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Lights, buttons, music!

TUTORIAL



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Making beautiful, weird sounds with a NeoTrellis



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Ben loves cutting stuff, any stuff. There's no longer a shelf to store these tools on (it's now two shelves), and the door's in danger.

Above: This unexcited looks kindly cynicism when in use.

The Adafruit NeoTrellis brings together some great elements for an electronic musical instrument. It combines an interface that's responsive, tactile, and flexible (both literally and metaphorically) with a microcontroller that's powerful enough for some interesting audio effects. Let's take a look at what this means by building a simple instrument. It combines a step sequencer, a drum machine, and an effects unit into one portable device.

We'll be bringing together two Arduino libraries to create this – the NeoTrellis library from Adafruit, which brings in what's needed to control the hardware, and the Audio library from Teeny creator Paul Stoffregen, which will do the audio synthesis and manipulation.

SOUND IN SEQUENCE

A step sequencer is a device that cycles through a series of different points. At each point, it plays a predefined sound. The NeoTrellis MIDI has a grid of

four rows of eight buttons. Each button contains an RGB LED that can be used to light that button up in any colour. We'll use this to create a 'toggle' effect – press a button once and it lights up; press it a second time and it turns off.

With the eight by four layout, it makes sense to step through sequences of either four or eight notes. We're going to use four notes, so each row of buttons can be used to define the sound that's played on that beat. We'll split the row into two sections. The leftmost three buttons each control a 'drum' sound (that doesn't sound too much like a drum, but more on that later). The rightmost four buttons define different effects that you can apply to these sounds. That leaves us with one free column – the fourth from the left – which we'll use for lights (without the buttons doing anything). This will indicate which beat is currently playing.

If you want to skip-right ahead and just install the software, you can grab it from [harmagoo/lykYDw](#). The interesting part about this project isn't the synth

HARDWARE

The Audio library is tied closely with the hardware, and it only runs well on two platforms: the NeoTrellis MIDI and the Teeny line of microcontrollers. If your project doesn't need the buttons of the NeoTrellis, we'd strongly recommend using one of the Teensies. We took a look at the Teeny 3.0 in issue 20. It's an awfully fast, which lets you crank in even more audio and effects. As you may have guessed by the name, it's try enough to fit into almost any project.

itself, but how it's built. You can build your own instrument using the same technique, but customised for the type of music you like to play.

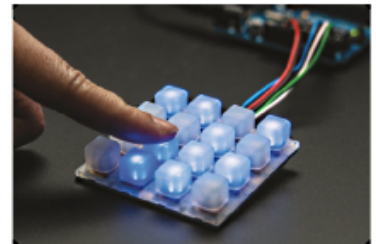
As is so common, we didn't start our code with a blank page, but with one of the example scripts from Adafruit that implements the toggle function – press a button and it lights up a random colour. Press it again and it turns off the light. You can get the code from [harmagoo/lykYDw](#).

Since we don't need the colours to show the particular value, we kept the random colours to make it a little more delightful.

We won't go through the complete code, but we modified the main loop to do this, but not allow the user to turn the fourth column on or off. It's as follows:

```
while (trillis.available()) {
  keypadEvent = trillis.read();
  if (keyEvent == KEY_PRESSED) {
    int key = a.key();
    if (key != 3 and key != 11 and key != 13 and
        key != 27) { // ignore fourth col
      Serial.print(key); Serial.println("
pressed");
      lit_keys[key] = !lit_keys[key];
      if (lit_keys[key]) {
        trillis.setPixelColor(key,
          Wheel(random(255)));
      } else {
        trillis.setPixelColor(key, 0);
      }
    }
  }
}
```

This almost gives us our complete interface. Each row of the keyboard on the eight by four keypad represents one beat; four synth will continuously loop a four-beat sequence. The columns split up the interface into three sections. The leftmost three columns each define a sound that can either be



played or not. The fourth column lights up one row in turn to show which beat is currently playing, and the rightmost four columns are effects that we can apply to the sound.

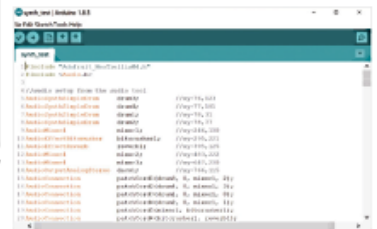
We only need to create the audio side of things. The Audio library is inspired by modular synths, where you have discrete devices that you can connect together using patch cables. There's a web editor for creating these which you'll find at [harmagoo/lykYDw](#). You can drag and drop different bits into your device and then press Export to get the Arduino code to copy and paste into your Arduino code. We don't need all the include statements, just the bits under //NOTE1.

Take a look at [Figure 1](#) (overleaf) for details of how we set this up (you can also use the Import function to take the relevant bits of code and bring them into the graphical editor).

There are three drums, named drum1, drum2, and drum3. These don't really create drum-like sounds –

Above: Want a bigger or smaller instrument? Adafruit sells the NeoTrellis separately so you can build all larger or smaller versions to whatever microcontroller you like.

Above: Don't worry and paste the code from the Audio library GUI into an Arduino sketch, and you're halfway there!



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