Sample Project 2 – Theremin

The Chip Tunes project is meant to introduce students to an instrument they probably haven't encountered before, making them think differently about music and consider the interesting ways computers and humans can interact with one another. Unlike Project 1, where most students should have been able to produce a basic program fairly quickly, the Theremin may prove challenging for many students. Some may turn in programs which are only half-functional while others may perfect designs which are novel in their approach or include special features we did not plan for. The key detail for this project is that students recognize how to use the Get Distance block and implement it in their programs in a way which produces some kind of meaningful interaction between the student, his/her program, and the shield's distance sensor. Hopefully, this interaction can result in some interesting music.

### C

Our "C" level program is a good example of the kind of basic program a student might produce if he/she struggles with the concepts of the project. This program does use the distance sensor, but only in a very basic way, turning the speaker on to play a pre-defined note and never turning it off (until the Arduino is reset). Students should be encouraged for getting the sensor to function and make the speakers do something, but you should help them to understand how placing the value Get Distance returns in a variable and using it to change the speaker's note can make the program more interesting and interactive.

Video
TODO: C level video
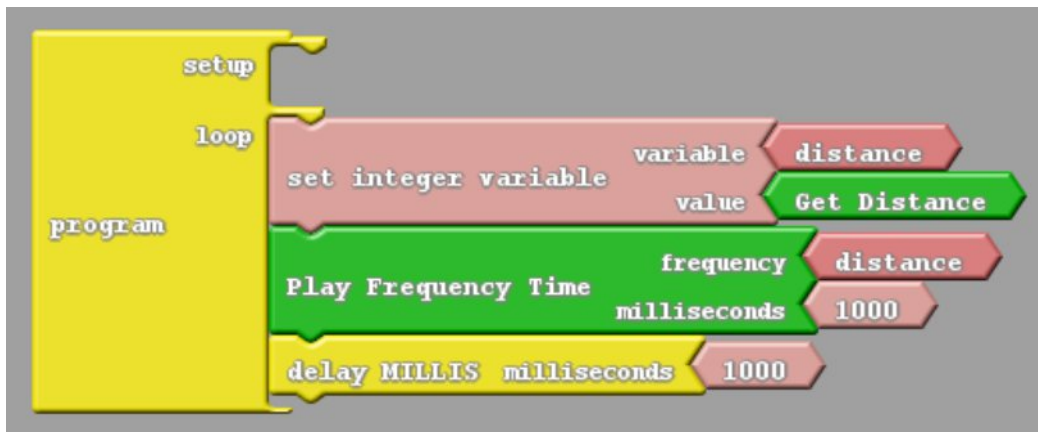
Our "B" level program takes advantage of a few more advanced features to make something which is has a few problems but is much closer to a real Theremin. Students at this level may still have problems with long delays between notes, pitches which are too high or too low to be pleasant or easy to hear, and/or rough reading of user input, but their programs use the distance value to change the speaker's pitch. Generally speaking, this will mean that the student has used a variable to store the Get Distance value, and that he/she has used this variable with a Play Frequency block instead of a Play Note block so that his/her program can change its frequencies.

Video
TODO: B level video
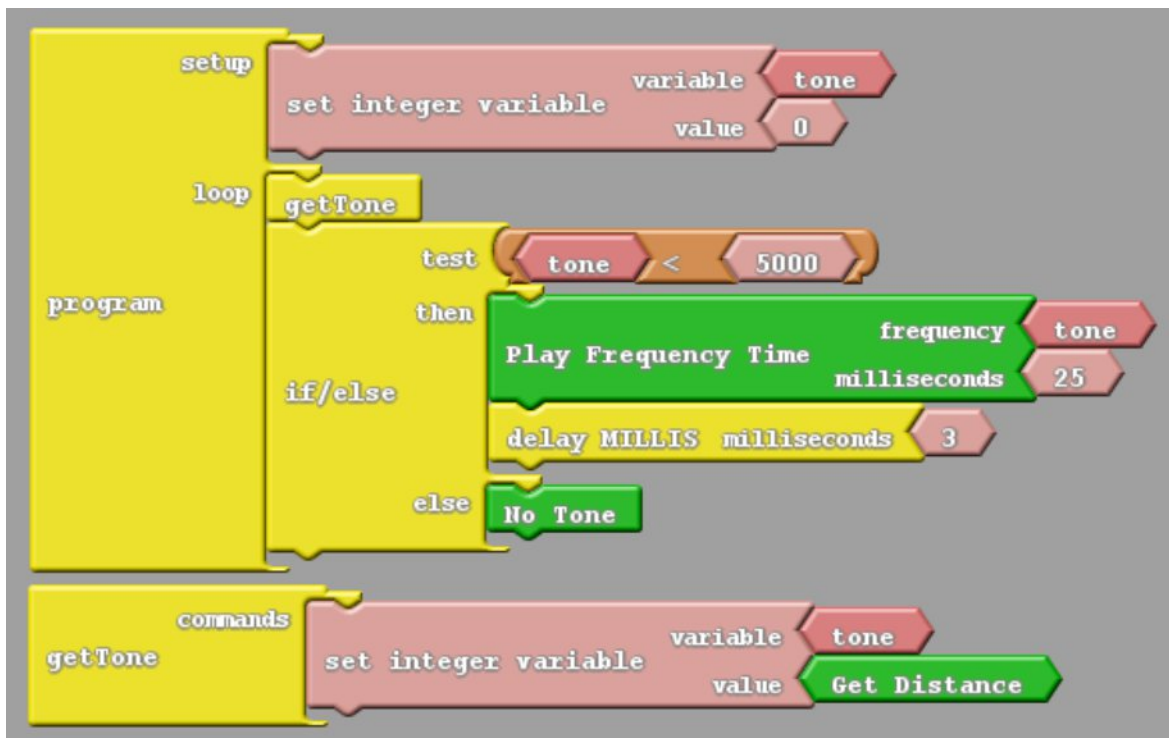
For an "A" level program, students will take the time to try many different techniques and arrive at a Theremin which can easily be played for pleasant results. These programs may look quite different from our reference version, but they will all play clear tones based on user input and will smoothly respond to changes in hand position. An "A" level project should not play sounds if the student isn't providing input, and this is usually managed using an if block like in our example. Students may experiment with changes in the lights or other aesthetic changes, but these are to be considered as bonuses and not required. Students who produce very high quality Theremin programs should be congratulated and allowed to demonstrate their work if they wish.

