

Light Theremin

by [TXTCLA55](#) on June 2, 2009

Table of Contents

License: Attribution Non-commercial Share Alike (by-nc-sa)	2
Intro: Light Theremin	2
step 1: Materials	2
step 2: The Circuit	3
step 3: The Case	3
step 4: The Photo Resistor Array	4
step 5: "Stuffing" The Box	5
step 6: Using The L.T.	5
Related Instructables	6
Advertisements	6
Comments	6

Intro: Light Theremin

The Light Theremin is a simple to build instrument that uses light and shadows to create sound. The theremin circuit used normally for these instruments are quite complex, this one however is as simple as a 555 Timer IC and some basic components from your scrap box. so without any more delay... Lets get started!

Don't forget to visit my site:

<http://www.wix.com/SimpleCircuits/Simple-Circuits>



step 1: Materials

Your materials list is really quite short. You will need the following parts... Please note that the quantity of each part is in the [].

- 555 Timer IC [1]
- 100uf Electrolytic Capacitor [1]
- 1.0uf Disk Capacitor (Marked "104") [2]
- Photo Resistors [4]
- 1K Resistor (colours: Brown, Black, Red, Gold) [1]
- a Switch [1]
- 9v battery [1]
- A speaker [1]
- A IC proto board to keep it all nice and tidy [1]
- Some machine screws and nuts to hold down the board (optional)

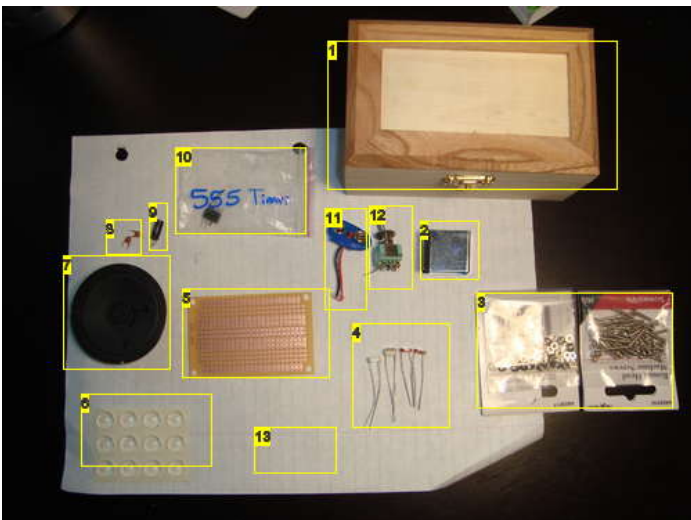


Image Notes

1. box/case
2. 9 volt battery holder clip (optional)
3. Machine screws and nuts to hold the proto board in the case; you could also use glue.
4. Photo Resistors. (light sensors)
5. IC Proto board.
6. little sticky feet for under the case, (optional). These guys just keep the case from sliding around when its on a smooth surface.

7. Speaker. you can use one from 4 ohm-16 ohm range.
8. 1.0uf capacitors marked "104." These can be found in old radios if you cant find them in stores.
9. 100uf Capacitor.
10. 555 Timer IC.
11. 9 volt battery clip
12. switch
13. 1k resistor was added later, not shown here.

step 2: The Circuit

Following the schematic provided below. solder all components to the correct pins on the timer or in the correct holes on the proto board. The switch and four photo resistors will need to be mounted outside the box through hole's; so I suggest you solder leads going to and from it. The same rule applies for the battery pack, only you will or might want to secure this with some hot glue or super glue just to keep it in place. **Do not solder the photo resistors yet they will be covered in a different step!**

R1: 1K Resistor
 R2,R3,R4,R5: Photo Resistors
 C3: 100uf Capacitor
 C1,C2: 1.0uf Capacitors
 Spk1: Speaker
 555 Timer: 555 Timer
 Sw1: Switch

