

Motion Feedback MP3 Player

by [polymythic](#) on April 3, 2010

Table of Contents

Motion Feedback MP3 Player	1
Intro: Motion Feedback MP3 Player	2
Step 1: Gather Up Components	2
Step 2: Modify Enclosure	3
Step 3: Setup the SparkFun MP3 Trigger	4
Step 4: Setup the Parallax PIR Motion Sensor	4
Step 5: Setup the ioBridge IO-204 Controller	5
Step 6: Stay Healthy	6
Related Instructables	7
Comments	7



Author:polymythic [author's website](#)

By sharing ideas there can be a crossroads of polymaths and myths. The origins of facts (found through science) meeting the origins of our beliefs (found through our human experience)...

So where do I sit between these concepts? I am a pendulum. A juxtaposition of cyberpunk and luddite. Hopefully you can help me make sense of it all, or at least enjoy the trip of understanding that the most interesting knowledge is whatever you're next about to learn.

Intro: Motion Feedback MP3 Player

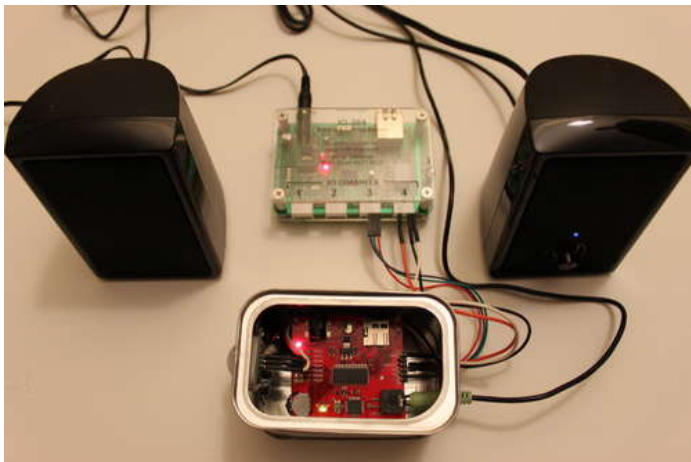
Concept: Create a feedback loop between a motion sensor and MP3 player volume

I wanted to create a positive feedback system to encourage more activity during a workout. What I came up with is an MP3 player that is controlled by continuous activity. After working with it and discussing the project with friends, I believe this concept could be implemented many different ways and maybe even directly embedded in a media player. Someone even brought up that they change the volume on their iPod to hear the songs as they workout or run harder just to hear the song better. Yeah Power Song!

My proof of concept uses a [SparkFun MP3 Trigger](#), [Parallax PIR Motion Sensor](#), and an [ioBridge IO-204 Controller](#). When motion is detected by the PIR sensor, the IO-204 sends serial commands to the MP3 player to raise or lower the volume. An added benefit to using the IO-204 as the controller is that I have the ability to data log my activity when it's net-connected.

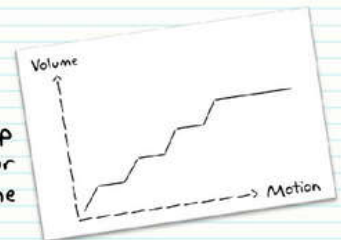


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Concept:

Create a feedback loop
between motion sensor
and MP3 player volume



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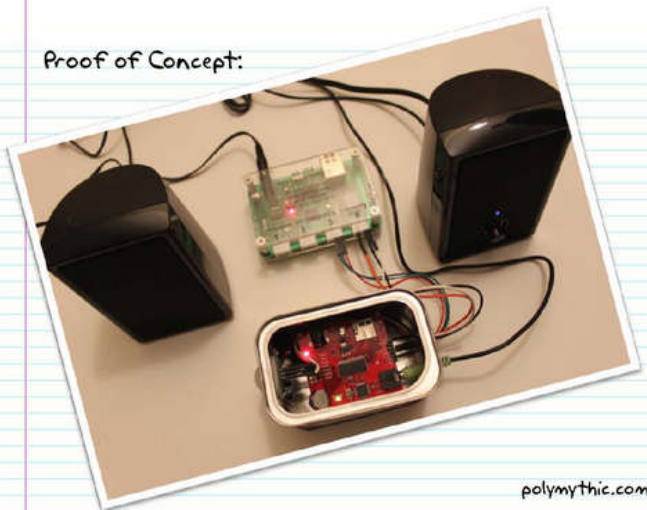
Step 1: Gather Up Components

Time to gather up your system components:

