



The Theremin project (Level 1)

Worksheet for students

Team:.....

Aim: Creating a one-hand operated Theremin

Search for information online and briefly describe what a Theremin is. Write your answer below.

Imagine a Theremin that is controlled with one hand. Sketch your Theremin and list the crafting material that you may need.

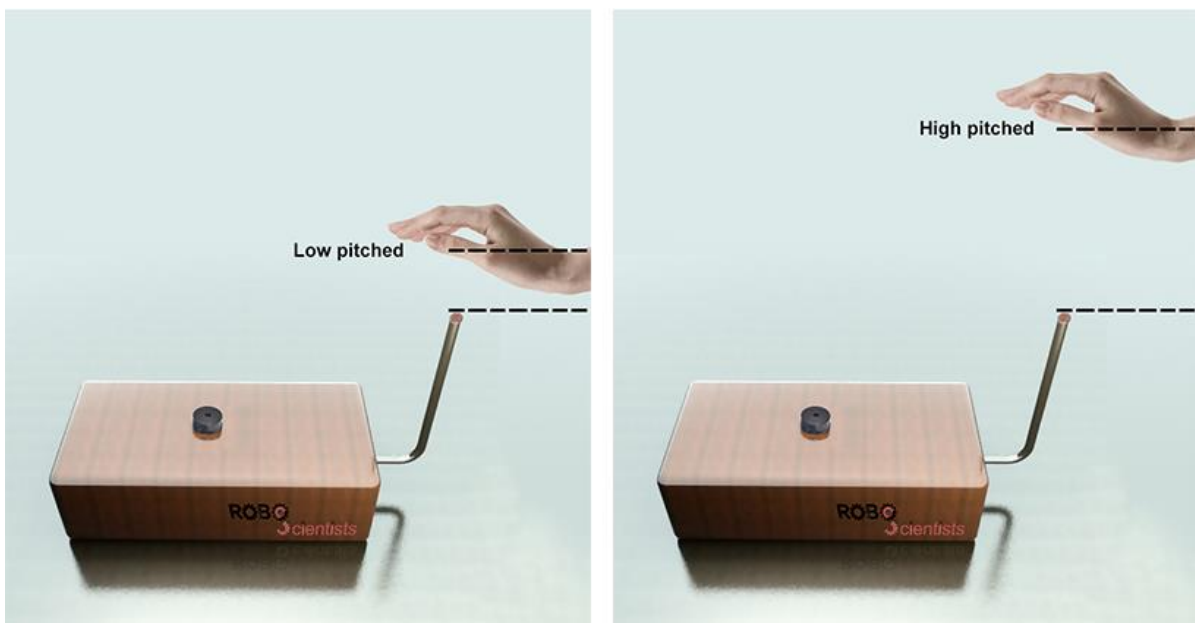
Area for sketches

List of material:

Time for crafting! Start working on the design of the smart light using the available crafting materials; bear in mind that your model will be revised several times and adjustments/improvements will be introduced (i.e. later on you should modify it in order to be controlled with 2 hands).

Our aim

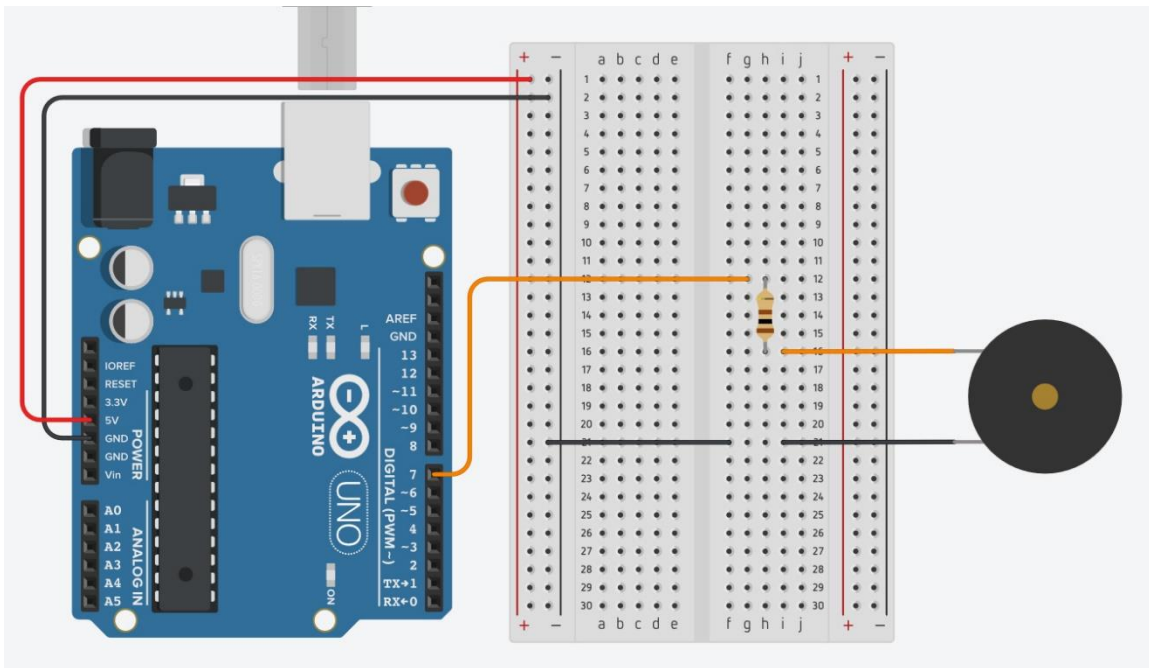
When the hand is moving closer to the photoresistor, low-pitched sounds are produced by the Piezo buzzer (left), while when the hand is moving away from the photoresistor, high-pitched sounds are produced.