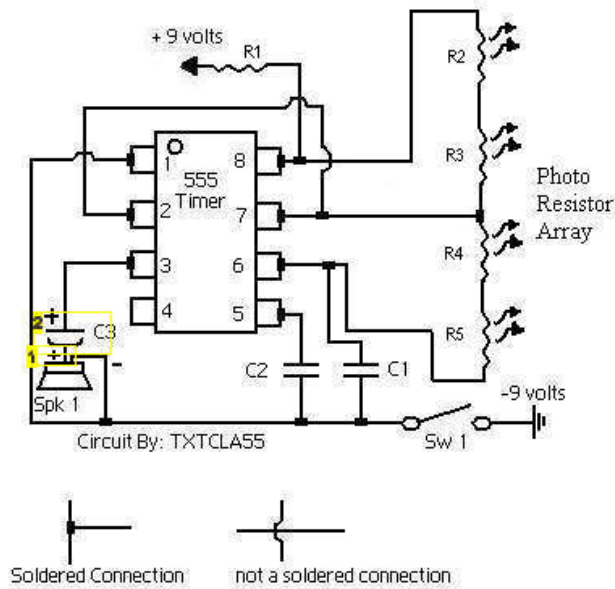


Image Notes

1. This positive sign is for the speaker. Not the capacitor.
2. Please ignore the fact I drew the symbol wrong, the polarity is what matters and that (the polarity) is correct.

step 3: The Case

You will of course need a box or container to hold the circuit. I went to Dollarama and picked up a small box from the craft asile. The boxes them selves are made of pine and thus can be painted or cut very easily. Be sure to find a box that will house you're circuit, but still offer lots of space. I gave my box a coat of "coffee" colored stain to make it look old; the color alone is totality up to you. After the paint or stain has dried drill four holes for the photo resistors, one for the switch, and a 1/4" hole on the side with the speaker. For the switch and photo resistors the hole size will vary by the size of your components. Ta-Da! You're box is complete! now all thats left to do is to stuff it with the circuit.

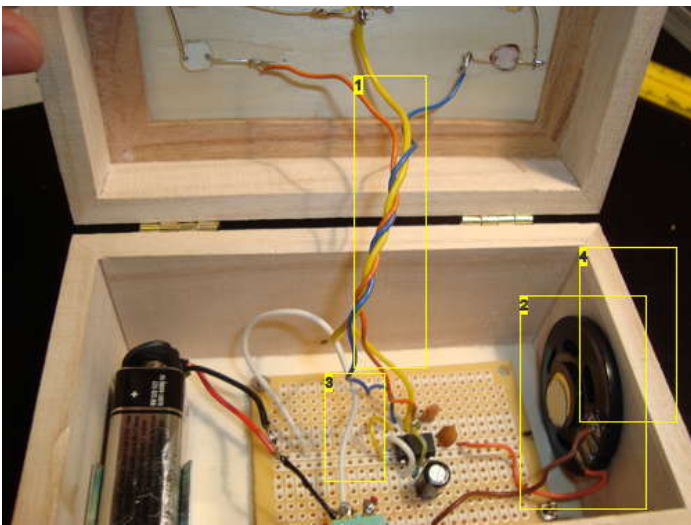


Image Notes

1. Long wires here is a must!
2. speaker is super glued to the side.
3. 1K resistor was added here on this white wire later.
4. On the outside of the box drill a 1/4" hole so the sound will leave the box.

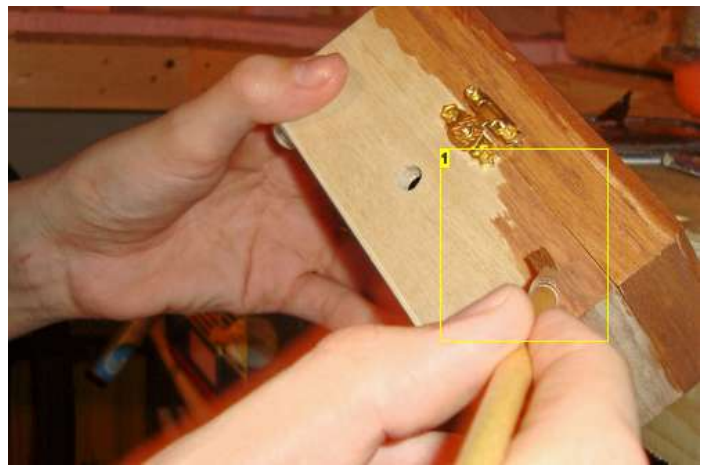


Image Notes

1. Staining the box is always a nice touch. Just be sure to do this BEFORE you install the witch and photo resistors.

step 4: The Photo Resistor Array

The design is totally up to you. I just put all four in separate corners. To do so you will have to use a drill bit that comes close to the size of your photo resistors. Then with the holes cut, place them in, and super glue them. Now solder the photo resistors as shown in the picture below. Now attach three wires, one to the left, one on the center two (the two photo resistor leads **do** get soldered together), and one to the right. Then lastly solder the other end of the wires to the correct pins as shown on the schematic.