- SparkFun MP3 Trigger
- Parallax PIR Sensor
- ioBridge IO-204 Controller
- Project Enclosure
- Speakers
- Micro SD Card with Favorite Songs
- Hookup Wire



Proof of Concept:



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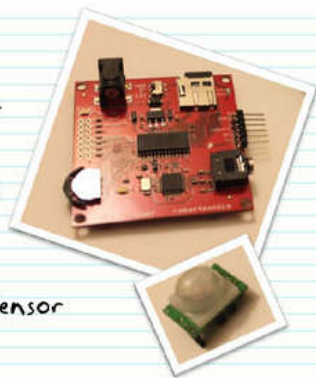
Parts:

SparkFun MP3 Trigger

- Plays MP3s
- Remote controllable volume

Parallax PIR Motion Sensor

- Detects motion

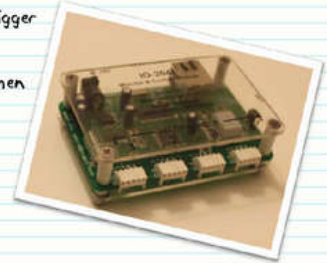


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Parts:

ioBridge IO-204

- Controls volume of MP3 Trigger as motion is detected
- Motion gets data logged when net-connected



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Step 2: Modify Enclosure

After finishing up my cup of General Foods French Vanilla Cafe, I noticed that the container would be a perfect project enclosure - kind of like a taller Altoids tin so many people use.

I drilled four holes in the bottom and placed screws to act as standoffs for the MP3 Trigger. I also drilled out a larger hole on the front side to support the motion sensor. On the back, I made holes for the speaker connection and hookup wires to the IO-204.



Step 3: Setup the SparkFun MP3 Trigger

Program 9600 Baud Firmware (optional)

I wanted the MP3 Trigger to support 9600 baud for more controller flexibility, so a friend reprogrammed the MP3 Trigger with new firmware. He found the [firmware](#) and instructions on the creator's website. To re-burn the firmware you will need a Cypress MiniProg.

Load Songs onto Micro SD Card

Copy songs over to a microSD card. The card must be formatted using FAT16. The songs support a constant bit-rate sampling up to 192kbps.

Make Connections

The MP3 has three pins that are required to be connected to the IO-204 - GND, USBVCC, and RX. There is also a switch that should have "USB" selected. This will allow the MP3 trigger board to powered by the USBVCC pin. Connect the corresponding pins to the IO-204.

Control Playback and Volume

The serial protocol is simple. Send the serial string "O" to start / stop the MP3 player. Send "v%01" to set the volume to the maximum. To lower the volume send serial strings of "v%XX" where XX is a number between 01 and 40 - "01" is the loudest and "40" is really low.



Step 4: Setup the Parallax PIR Motion Sensor

The PIR sensor has two modes: High and Low. When the sensor is placed in "high" mode, the sensor will go high and stay high as motion is detected. In "Low" mode, the sensor pulses when motion is detected. (Also used this guy on the [Half-Hour Halloween Hack](#))

I used the High mode to interface with a digital input on the IO-204. Connect the "+" and "-" to the +5v and GND of the IO-204.

Motion Sensor Notes

The PIR sensor can detect motion up to 20 feet away. I found that the sensor works best after a minute of no activity right after the sensor receives power. Parallax mentions this is the sensor calibration phase.



Step 5: Setup the ioBridge IO-204 Controller

The IO-204 acts as the controller taking input from the PIR sensor and controlling the MP3 Trigger. I used two different channels in my demo, but afterwards I figured out how to use one channel.

Make Connections

Each channel has Serial Out, Analog Input, and Digital Input. The PIR sensor connects to the Digital Input (pin 2) and the MP3 Trigger's receiver connects to the digital output (pin 3) of any open channel.

Create Onboard Rules

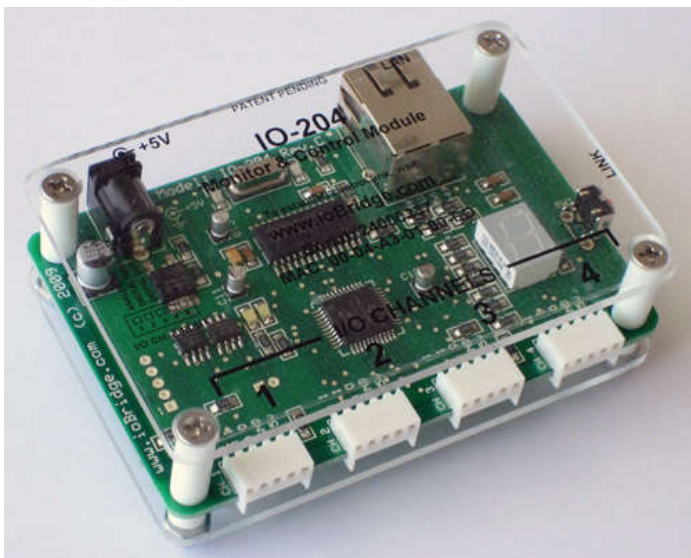
The IO-204 is programmed via a web interface. You want to create "Onboard Rules". They are "programming-lite" or "logical triggers - if then", if you will. Once the rules are programmed, they reside on the IO-204 with or without a network connection. That feature came out in one of the recent firmware revs, so make sure you're up to date. The IO-204 has a dual red/green LED to indicate it's network status. RED is offline and GREEN is online.

