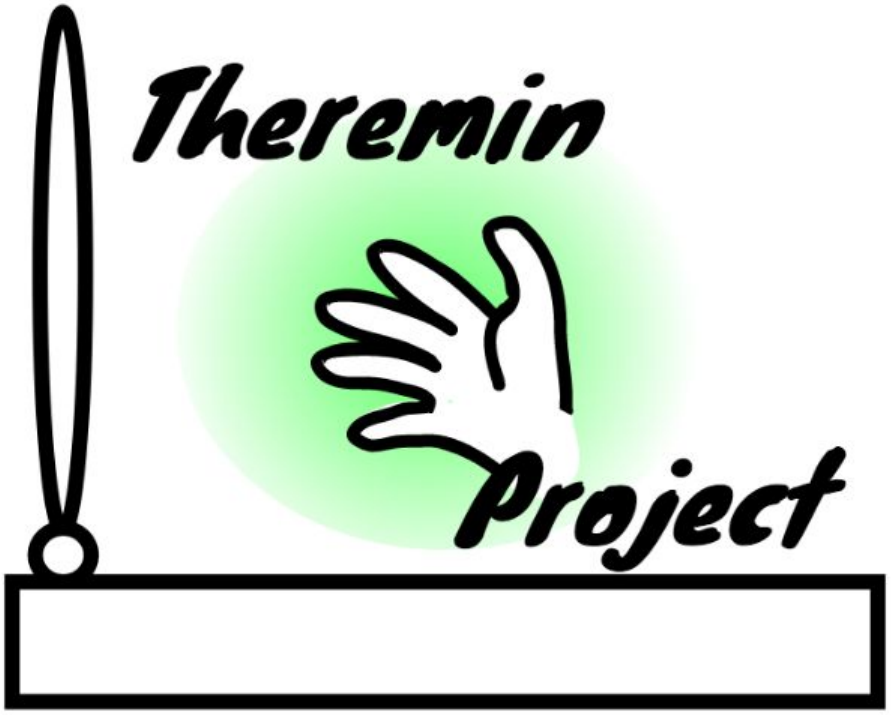
Phoenix



You will need:

Access to the Scratch website, from a computer or laptop.
(It might also work from an ipad or tablet)

This tutorial is best for people who have used Scratch a little bit before.

Setup:

If you haven't used Scratch before, click **join scratch** at the top and create an account. **You might need your parent's email to do this, so ask for help.** If you can't make an account, you can follow along, but you won't be able to save your work.

Once you've made an account follow the Phoenix Scratch studio here. This is where you can find the template versions of all the workshops we create. Feel free to remix them and post the new things you create.

Wait, what is Scratch?

Scratch is a free, online, block-based code editor. You might have used it in school. If you've been to one of our family workshops, you've probably seen us using it there.

There are lots of different tutorials available for using Scratch. Here we are going to focus on showing you ways of using Scratch that link to the work we do at Phoenix. This will include things like animation and drawing.

Theremin Project

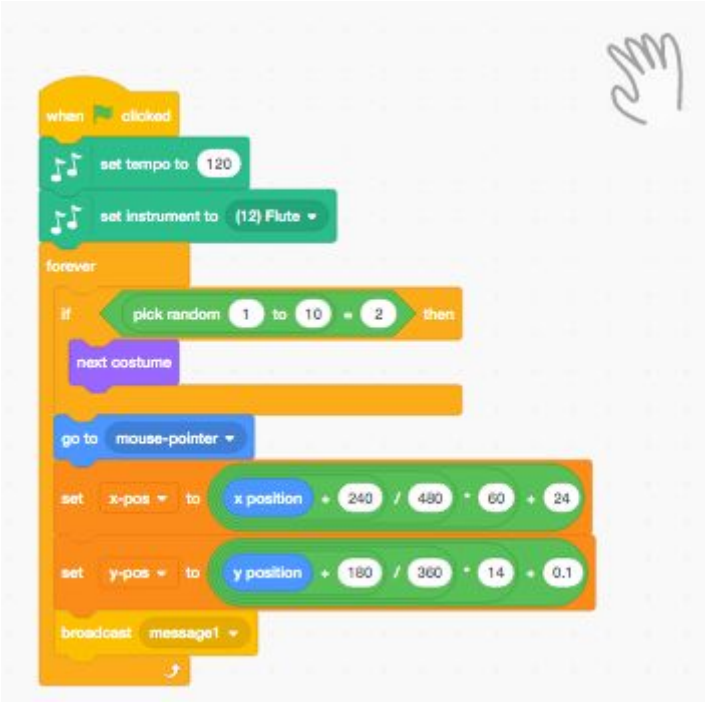
This project creates an interactive instrument, similar to a Theremin. The Theremin is an instrument created in 1928 by Léon Theremin.

