

Theremin

Due 4/7/22 (4th period) 4/8/22 (5th period)

Today we're going to make noises with the Arduino by creating a simple Theremin circuit. A Theremin is a device that makes strange sounds electronically. Ours will use the LDR to make different tones.

Part 1: Together

With your partner build two circuits on your breadboard:

1) Go from the Arduino 5V pin to one side of the LDR, to a 10K ohm resistor, then to GND. Add a wire that goes from the resistor side of the LDR to pin A0 on the Arduino. If this isn't enough info for you, open up the LDR assignment from last class and build that circuit, because that's what we're doing here.

2) Get a long wire and connect Arduino pin 9 to a blank area of the breadboard, then connect a 270 ohm resistor, then connect that to one side of the speaker. The speaker's wires should be in different rows of the breadboard (like 10 and 13, not both on 10). Finally, connect a wire from the other side of the speaker back to GND. Remember, to work, a circuit must make a loop. In this case, we're going from Arduino pin 9 to a resistor, to a speaker, back to GND on the Arduino in a loop. Make sure the speaker's pins are not on the same row.

The program: open "theremin_starter.ino" that I emailed to you. Do a save as, name it with your name and "theremin" in the title. Put your name in a comment at the top.

This program uses one new command we haven't used before: `tone()`. Open the Arduino Reference page from the Help menu and look up `tone` to get a feel for what it will do.

Load your program, and you should immediately get a tone coming out of the speaker when the Arduino is connected to your computer. The tone should change when you change the light hitting the LDR. If this isn't happening, open the serial monitor to make sure that the LDR values are being read from pin A0 properly (they should go up and down as you uncover and cover your LDR...)

Have fun with the sounds, see how it works. This is called a Theremin, basically an obnoxious sound generator!

When you have this working, get me to check you and your partner off. This gives you 4 of today's 10 possible points.

Part 2 involves each person writing their own program that takes the process further.

Part 2:

For part 2 each person must write their own program that goes further. You will share the one circuit, and trade it back and forth by plugging the Arduino into the correct computer when you want to test your own program.

For part 2, you choose what you are going to do per the notes below. You must do something substantially different from your partner or whoever you are sitting next to on both sides.

Ways to go further include, but are not limited to:

- Add code that changes the tone playing from the speakers even when you are not covering the LDR (you could use a for loop for example); make the LDR still have an effect, perhaps on the speed or timing between notes.
- Make your program play a short snippet of a recognizable song. For this, it might help to know that in our traditional music scale notes go up by 1.059463, which is the 12th root of 2. Or a much more helpful thing is to use a table of note values such as this one: <http://www.phy.mtu.edu/~suits/notefreqs.html> if you know the notes you're trying to play...
- Use a series of for loops to make a siren or alarm sound sequence.
- If you have another great idea, run it by me.

Do not download someone else's program and try to convince me that you wrote it. I want YOU to write a program, not see if you can copy someone else's song off the Internet, as much fun as it would be to have your Arduino play the theme from Star Wars. (Please, program it to play that song if you want, but do it yourself, don't cheat by using someone else's work.)

Get me to check you off when you are done. Obviously you and your partner will need to share the circuit to test and debug your programs. Just switch the USB cable back and forth as necessary. When you plug the Arduino into your computer it will start running the last program that was uploaded to it; so after plugging it in don't forget to upload your program so that you are listening to YOUR creation instead of your partner's.

If you need to make the Arduino quiet to concentrate, just unplug the wire from pin 9 on the Arduino, or unplug the USB cable. It's best to leave the speaker plugged in to the breadboard because the speaker's leads are fragile. Please be careful with the speakers, they are easy to break, thanks.

If you finish with more than 30 minutes to go, you have a choice: either work on homework for another class or add more to your Arduino project.