Abstract

MIDI instruments do not create their own sound; they merely instruct a synthesizer to create a sound. Since MIDI keyboards can be very expensive, other methods of obtaining MIDI input were explored. One method is to program an Arduino microcontroller to read photoresistor inputs. Both Arduinos and photoresistors are very affordable and can be easily repurposed for other projects, making music creation more accessible to consumers. This Light Keytar is a MIDI controller that can be played without touch. With a digital audio workstation, it can be used to play any software instrument. The Light Keytar has a layout similar to the keytar, which is an instrument with the layout of a piano but is held as a guitar; however, notes are played by obstructing light rather than by pressing mechanical keys. The body is made from light and elegant, black laser-cut acrylic. To construct this instrument, twenty-five photoresistors were lined up on a strip of acrylic, creating two octaves of “keys.” The amount of voltage flowing through the photoresistors change based on the amount of light they are exposed to, so by reading the voltage, the relative amount of light can be determined. The Arduino does not have enough analog inputs to read from all twenty-five photoresistors, so multiplexers were used. Multiplexers serve as an avenue for multiple photoresistors to be read by only one analog input pin. The Arduino is programmed with an algorithm to send respective MIDI values whenever any sensor’s values change from a decrease in light. The Arduino also has an algorithm for recording the notes that the user plays and playing them back. Hairless MIDI is used to route MIDI messages from the Arduino through a microUSB cable to loopMIDI in order for the keytar to be recognized as a MIDI device by the computer program Pure Data. The Arduino sends MIDI signals with note number and velocity through Hairless MIDI and loopMIDI to a Pure Data synthesizer, which takes the MIDI values and converts them into audio. The timbre of the audio is modified by an ADSR envelope and a filter within the Pure Data synthesizer, and then played through the computer. With speakers and a computer running Pure Data, the Light Keytar can be played by anyone at performance volume with ease.