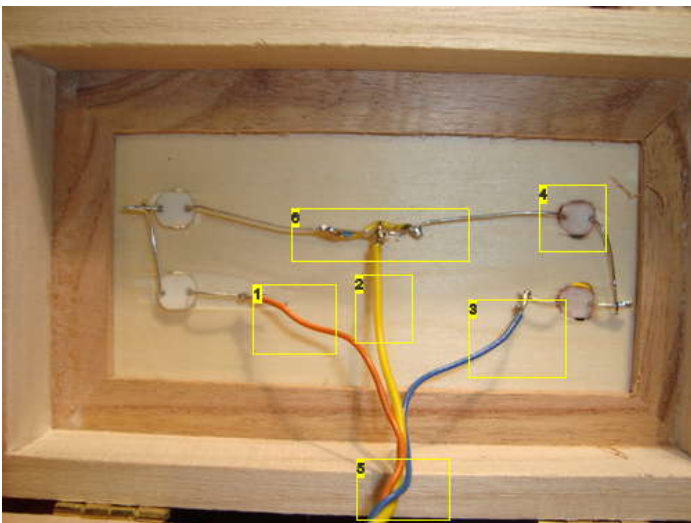


Image Notes

1. To pin 6
2. To pin 7
3. To pin 8
4. Super glue these guys in place.
5. Twisting the wires will help keep them in place and also keep the inside of the box neat and tidy.
6. These two are soldered together and then go to pin 7.

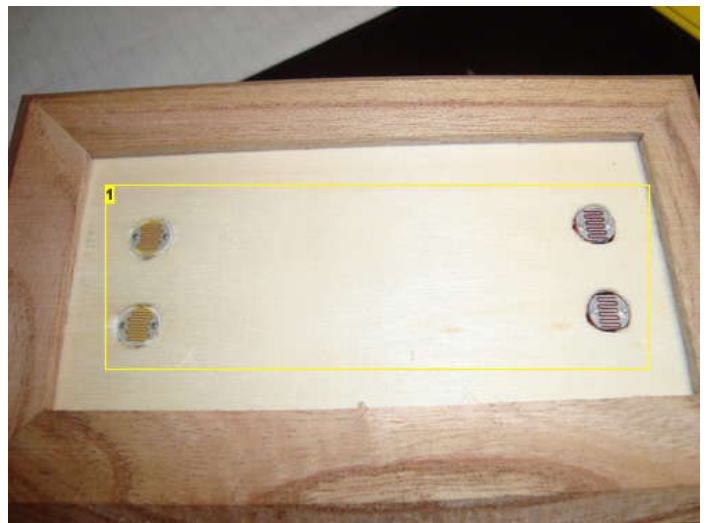


Image Notes

1. The complete photo resistor array.

step 5: "Stuffing" The Box

Simply take your completed circuit and all other components attached and drop it in. Then armed with super glue, secure any loose items. Where you drilled the 1/4" hole on the side earlier, center the speaker over it and super glue it in place. Then Mount the completed circuit board in a spot where it can sit comfortably and allow the box to open and close fully. Once you found that spot use some hot glue or screws to secure it, repeat this for the battery pack as well. Close the box and flip the switch...

