myDAQ® Air Guitar Building Instructions

Background
The air guitar is an instrument and men and women have been playing it for centuries. But until now, no matter how hard you strummed, you just couldn’t wave your arms fast enough to make a sound. Today, that all changes. Using myDAQ and LabVIEW, you will now be able to not only rock out to your own music, but also let other people hear it too! This tutorial will demonstrate how you can turn a myDAQ into an air guitar by programming it in LabVIEW. This will help convey knowledge about accelerometers and sound output in LabVIEW. (Source: https://decibel.ni.com/content/docs/DOC-17139)

Required Components
- myDAQ
- LabVIEW installed computer
- Speakers
- 2 Axis Accelerometer (e.g. ADXL335)
- 8 Push Buttons (normally open)
- 8 Resistors: 12kΩ
- 8 Pieces (about 15x15mm) of PCB Test Board
- Soldering Iron
- Gloves
- Glue
- Connecting Wires
- 0.1" Breakaway Header Pins (Optional)
- Multi-Conductor Electronic Wire Shielded (optional)

myDAQ Air Guitar Setup

Electronic Gloves
Circuit Setup
Air Guitar VIs
Electronic Gloves

As the first step in this project, you will assemble your electronic gloves. This project uses 4 push buttons (normally open) on each hand. On the right hand, the 4 buttons determine which of 4 strings to play, and on the left hand, the 4 buttons choose which of 4 notes to play on each string. Also on the right hand, there is an accelerometer which recognizes the strumming motion. Accelerometer is an electromechanical device used to measure acceleration. Some smart phones also use accelerometers to rotate screen display from portrait to landscape or vice versa according to phone screen orientation. Use a small piece of PCB test board (about 15x15 mm) to attach push button switches to gloves, as it will provide strength to the switches and connecting wires as shown in Fig. 01.

Fig. 01: PCB test board (bottom) and Multi-Conductor Electronic Wire (Shielded) cable with 8 conductors (top)

To begin with, solder the push button switch on a piece of PCB test board followed by soldering two wires on the same piece of PCB test board as shown in Fig. 02. Now, short a wire to the each
terminal of the switch on other side of the test board. It will be helpful if you use a Multi-Conductor Electronic Wire (Shielded) cable with 8 conductors as shown in Fig. 01. Also, the length of wire should be at least five to six feet so that you can play your guitar freely. Now, glue the piece of PCB test board with switch to the bottom side of the finger on glove as shown in Fig. 02. You may want to glue the wires on back side of the glove as shown in Fig. 03. This would not wiggle the wire connected to switch during hand movements. Repeat this for all the fingers on each glove except thumbs as shown in Fig. 04.

Fig. 02: Push button switch on the PCB test board
Fig. 03: Glued wire to the glove
On the right hand, velcro the accelerometer to the top of the right glove as shown in Fig. 05. Your accelerometer may have three axis output. But in this project, we will only use X and Y axis and leave the Z axis unconnected. Attach wires to the accelerometer and tie them to the right hand’s cord of wires. You can use Multi-Conductor Electronic Wire (Shielded) cable with 4 conductors which will remove the loose wires. The four wires attached to the accelerometer include: +5V, AGND, XA, and YA. XA and YA will be connected to Analog In pins 0+ and 1+, respectively. AI 0- and 1- are attached to AGND.
Circuit Setup

Connect the wires from our electronic gloves according to the circuit diagram shown in Fig. 06. To ease the connection on the proto-board, you may arrange connecting wires using 0.1" breakaway header pins and PCB test board as shown in Fig. 07. Also if you carefully look at Fig. 07, all the wires from each glove which are going to be connected to 5V are tied together. Connect speakers to Audio Out port of the myDAQ. Now, you are almost ready to play your air guitar.
Air Guitar Virtual Instrument (VI)

Download the ENGR190_Vis.zip from following link and extract it.
http://www.clemson.edu/ces/departments/ece/document_resource/undergrad/electronics/ENGR190_Vis.zip