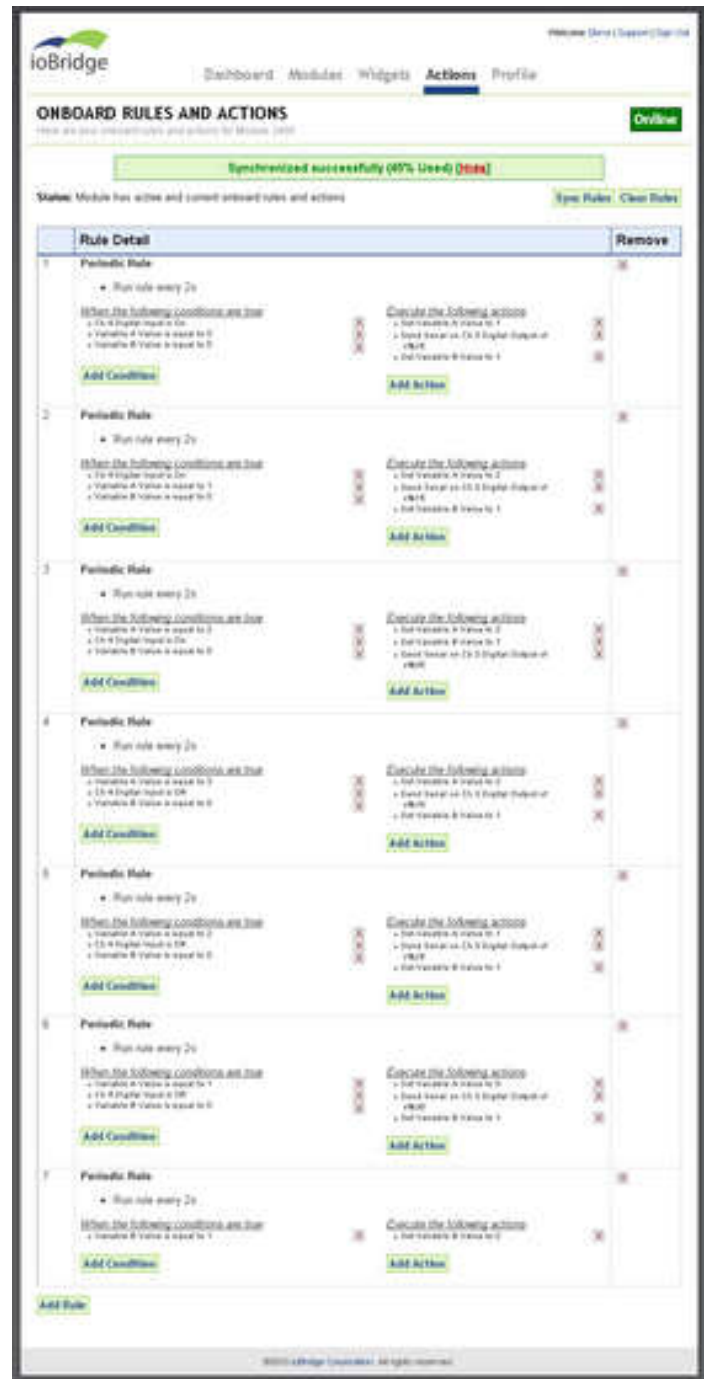
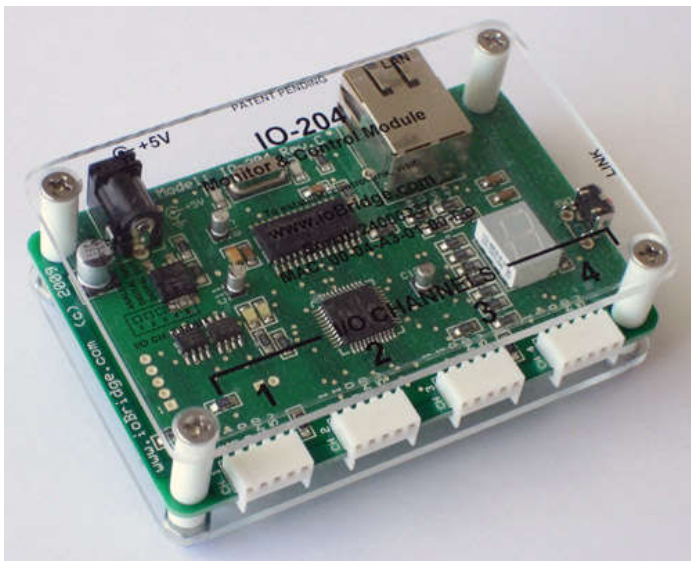
I wanted the IO-204 to change the volume of the MP3 track as motion is detected. As more motion is detected, the volume should increase to a maximum level by stepping through volume levels. I decided on 4 volume levels as a first attempt. When the MP3 player starts a track the volume is low. I also decided to check the motion status every two seconds. If there is continuous motion, over 8 seconds the MP3 player will reach the highest volume level. The volume will step down in volume as activity decreases.

