Guitar Musical Instrument Digital Interface (MIDI) Controller | Digital Circuit Project

2017

In this project, my teammate and I built a guitar-based MIDI controller. By using a modified acoustic guitar, we could generate standard MIDI signal by a connected Arduino board, and could further modified the timbre of guitar sound.

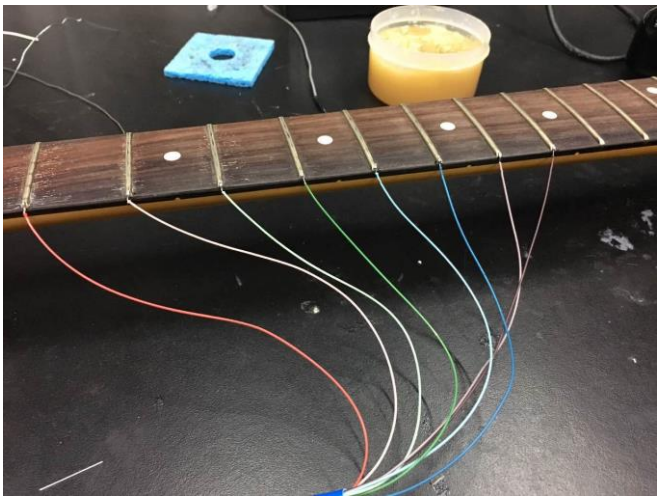
I was in charge of modifying the structure of acoustic guitar.

Insulating guitar strings

Because the strings and frets in guitar are made of metal, they can conduct electrical signal. When we play the guitar, our fingers press strings onto frets, the strings and frets are connected, and thus enable electrical signal to flow through. If a scanning signal is generated to the metal plectrum we used and detected at strings and frets with Arduino, the signal can let the program in Arduino know which string we are playing on, which fret is pressed onto, and what sound would be generated.

Because the strings on guitar may be electrically connected at metal tuning keys or metal bridge, the first modification I did was to insulate the strings. I disassembled the strings from guitar, and wrapped the heads and tails of the strings with insulation electrical tape, then placed them back to the guitar.

Connecting with Arduino



I attached the electrical wire carrying scanning signal output by Arduino to the plectrum, and attached the wire connected to the signal detector at Arduino to the strings and frets. Real-time standard MIDI signal could be generated as we played and pressed the strings onto the frets. One application of this MIDI controller is timbre transfer. There is a channel in MIDI to control timbre, so we changed the value at this channel to change the timbre of the sound produced by guitar. For example, we can play drum kit or trumpet with a guitar.