

Chameleon Lamp Workshop

INTRODUCTION

In this workshop, Fablab Saigon will show you how to make a lamp that changes colours upon detecting a hand swipe. You will learn to program the lamp's LEDs to shine your favourite colours. To switch off the lamp on or off, keep your hand just above the sensors for a few seconds.

You need to know:

1. Basic knowledge of electronic components
2. How to solder them to printed circuit board (PCB)

We will show you how to program a microcontroller to sense your hand movement and to build a lamp shade from scrapbooking paper.

A demo can be seen at: <https://youtu.be/w0-yVBAA4qA>

Github: <https://github.com/papcodientu/Chameleon-Lamp>

PROGRAM

1. Introduction	5 minutes
2. Make a lampshade from paper	10 minutes
3. Solder LEDs to PCB	10 minutes
4. Programme & debug	15 minutes
5. Testing	10 minutes
6. Q&A	10 minutes
TOTAL	60 minutes

MATERIALS OVERVIEW



BILL OF MATERIALS

No	Item	Qty	Sample Link	Note
1	12V 2A Adapter	1	http://twen.rs-online.com/web/p/plug-in-power-supply/2243928/	
2	Atmega8U	1	http://twen.rs-online.com/web/p/microcontrollers/6281788/	
3	DIP 28 pins	1	http://twen.rs-online.com/web/p/dil-sockets/6742450/	
4	SMD 5050 LED Strip	1	http://twen.rs-online.com/web/p/led-flexible-arrays/7736923/	0.2m strip/person
5	Resistor 220 1/4W	1	http://twen.rs-online.com/web/p/through-hole-fixed-resistors/7077612/	
6	Resistor 1K 1/4W	3	http://twen.rs-online.com/web/p/through-hole-fixed-resistors/7077666/	
7	Resistor 10K 1/4W	1	http://twen.rs-online.com/web/p/through-hole-fixed-resistors/7077745/	
8	Resistor 100K 1/4W	3	http://twen.rs-online.com/web/p/through-hole-fixed-resistors/7077824/	
9	Electrolytic Capacitor 10uF 25V	2	http://twen.rs-online.com/web/p/aluminium-capacitors/4491006/	
10	Electrolytic Capacitor 100uF 25V	1	http://twen.rs-online.com/web/p/aluminium-capacitors/3654127/	
11	Electrolytic Capacitor 470uF 25V	1	http://twen.rs-online.com/web/p/aluminium-capacitors/3150574/	
12	Ceramic Capacitor 104	1	http://twen.rs-online.com/web/p/ceramic-multilayer-capacitors/5381310/	
13	Small button switch 2-pin	1	http://twen.rs-online.com/web/p/tactile-switches/7182415/	
14	Male Header 1x40	1	http://twen.rs-online.com/web/p/pcb-headers/6705111/	
15	Voltage Regulator L78M05	1	http://twen.rs-online.com/web/p/linear-voltage-regulators/5166234/	
16	DC Power Connector 2.1mm	1	http://twen.rs-online.com/web/p/dc-power-sockets/0448382/	

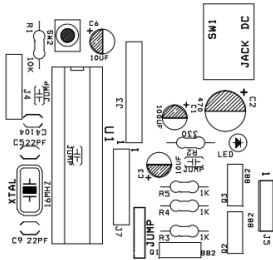
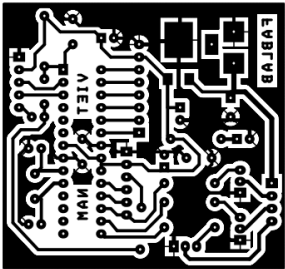
17	Power Transistor 2SD882	3	http://twen.rs-online.com/web/p/bipolar-transistors/6868045/	
18	3mm Infrared Emitter	3	http://twen.rs-online.com/web/p/ir-leds/6655476/	
19	3mm Infrared Receiver	3	http://twen.rs-online.com/web/p/ir-leds/6655476/	
20	Wire Bus 4-Pin Female + 2 PCB Header Length 40cm	1	http://www.tme.vn/Product.aspx?id=1177#page=pro_info	
21	Wire Bus 5-Pin Female + 2 PCB Header, Length 40cm	1	http://www.tme.vn/Product.aspx?id=1178#page=pro_info	
22	Printed Circuit Board	2	1/ MCU board 2/ Sensor board	
23	Arts Paper 47cmx2cm	1	http://www.fotobella.com/Bo_Bunny_Autumn_Song_12x12_Scrapbooking_Paper_Bu_p/bo-autumn-pb2.htm	
24	PVC Foam Sheets, 3mm thick 12cmx12cm	1	http://www.foamboardsource.com/sintra-pvc-foam--sintra-pvc-board--sintra-pvc-3mm.html	
25	Super Glue 502	1	http://www.tuyetmaibn.com/keo-502-3954751.html	
26	16MHZ Crystal	1	http://twen.rs-online.com/web/p/crystal-units/6938819/	
27	USB to Serial UART	1	http://dientuachau.com/page/index.php?_m=mod_product&_a=view&p_id=890	