When you have created your states, make sure you click "Sync Rules" to transfer your rules to the IO-204 module.

Log Your Activity

When the IO-204 is online, the module can push data to the ioBridge servers to be data logged. I created a digital input log (for both the high and low states). The data is accessible via an API. With a simple PHP script my friend was kind enough to assist with, I added up all of the the high states to see how much activity the system logged.





Step 6: Stay Healthy

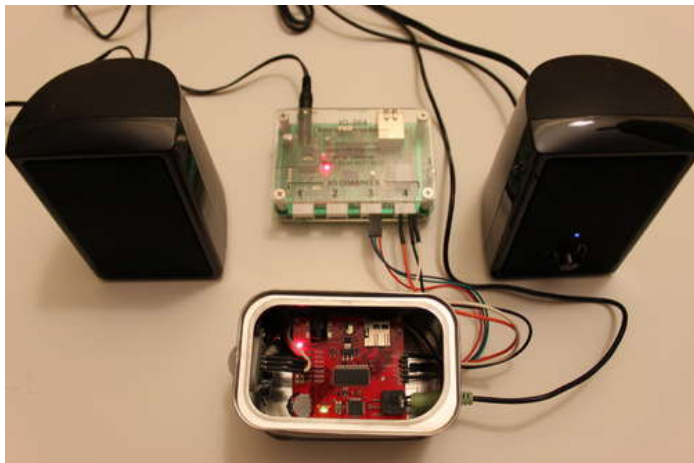
After some tweaks and tuning, I got the volume states to where I wanted them. Overall I am very happy how the proof of concept turned out. In the process, I also found another use - motion detector, IO-204 sending email when motion is detected or play a sound as an alarm that is triggered by motion. Or if I slack off too much, perhaps I will have it play some "encouraging words" from R.Lee Ermy (the Full Metal Jacket drill sergeant.).



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Stay healthy my friends,
Steve

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Comments

6 comments

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olegka says:

????? ????????? ?????????? ????????. ?? ????????????

Nov 24, 2010. 12:29 PM [REPLY](#)



iobridge says:

Great project! Good luck wit the contest. Last month we blogged about your project. www.iobridge.net/projects/2010/04/feedback-mp3-player-and-activity-logger/

May 24, 2010. 2:29 PM [REPLY](#)



inchman says:

This is cool, but how does it fit in with the Humana contest? Am I missing something?

Apr 18, 2010. 4:38 AM [REPLY](#)



polymythic says:

The rules indicate that the contest asks people to "Enter an instructable that promotes health..." This makes being active just a little easier by allowing you to feel the positive effects immediately of your activity. If you are rewarded for an activity, you are more likely to do it. :-)

Apr 18, 2010. 7:42 AM [REPLY](#)



odin84gk says:

From what I understand, PIR sensors detect a change in heat. How does it detect motion if you are standing in one spot? Does this only work if you are within a few feet?

Apr 16, 2010. 10:43 AM [REPLY](#)



polymythic says:

From the Parallax site it looks for changes in infrared patterns in its 20 foot field. So if you are standing still, the image is not changing much, hence no movement. I don't know the details of the sensor, but perhaps it just sums up the total IR content in its "snapshot" and if there is a lot of change, it registers movement. I doubt it takes IR values for a field and compares changes at each X and Y position.

Apr 16, 2010. 12:06 PM [REPLY](#)