Video
TODO: A level video

Sample Project 3 – Piano

C

A basic "C" implementation of Project 3 generally includes functionality for only some of the buttons or doesn't allow easy use of multiple buttons simultaneously or in quick succession. Once students have figured out how to comfortably use the shield's buttons to interact with the speaker, they should be encouraged to make their basic program work as well as possible with multiple notes available and easy use. After this, they can add other features or consider experimenting with the keyboard blocks.
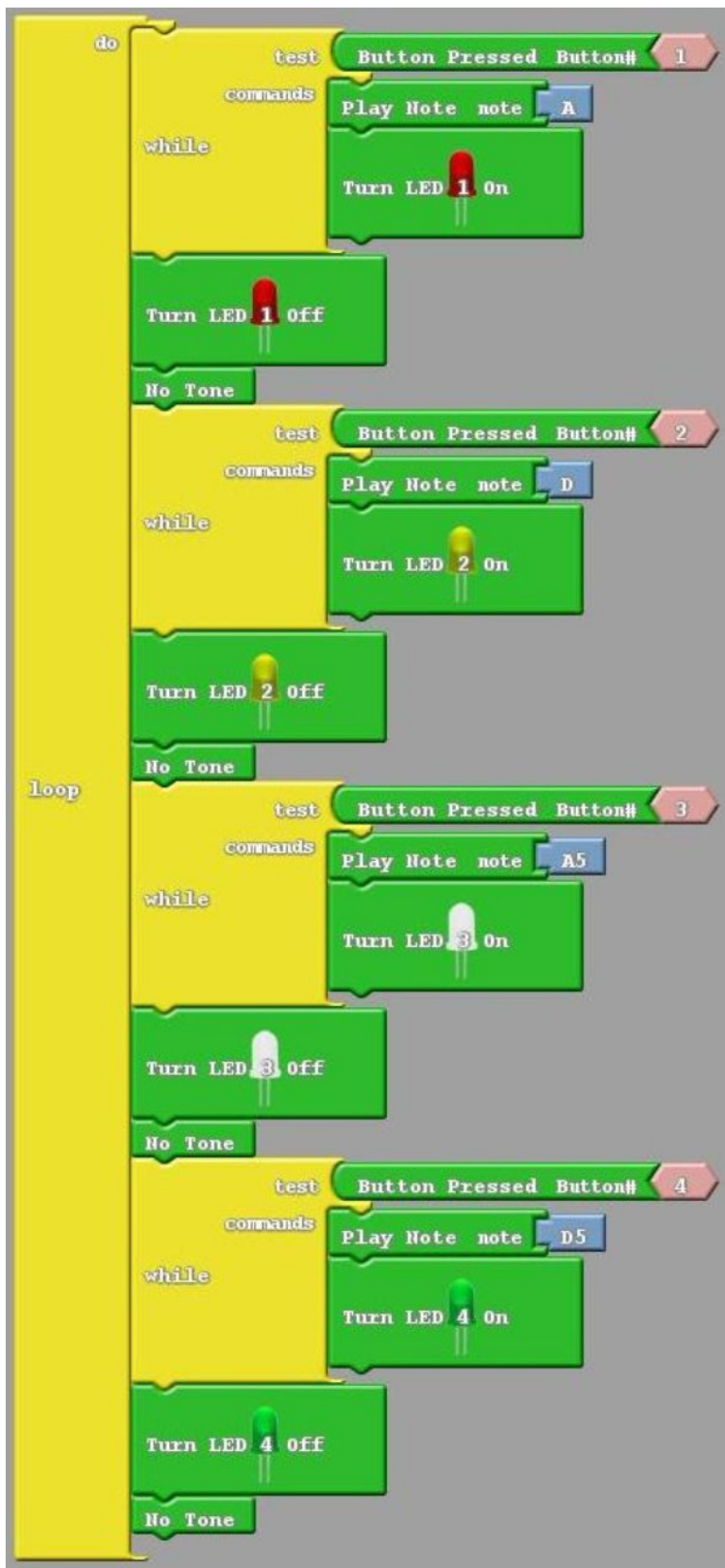
Video
TODO: C level video