Time for circuit making!

The image below depicts an already connected breadboard to the Arduino board with a Piezo buzzer and a 100-ohm resistor. You will also need a photoresistor and a 10 k Ω resistor. **How will you connect them?**

Try to draw the circuit below or create the simulation on TinkerCAD.



What does the piezo buzzer do?

Why are we using digital instead of analog pins to connect the Piezo buzzer?

Why are the resistors needed? Can we safely remove them?

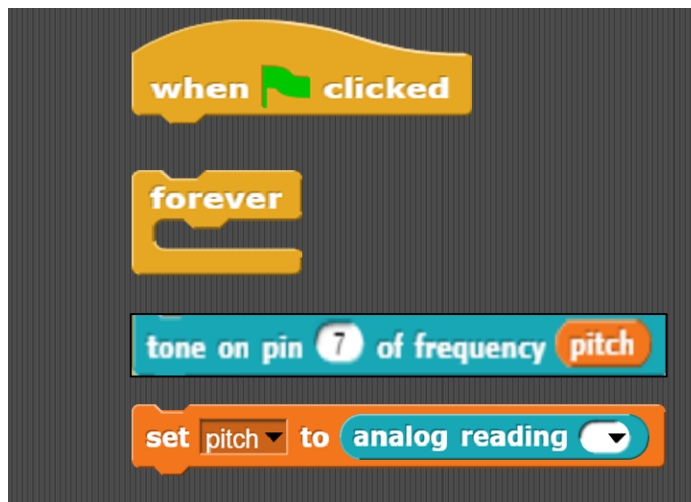
Time for hands-on practice!

Let's create the circuit using your Arduino board and the corresponding electrical components.

Time for programming!

Open Snap4Arduino and connect your Arduino to Snap4Arduino.

The following script (see below) is semi-structured. Shape the blocks and place them in the correct order into the scripting area, in the middle part of the window, in Snap4Arduino, in order to create a Theremin that is controlled with one hand.



Time to revise your model! Start improving the design of the smart light model using the available crafting materials. Integrate the electrical circuit and the script to add the needed level of interactivity.

Towards a more optimal solution (optional)

Let's move to a more optimal solution by setting the range of values out of which no tone will be reproduced. In other words, knowing the lower value and the higher value, we can check whether the current analog reading from the photoresistor (stored into the variable **pitch**) falls into our range. If it does, then the buzzer tone that corresponds to the current value of the variable **pitch** is played. If it does not, then nothing is played.

