 watt resistor	70022907
1	22K, 1/4 watt 5% resistor	70022904
1	SPDT toggle switch	70155934

→ [Click here to see the full list](#)

Super Rugged Computer- Controlled Tyco Car

Want to give your Tyco car some extra oomph and control? Matthew Katzenstein took an electrical car and added a range of control based on robotics.

By adding an Arduino to the car, Matthew was able to bring more control to the car and increase its speed. Though his initial car is run from a laptop, there are Bluetooth options that offer control of the car from a smartphone. The car is also ruggedized, so it can take drops and crashes and still perform well.



Allied Parts List

Amt	Part Description	Allied Part #
1	CABLE, FLAT RIBBON, 10 CONDUCTOR, 28AWG, STRANDED, PVC, 300V, COLOR CODED CLEAR	70004149
1	Header; Breakaway; 0.100 in.; PC Board; Single; 40; 0.025 in.; 0.12 in.; 3 A	70042452

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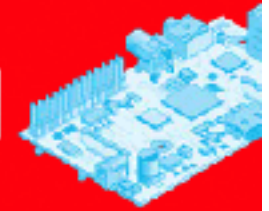
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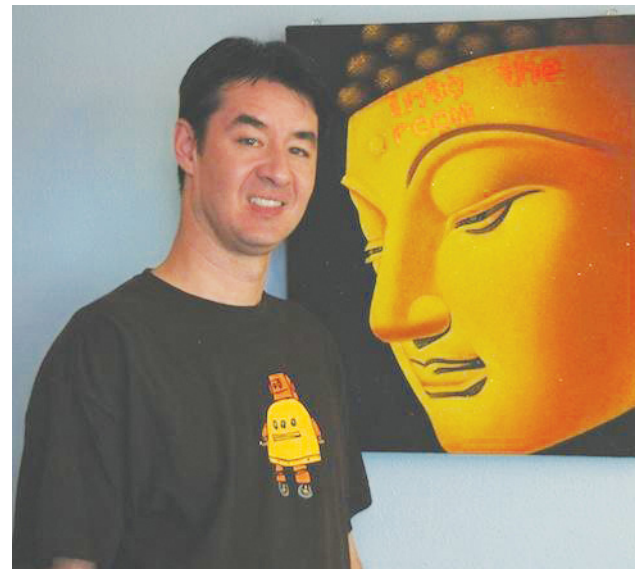
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Modify Your Wall Art

Gadget Freak Al Linke has created a gadget that modifies wall art using LED matrix panels behind the art.

Al uses an Arduino and an Android smartphone as the major tools to add his own images to the wall art. The gadget will work with any type of painting. The images or words that show up through the LED matrix panel can be programmed in via the smartphone.



Allied Parts List

Amt	Part Description	Allied Part #
1	IC, Dev Kit; Arduino, Uno32; 128KB; Boards-PIC32	70048429
1	Power Source, Switching, 100-240VAC IN, 5VDC, 600MA, 3W OUT, PLUG POLARITY NEG I	70213153
1	Pot; Cnd PI; Rest 10 Kilohms; PCB; Linear; Pwr-Rtg 0.25W; Shaft Dia 0.125In	70153699

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Super LED Flashlight Hits 3,000 Lumens



Fifteen-year-old Gadget Freak John Duffy has put together a powerful LED flashlight. He calls the LED a major advance over Edison's incandescent lighting. "Nowadays we have LEDs that are significantly more powerful and efficient, and they run on low-voltage DC." Duffy's super LED flashlight runs at almost 30W and 3,000 lumens. By comparison, bright xenon car headlights reach about 1,000 lumens. He says you have to be careful building and using this gadget, because it is powerful enough to blind someone if used up close. He used welding glasses while constructing the flashlight.



Allied Parts List

Amt	Part Description	Allied Part #
1	Battery, Lead Acid, 12V, 7.2A, .250 Termination	70141087
1	Switch, Rocker, Power, DPST, On/Off, Black, Imprinted O/-	70207352
4	Resistor; Wirewound; Res 1 Ohms; Pwr-Rtg 20 W; Tol 5%; Axial; Silicone	70201879
1	Battery, Lithium, Size: 1/2 AA, Terminals: Axial Pin, 1.2 Ah, 3.6V	70102840

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A close-up photograph of a person's hand holding a glowing lightbulb. The lightbulb is the central focus, emitting a bright white light that creates a soft glow around it. The hand is positioned in the lower-left quadrant of the frame, with fingers gently cradling the base of the bulb. The background is a blurred, dark blue-grey color, suggesting an indoor setting with soft lighting. The overall mood is one of inspiration and innovation.

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Moving the Keyboard Onto Your Fingers

Can you improve on the standard QWERTY keyboard? Wayne Rasanen got it into his head to do just that. He created a device to replace QWERTY. He also wanted to reduce hand movement and end the days of flying fingers. So he invented the “chord” keyboard that uses more than one finger to produce letters in a way that is similar to how you play several notes to produce a chord in music. Wayne’s design is versatile, allowing the 10 wires and ground to connect to a variety of switches, from a video game controller to a one-handed version.



Allied Parts List

Amt	Part Description	Allied Part #
1	Mini USB Connector	70099067
1	AVX Capacitor CAP 2.2 uF	70001031
1	AVX Capacitor CAP 0.1 uF	70001134
2	Capacitor CAP 15 pF	70079424
1	AVX Capacitor 15 pF	70195689
2	TE Resistor	70063212
1	Microchip Microcontroller	70045666

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Gadget Remembers What You Need to Do



George Tempesta had a problem. He couldn't remember scheduled family events or even when to take out the trash. His wife suggested he come up with a device to remind everyone in the family when a chore needed to be done or an event needed to be attended.

George came up with a motion-triggered calendar. The ChronoDot keeps track of time and dates for chores and events. A motion sensor triggers a response when someone walks by the gadget. A WAV file message is displayed to nag the family member about an imminent chore or event.



Allied Parts List

Amt	Part Description	Allied Part #
1	Ohm resistor carbon film	70022902
1	10K potentiometer	70063995
1	50MM speaker	70115854
1	IDE cable	70114104
1	Arduino Uno	70048429
1	20x4 LCD	70157090
1	Header strip	70114969

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Rocket Records Its Own Flight

Doug Conner attended Maker Faire in San Mateo, Calif., and was impressed by a compressed-air rocket demonstration. These are not actual rockets—they're projectiles—but he was sufficiently inspired to go home and make his own PVC-based rocket and launcher. He started sending rockets 200 to 300 feet high from his backyard. Then a brainstorm hit. What if you could watch the flight from the rocket's point of view?

Conner decided to strap a video camera on to the rocket. This required calculations to accommodate the additional weight of the camera. He increased the body diameter and length of the rocket and sent it up with a live camera shot of the trip.



Allied Parts List

Amt	Part Description	Allied Part #
2	Battery holder 4AA	70182754
8	Battery AA alkaline	70196987
2	Battery strap	70181696
1	Momentary switch	70217150

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