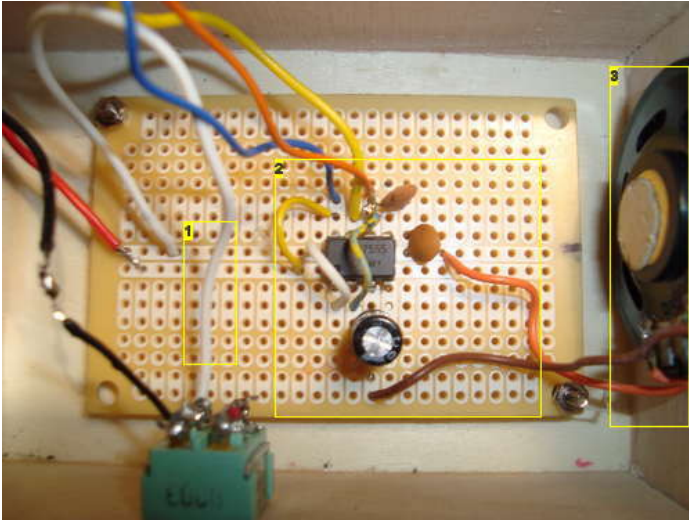


Image Notes

1. 1k resistor was added here on this white wire.
2. try to keep it all nice and tidy.
3. I later replaced my 4 ohm speaker with a smaller 1 inch dia speaker because the old one took up too much space.

step 6: Using The L.T.

As you can see the sound the circuit makes will change when you wave your hand over the photo resistors or change the lighting in the room. Try different motions to produce different sounds, I observed that if you shake one hand really fast over one or two of the photo resistors the L.T. will give to a erie shaky sound. Or if you more your hand like a wave over one or all four photo resistors you'll get a wavy sound (no kidding!). Most of the sounds it produces sound like they are from a cheesy horror flick from the 60's or 70's! The total amount of sounds you can produce is only limited by your hands and lighting! Now sit down (well standing might be better) and enjoy!

You can see a HD video of the L.T. at this link:

<http://www.flickr.com/photos/14462918@N03/3502046867/>

Or watch the youtube video here...





Image Notes

1. Complete! Ready for paint or beat boxing.

Related Instructables



1, 2, 3, Metal Detector by TXTCLA55



How To Build An Optical Theremin by sacred



Multimodal Music Stand by DanOverholt



Make a Theremin Enclosure Out of an Old Tea Tin by Brennan



Arduino Photocell Theremin Synth (glitchamin) by gatesphere



A More Annoying Noise Maker (Version 1.0) by TXTCLA55

Comments

[36 comments](#) [Add Comment](#)



luudvig says:

Thanks, I built it and it works great!!

Apr 7, 2010. 3:46 AM [REPLY](#)



mgrc says:

Mine won't work...I put in on a breadboard and re-checked everything twice. Does it matter if 2 of the photoristors are slightly different sizes? Are they polarized (+, -). I also tried what datenkrieger said and removed C2 and put in between pins 1 and 2, but still nothing. I'm using an adjustable power supply set to 9v, so it's not that. my 555 timer said LM 555CN. I'm using a 100uf cap and two caps marked '104', just like you said. The speaker is marked at 8 ohms and it makes crackly sounds when I hook it straight up to a AA battery, so that works. I'll ask my dad, but do you have any ideas?

Mar 7, 2010. 2:42 PM [REPLY](#)



mgrc says:

Nevermind, I got it. It turned out I had a bad spot on the breadboard, so I just moved everything over a bit, and still using Datenkrieger's idea, it works. I might need a better speaker because it really sucks with low pitch, it just makes ticking noise. Has anyone wired it up so a pair of photoresistors changes the pitch and the other pair changes the volume? It would be like a radio-wave theremin. Good instructable BTW. Thanks

Mar 7, 2010. 3:40 PM [REPLY](#)



TXTCLA55 says:

Sorry to hear you have been having some problems, but I am also glad to hear that you managed to fix the issues as well. I think the problem some of you may be having with the capacitors is that some 555 timers may require different connections (probably due the manufactures design) in any case this should happen to any one in the future I would suggest trying this solution first before commenting. As for your issue with the sound (pitch and tone) the photo resistors should work like that already if not try using a fresh battery and the volume should improve. Hope this helps!

Mar 8, 2010. 5:46 AM [REPLY](#)



raisin_brain747 says:

where can we get all the materials?

Feb 27, 2010. 10:40 AM [REPLY](#)



TXTCLA55 says:

Feb 27, 2010. 6:31 PM [REPLY](#)

You can get most of the materials from radio shack or the source as it has come to be known. Or you can get the components from online sellers like solarbotics.com thats probably the cheaper option, however if you still cant find some of the components just rip open a old radio and your more than likely to find what you need sooner or later. Hope this helps you in your project(s) let me know if you are still having trouble location the components.