Open the file named Air Guitar.vi. It will open up two windows i.e. Air Guitar.vi and Calibrate Strum.vi. Now, run the Air Guitar VI. At the start of this program, a function is called which will calibrate the accelerometer and set its baseline voltage in the X and Y directions. During this calibration, keep your hand still in your resting position. Once the voltages appear relatively constant as shown in Fig. 08, press the Accept Calibration Button. During each iteration of the while loop, the DAQ Assistant acquires the X and Y voltages from the accelerometer and
determines if there has been a strum. A strum occurs when the voltage in the X or Y direction varies by more than some set value (for example, +/- 0.2 Volt). Also in each iteration, a DAQ Assistant determines which string and which notes have been chosen by the user. The DAQ Assistant is reading in 1 bit for each push button (1 or 0). The first 4 bits correspond to the left hand buttons (Selected Notes) and the last 4 bits correspond to the right hand buttons (Selected String). The sets of 4 bits are extracted and converted to a numerical value ranging from 0 (0000 in binary) to 15 (1111 in binary). These values are sent into the case structures. The strum detected Boolean indicator is wired to the larger case structure, and the numeric value of selected string determines the case of the inner case structure. The Selected Notes numerical value determines which row in a predetermined array to output. This array holds all the combinations of notes for a particular string. Each note is a type def Ring control called Music Notes.ctl, which connects a particular note (ex: A4, B4, C4) to the frequency of that note. Once the set of notes has been chosen, the array of frequencies are generated by the Simulate Signal vi’s, filtered to smooth out the sound of the waveform, and sent to the Audio Output of the myDAQ.

**Air Guitar Songs VI**

If you want to sound like a pro guitar player with very little effort, then this VI is for you! This program plays the National Anthem note by note, and all you have to do is hold down one
button and strum. This program loads in the contents of the text file called Note Files.txt. This file contains all of the file names of the wav files that contain the individual notes of the National Anthem in order. The contents of the text file are converted into an array of strings so that the file names can be sent to the Play Sound VI. In each iteration of the while loop, a DAQ Assistant determines if a strum has occurred and if the user is holding his/her “pick”, which is done by pressing the button on the index finger on the ring hand. If both of these are true, then the program takes the next element in the array of file names and sends it to the Play Sound VI, which uses a windows dll function call to play the file. The index is then incremented for the next iteration. This continues until the program ends. (Source: https://decibel.ni.com/content/docs/DOC-17139)

More Information
The Vis, circuit design and part of the text are adopted from https://decibel.ni.com/content/docs/DOC-17139.
**Record a PowerPoint Slide Show (Office 2010)**

PowerPoint allows you to easily record timing and narration for a slide show. You simply click “Record Slide Show” and then start talking (assuming your computer has a microphone). The timing of when you advance slides will also be recorded.

**Instructions**

From the “Slide Show” menu, select “Record Slide Show.” You can choose to either start recording from the beginning of the presentation or at the current slide.

![Slide Show Toolbar](image)

This should bring up the full screen slide show view along with a small window in the top left corner of the screen.

![Recording Window](image)

This window controls the recording. The arrow button on the left advances to the next slide, the pause button pauses recording, and the U turn discards the recording for the current slide and starts it over. The time on the left is the time recorded for the current slide and the time on the right is for the entire presentation.

When you are finished recording your presentation, close the recording window and exit the slide show. You can review what you’ve recorded by playing the slide show from the “Slide Show” toolbar.

![Play Slideshow](image)
You can also have your mouse pointer show up in the recorded slide show by holding both the CTRL key and the left mouse button while moving the mouse around. The pointer will be displayed as a “laser pointer.”

After recording a slide, in the left column of the “Normal” view, there will appear a star icon under the slide number and an audio icon in the bottom right corner of the slide to indicate that the slide has a transition and narration set.

The audio icon also appears in the bottom right corner of the slide itself in “Normal” view.

You can mouse over this to play the narration or adjust its volume. Also, you can select the icon and delete it to remove the narration and timing from that slide.
**Microphone Settings (Windows 7)**

To adjust the volume on your microphone, open the Control Panel. Click on “Hardware and Sound” and then click on “Sound.”

![Hardware and Sound](image1)

In the window that opens, select the “Recording” tab.

![Sound](image2)

Select your microphone device, and click the “Properties” button. In the window that opens, select the “Levels” tab. From here, you can adjust the microphone volume and boost.

![Microphone Properties](image3)
Export to Video

After you have recorded all your narration, you can convert your PowerPoint presentation to a video. In PowerPoint, open the “File” menu and select “Save & Send.” Under “File Types,” select “Create a Video.” In the options on the right side of the screen, select “Internet & DVD” and “Use Recorded Timings and Narrations.” When you are ready to start, click “Create Video.” This process can take several minutes, depending on the length of your presentation and the size of embedded videos and narration.

You will be prompted for a location to save the video. This will create a Windows Media Video (.wmv) file, which is playable in Windows Media Player.