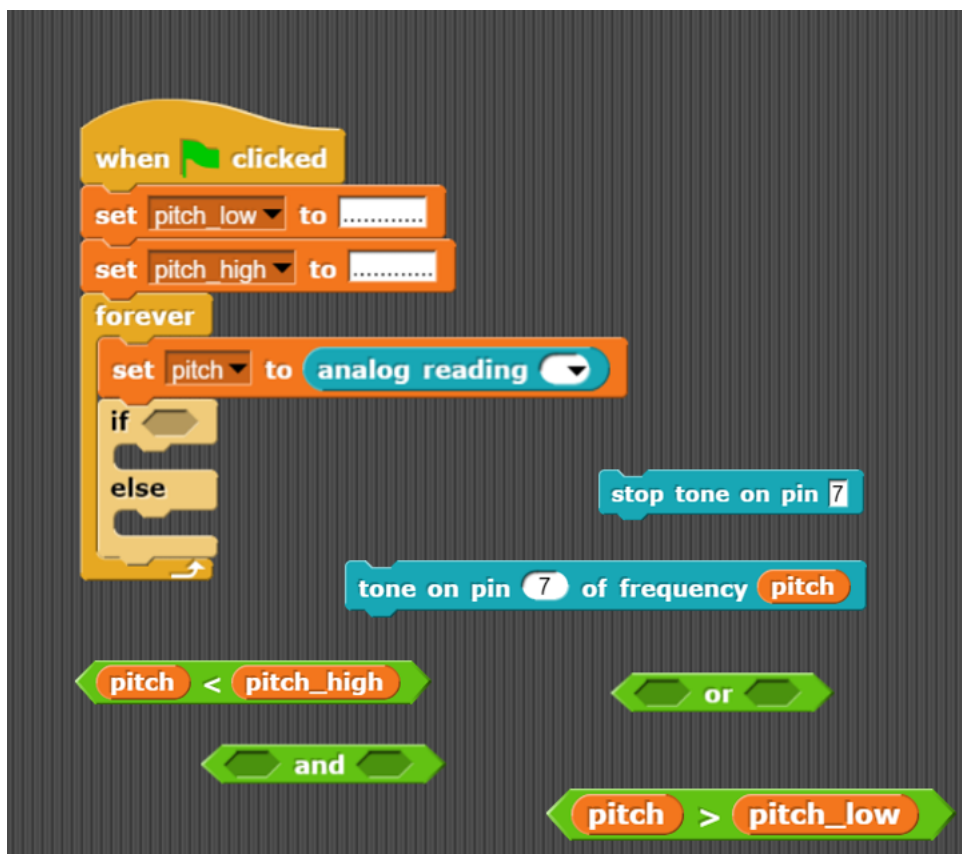
Move your hand across the photoresistor in order to identify the lower analog reading, which can be set as the value of the **pitch_low** variable.

pitch_low:

Move your hand across the photoresistor in order to identify the higher analog reading, which can be set as the value of the **pitch_high** variable.

pitch_high:

The following script (see below) is semi-structured. Construct the blocks and place them in the correct order into the scripting area, in the middle part of the window, in Snap4Arduino, in order to make a functional Theremin. You will only need one Boolean operator of the two available (and, or).



Time to revise your model! Start improving the design of the smart light model using the available crafting materials. Integrate the electrical circuit and the script to add the needed level of interactivity.

Tips zone

Programming blocks



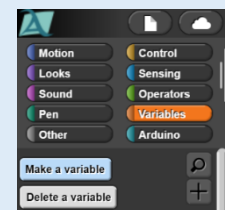
This is a *hat* block that indicates that the script should be carried out when the green flag will be clicked.



This is a *C*-block. The slot inside the *C* shape is a special kind of input slot that accepts a *script* as the input. Any script placed **in there** will be carried out forever in a circle.



This block comes from the Variables palette and sets the value of the variable '*pitch*' to the current analog reading retrieved from the photoresistor (controlled with your hand). You can create variables “by hand” that aren’t limited to being used within a single block. At the top of the Variables palette, click the “Make a variable” button:



tone on pin 7 of frequency pitch

This block plays the buzzer tone that corresponds to the current value of the variable *pitch*. The tone block works with two arguments: the pin number that you will use in Arduino (in our case pin 7) and the frequency that takes values approx. from 200 to 800 (given that is closely related to the readings from the photoresistor)

and





The Boolean operator 'and'. This block evaluates to true only when the two conditions are true. Otherwise evaluates to false. Typically, it is used to narrow down a search.

or

The Boolean operator 'or'. This block evaluates to true if at least one of the condition is true. Typically, it is used to broaden a

Electrical components

The following table is an index containing all the components that need to be implemented for accomplishing the present activity.

| | |
|---|-----------------------|
|  | photoresistor |
|  | 10 kΩ resistor |
|  | Buzzer |
|  | 100 Ω resistor |

ROBOSCIENTISTS PROJECT

Motivating secondary school students towards STEM careers through robotic artefact making

Erasmus+ KA2 2018-1PL01-KA201-051129

Creators

Rene Alimisi, Chrysanthi Papasarantou, Konstantinos Salpasaranis (EDUMOTIVA)

Declaration

This report has been prepared in the context of the ROBOSCIENTISTS project. Where other published and unpublished source materials have been used, these have been acknowledged.

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