GreenD says:

Feb 19, 2010. 1:36 PM [REPLY](#)

I'm assuming light allows for current to pass through the photoresistors?

I wonder if there is a way to make the sound more pleasing...?



TXTCLA55 says:

Feb 22, 2010. 7:09 PM [REPLY](#)

I don't know about that, I prefer the electronic whine of the device so I never really went much further to improve it; but if you can figure something out send me a message!



raisin_brain747 says:

Feb 22, 2010. 5:36 PM [REPLY](#)

Would it be possible to add an oscillator and a pot. to control said osc.



TXTCLA55 says:

Feb 22, 2010. 7:07 PM [REPLY](#)

Yes. My first model worked like that, but I wanted to add something special, so instead I used photo resistors to do the job.



kappish028 says:

Feb 1, 2010. 3:48 AM [REPLY](#)

oh i see.hehehe!!! thanks your the best! before i forgot can i see the back of this light theremin that you made if that is possible but if not its ok. last question can i bend this theremin?



TXTCLA55 says:

Feb 3, 2010. 3:21 PM [REPLY](#)

There's not much to the back of it...just the wood the box is made of and the hinges for the lid. And you may do what ever you please with this circuit expect mass produce it and sell it on a consumer market! Hope that answers your questions.



MottGia1 says:

Nov 24, 2009. 11:47 AM [REPLY](#)

Hey, you said we needed 2 "0.1uf Disk Cpacitor" but on both the next images you say we need 1.0uf capacitors, which ones do we really need then?



TXTCLA55 says:

Nov 24, 2009. 12:00 PM [REPLY](#)

Opps my mistake. Its a 1.0uf capacitor. they should have a "104" marked on the side. Sorry for the confusion, its corrected now.



MottGia1 says:

Jan 27, 2010. 12:28 AM [REPLY](#)

Thank you



edspegeddd says:

Jan 26, 2010. 10:55 PM [REPLY](#)

i'm confused about the capacitors as well. I bought 0.1uf disc capacitors because they read "104Z" on the side, and look exactly like the ones in your picture. the electronics store did not know of any 1.0uf capacitor with '104' marking... just the 0.1uf. anyway, my circuit works it's just the volume output is very very low. you can barely hear it. any ideas?



TXTCLA55 says:

Feb 3, 2010. 3:34 PM [REPLY](#)

Try using a new battery I had this problem to. The capacitors you are using could also be the ones to blame. If you cannot hear it with the new 9V battery I would suggest finding new capacitors; try opening a radio there will be lots in side. Hope this helps!



kappish028 says:

Jan 15, 2010. 12:42 AM [REPLY](#)

can i use any 555 timer? what kind of 555 timer did you use? sorry i dont know anything about electronics kindly help me thanks.i saw that there are LM555 and NC or NE 555 timers what is the differences in those timers?thanks!



TXTCLA55 says:

Jan 16, 2010. 12:51 PM [REPLY](#)

Nope, there is no difference in the timers you have/saw. The letters simple stand for the company's model, not the type. All of those you listed above will work.



luudvig says:

Dec 16, 2009. 7:15 AM [REPLY](#)

Does it matter how many volts the capacitor is on?



TXTCLA55 says:

Dec 16, 2009. 3:58 PM [REPLY](#)

yes, in this circuit it does. Capacitors are essentially store houses, imagine it slowly filling up and then all at once emptying out. This is how capacitors work, they slowly build up electricity then all at once, lets it all go. They are normally used to stabilize the current in a circuit. In short you should probably use the ones I did or find something really close to it. Hope this helps!



blindruz says:

Aug 9, 2009. 5:04 AM [REPLY](#)

hey guyz comment this simply like wat is did



Laogedritt says:

Jul 24, 2009. 11:36 PM [REPLY](#)

Hello, This looks like an interesting project, thanks for posting. I have a few questions regarding the light theremin: Does it allow controlling the amplitude of the output with one control and frequency with another (as with the real theremin)? From what I understand of the IC and this circuit, it doesn't seem so... If not, do I understand the 555's specs correctly in that the amplitude of the signal is proportional to the input voltage, and so I could implement this feature by varying the voltage at the +V pin? What is the max voltage this puts out? Is there any risk of damaging drivers with an impedance in the 8-16 ohm range by hooking them up directly? (Or, in other words: what considerations should I make regarding the speakers - impedance, etc. - or the output to prevent damaging them?) Thanks, Laogedritt



TXTCLA55 says:

Jul 27, 2009. 3:18 PM [REPLY](#)

Hi! If I am reading this correctly these answers should help you out...