TOOLS REQUIRED

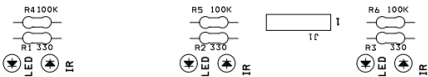
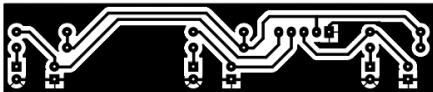
Soldering iron, Scissors, Hot-glue gun, Multimeter for troubleshooting

PCB


MCU PCB



Sensor PCB



Making a lampshape from paper

	<ol style="list-style-type: none">1. Cut the big paper to rectangular shape with size of 3cm x 47cm (Height x Width). You need at least 6 pieces.2. Use paper knife to cut 5 vertical narrow line 9cm apart.3. Use super glue 502 or glue gun to stick 2 heads of the paper together.4. Connect all those 6 pieces together using glue, like the one on the left.
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Hardware

Checkout PCB design at Github <https://github.com/papcodientu/Chameleon-Lamp>
Print out your boards and solder components to the boards.

Connect sensor board and LED strip to mainboard, as shown in below screenshot.

Software

If your IC Atmega8 hasn't had a bootloader, please burn it using either SPI adapter or Arduino board.

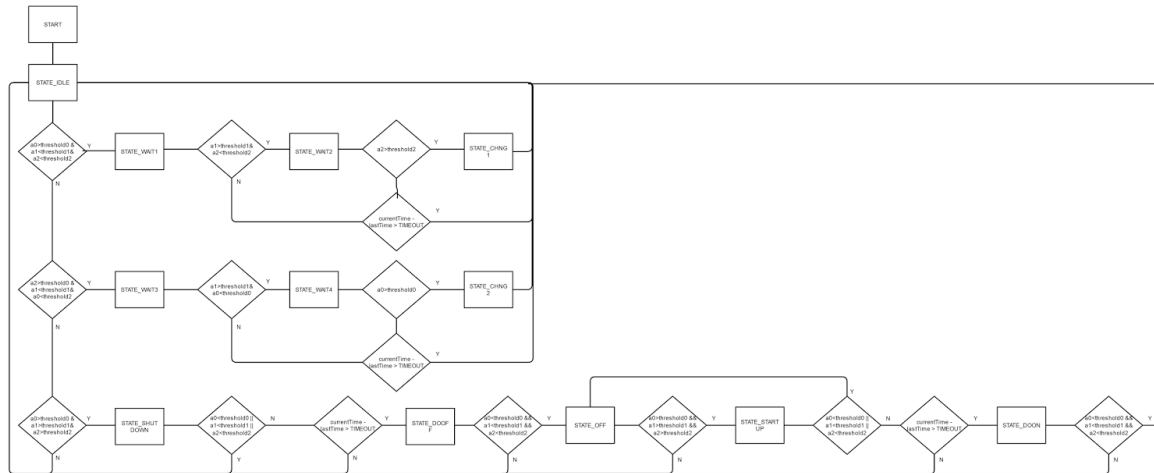
See below instruction on burning bootloader to Atmega IC using Arduino board

<http://www.arduino.cc/en/Tutorial/ArduinoToBreadboard>

You can also program the chip using SPI protocol or using UART adapter (Tx, Rx).

Software is located at <https://github.com/papcodientu/Chameleon-Lamp>

Flowchart



Commands

Command	Description	Example
getcolor	Display all 9 HEX colors in EEPROM	
setcolor n r g b	Set n th color to new color	setcolor 0 255 0 0 change first color to red
color r g b	Set current color to new color	color 0 255 0 change current color to green
ncolor	Set number of color in EEPROM	ncolor 5 set number of colors to 5
save	save color change to EEPROM	
Note: color change will not be saved until send 'save' command		

It's testing time!!!

Bluetooth

You can try to connect bluetooth module to the mainboard and send command wirelessly using common bluetooth terminal on Google Play, keywords: Bluetooth Terminal

Testing

Swipe your hand in front of IR sensors to change the color. If it doesn't work, please check Troubleshooting part.

Troubleshooting

1. IR sensor doesn't work
2. Changing color doesn't work
3. Bluetooth doesn't work