The Theremin is played by moving your hands around two metal antennas. These sense the position of the hands and allow the performer to control frequency and volume. Our version is a bit simpler than that, and we have only set up one hand.

This project explores the sound and motion blocks as well as introducing some new maths concepts.

Below is the finished project. Open it up and start remixing:
https://scratch.mit.edu/projects/394046219/

Most of this project works simply from the Hand sprite. Open it up, and you should be able to see the blocks all together.



Let's talk through what is happening here.

Step 1

First of all we set up our sound blocks.
The tempo is set to 120 and the instrument is set to Flute. Try changing these and see what kind of effects you get.

Step 2

Now that the sound is set up, we open up a forever block to contain our main code.

The first part is an if block. We then use some maths to pick a random number between 1 and 10. If this is equal to 2, the next costume block is triggered.

This means that about 1 in 10 times, that the code loops around, the costume will change. This doesn't do anything to the sound, but it makes the project look a bit more interesting.

You could try drawing your own costumes into the Hand sprite and see how they look.

Step 3

So now, we get to the part that is emulating the way a Theremin works.

We need to make the Hand sprite follow the mouse pointer, which is easy enough using the go to mouse-pointer block.

Now we have the most complicated part of the project. We want to map the position of the hand on the screen to the range of notes and beats that the sound blocks can handle.

This is difficult because our x position can be anything between -240 and 240. But the range of notes is ideally, 24 to 84.

Our y position can be anything between -180 and 180. But the range of beat-lengths is ideally, 0.1 to 14.

So, we create two new variables, x-pos and y-pos, that will hold our adjusted values.

And then we can apply the following formula:

new_value = ((old_value - old_min) / (old_max - old_min)) * (new_max - new_min) + new_min
X-pos = (((x position + 240)-0) / (480 - 0)) * (84-24) + 24

We have added 240 to the x position, so that it will always be 0 or above.

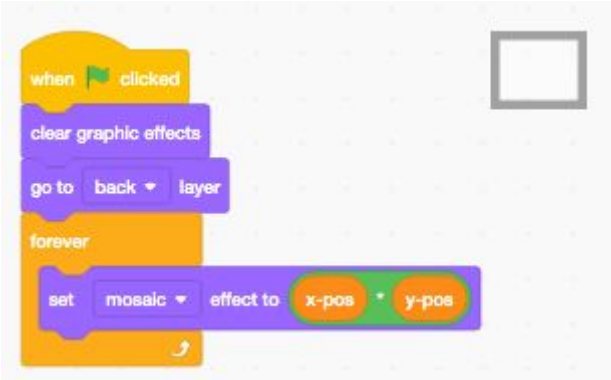
Step 4

Finally this block then sends a message. We use this message to play the sound. By playing the sound this way, instead of within the forever loop, means that the forever loop block can continue looping. Otherwise we would have to wait for each sound to finish before playing the next one.

So, as you can see, here we use the play note block with our custom variables.

Step 5

The great thing about variables is that we can use them to control all kinds of things. You might have noticed the Visualiser sprite. It contains this block of code.



As you can see, we have a very similar setup to the Hand sprite.

It is simply looping around, and pulling the latest x-pos and y-pos variables. Instead though, we are applying it to the mosaic graphic effect.

Step 9

So now we've walked through the basics of our Theremin project. How can you customise it and develop your own version?

- Can you make some new costumes?
- Can you add sounds?
- Can you change the way the input works?
- Can you create some more visual effects using the x-pos and y-pos variables?

Remember to share your project to the Phoenix Scratch studio!

Hopefully you found this exercise interesting! We can't wait to see what you create.

Phoenix.org.uk
@PhoenixLeic