B
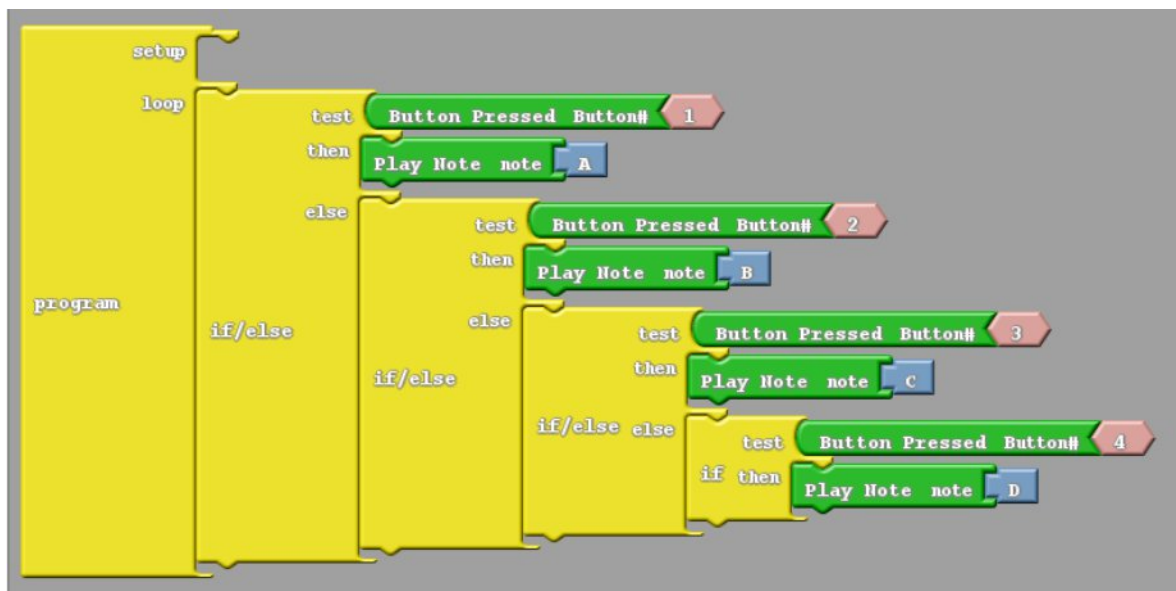
A "B" implementation of Project 3 is one which works well but does only the minimum for the project. The buttons can all be used to play notes (which play cleanly and are easy to transition between), but the student may not have used his/her creativity to make the project his/her own. Students at this level should be encouraged to use the LEDs or try to use the keyboard in order to make their programs more fun and interesting.

Video

TODO: B level video

A

loop
do
  while
    test: Button Pressed Button# 1
    commands:
      Play Note note A
      Turn LED 1 On
    Turn LED 1 Off
    No Tone
  while
    test: Button Pressed Button# 2
    commands:
      Play Note note D
      Turn LED 2 On
    Turn LED 2 Off
    No Tone
  while
    test: Button Pressed Button# 3
    commands:
      Play Note note A5
      Turn LED 3 On
    Turn LED 3 Off
    No Tone
  while
    test: Button Pressed Button# 4
    commands:
      Play Note note D5
      Turn LED 4 On
    Turn LED 4 Off
    No Tone

For an A on Project 3, students should again go above and beyond the basic requirements. An "A" level piano project will work consistently and well to recognize button presses and play notes. It will also do something interesting and extra, whether that is lighting up the LEDs which correspond to the buttons, making use of the keyboard blocks to use the keyboard in addition to (or instead of) the buttons, using the distance sensor somehow, or allowing multiple buttons to be used at once for different notes to play. Students comfortable enough with block programming to produce "A" level piano projects should be encouraged to pursue programming themselves, since they will have a good understanding of the fundamentals based on their mastery of this course and its projects.

Video
TODO: A level video