Does it allow controlling the amplitude? I am not sure what you mean here but, I think what you could be getting at is something to do with volume control. The answer is yes; you can put some sort of device or component to control the devices volume. If that doesn't help send me a message and I'll try to help more.

what is the max voltage this puts out?" Any attachable speakers ranging from as little as 4ohms to 16ohms can be used (at least thats what I have tested) anything more might loose the sound effects the Light Theremin produces.

I hope I was helpful and was able to answer both questions fully. any other questions you may have can be sent to mer via instructables mail.



Laogedritt says:

Jul 27, 2009. 5:17 PM [REPLY](#)

Hello, Yes, essentially, volume - to me, a given instrument isn't musical if it's lacking the ability of expression, a lot of which is done through dynamics. I was hoping it implemented or I could implement something similar to the left antenna using light-sensitive components. (I was looking at the circuit itself, but I stupidly neglected putting something at the output stage... I can pretty trivially add a voltage divider there.) All right, thanks. I was mostly concerned with damaging them. I plan on putting an output jack on it and playing around with the sound using a few (home-made) analog effects/filters, so I'd rather be sure. I'll probably check the output and see if I have cheapie speakers lying around just in case... Thanks for the reply. Laogedritt



TXTCLA55 says:

Jul 28, 2009. 7:45 AM [REPLY](#)

Hey no problem! let me know how things turn out! TXTCLA55



amplex says:

Jun 30, 2009. 6:52 PM [REPLY](#)

very cool!! ive been wanting to make one of these with an antenna for awhile, picked up an RC antenna from radioshack awhile ago, how much different would that be?



TXTCLA55 says:

Jun 30, 2009. 8:48 PM [REPLY](#)

Very different. You see the "regular" theremins use radio waves or IR signals to create sounds, and also use more complicated circuits. Mine however is pretty much a cheap, easy alternative to the regular theremins. Hope this helps you answer your question.



amplex says:

Jun 30, 2009. 9:12 PM [REPLY](#)

i understand that you are using resistances to determine the pitch of the 555 osc with the LDRs, not radio waves or IR, but im thinking that you could easily adapt it to the antenna type by having one pin on the 555 be the top of the antenna, and the other pin be the bottom (so the antenna acts as a variable resistor depending on where you put your hand on it and how much contact you make).. not exactly the original theramin idea (of not touching it to play it) but would this work? kind of like how a ribbon controller works?



TXTCLA55 says:

Jul 1, 2009. 8:43 AM [REPLY](#)

Hmm...it might work. You could always give it a try. Let me know how it works! :P



Gamernotnerd says:

Jun 23, 2009. 7:06 PM [REPLY](#)

Sounds like a squirrel getting raped... On some sort of squeaky surface.



TXTCLA55 says:

Jun 24, 2009. 7:04 AM [REPLY](#)

LOL. Thanks (I think).



Gamernotnerd says:
It was a good idea, lol.

Jun 26, 2009. 6:22 PM [REPLY](#)



datenkrieger says:

I tested it on a breadboard, didn't work until i removed C2 and put it between pins 1 and 2. But then it worked like you described. Nice casing btw.

Jun 14, 2009. 2:54 PM [REPLY](#)



TXTCLA55 says:

Hmm that is strange. I went thorough all my steps and looked at the project IC board, all was well on mine...oh well. I guess the imporant thing is that it worked.

Jun 14, 2009. 3:36 PM [REPLY](#)



mspark400 says:

Great job an great project! Ill bet you a shiny nickel that this 'ible will be featured/popular! cheers, mspark400

Jun 13, 2009. 3:01 PM [REPLY](#)
