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Spin Project: Halloween Pumpkin Project

Skill Level: Intermediate
Hours to Complete: 3 - 6
Skills Required: Read a Schematic Diagram, Soldering, Propeller (SPIN) Programming, Drilling and some Assembly

View this project's YouTube video on the ParallaxInc YouTube channel.

This project is a pumpkin designed to be used as a Halloween prop. It can be the trick before the treats!

Using a PIR sensor, the pumpkin senses motion and when triggered it plays a WAV file from a microSD Card while flashing an internal light, causing an eerie glow inside. You can place this project on your porch or in your yard on Halloween night to scare trick-or-treaters. Position the pumpkin in a path where trick-or-treaters come to your door, preferably a dark location. It looks like an ordinary pumpkin until it plays your preset sound file at your preset volume. This project could also be used in a fun-house setting.

What's Required

Parallax Products:

- (1) - Propeller Project Board USB (#32810)
  - *Don't have a Project Board? With a few modifications you can substitute an Activity Board (#32910/#32912).*

- (1) - microSD Card Holder SMD, Push-Pull (#452-10017)
- (1) - 2 GB microSD Card (#32319)
- (1) - PIR Sensor Rev B (#555-28027)
- (1) - 10" Extension Cable with 3-pin Header (#805-00011, discontinued)
    - *Try a #800-00120 or #800-00080 plus a 3-pin header instead.*
- (1) - Li-ion Power Pack Full Kit (#28989, discontinued)
    - *Try #28987 plus the #28988 instead.*
- (2) - 10K 1/4W Resistor (#751-00011)

Non-Parallax Products:

- (1) - 1 uF Tantalum Capacitor
- (1) - 0.01 uF Ceramic Disc Capacitor
- (1) - 220 uF Electrolytic Capacitor
- (1) - LM386 Audio Amplifier
- (1) - 8 Ohm Speaker
- (1) - IRL520 FET
- (1) - 12V Lamp (Red Marker Light, get at any auto parts store)

Optional Components:

- Standoffs (for mounting boards)
- 22 gauge solid wire
- Toggle Switch (to turn power on/off)

Carve Your Pumpkin

To build the Halloween Pumpkin Project, start with the pumpkin itself. It can be a real pumpkin or a plastic one. The one I used was plastic and I got a few of these at my local Wal-Mart for $4.99 each. Here are the 4 I purchased to use for this project:

These each had a 120 VAC light bulb inside that would light up when the cord was plugged into an outlet and the cord switch was turned on. Below is what the internal light looked like when removing the base from the first pumpkin.

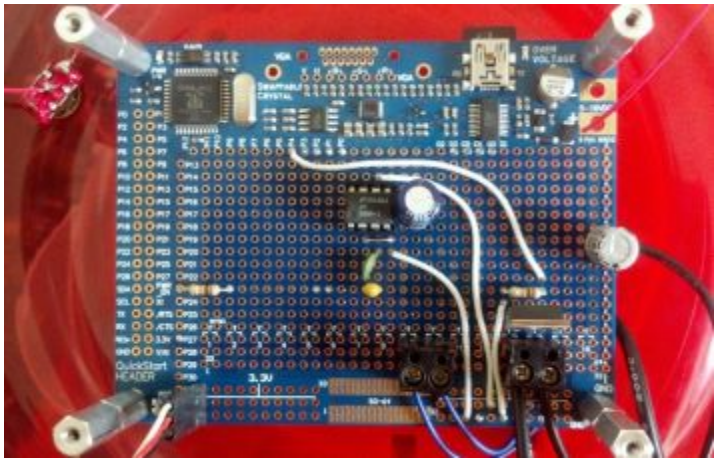
- ✓ Remove the existing light and replace it with an automotive marker lamp and the speaker.

- ✓ Once the lamp and speaker are mounted to the base and the wires run down through you can reassemble the pumpkin.

There's not enough room inside to really hold the control board and power supply so running the wires out the bottom lets us mount the pumpkin onto a project box that can hold these items.

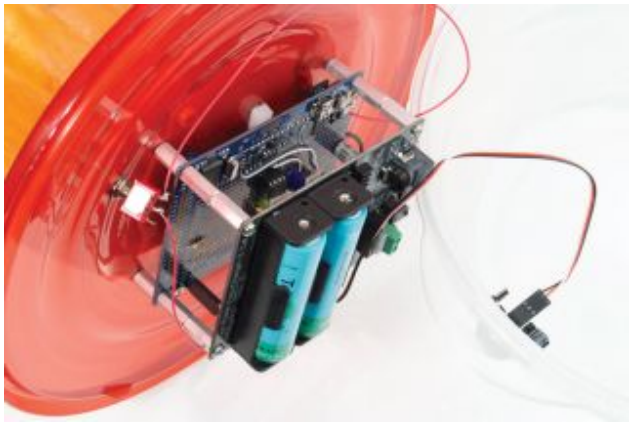
- ✓ Next, complete the Propeller Project Board USB by soldering the microSD Card Holder to the back side of the board.
- ✓ Once this is done you will need to connect the pads for the 4 signal lines to the I/O pins that will be used by the code.

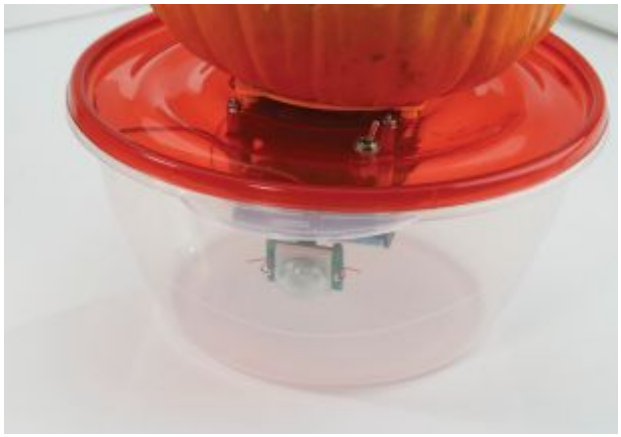
You can find these connections in the schematic diagram along with the details of the connections for the PIR Sensor, Audio Amplfier, Speaker and FET. As you can see in the image below, I mounted the LM386 Amplifier IC in a socket to make changing it out easy if I needed to. I had a set of PCB mount terminal blocks in a junk drawer so I used them. The FET was also able to be mounted in the proto board area on the Propeller Project Board USB. I mounted a 3-pin header in the bottom left corner to connect the PIR sensor. I used this connection method so I could easily disconnect the PIR sensor from the board. The FET is on the right side and the 10K pull-down resistor above it keeps it from coming on at startup when the gate would be floating.



In the above photo you can also see the microSD card below the USB connector. The microSD card must be formatted in FAT32 and make sure your WAV file is copied to the root directory. In the code I am playing 4.wav, which was one of 5 WAV files I copied to the card to test for use in this project. **You can find free WAV files online for many categories of use, including Halloween (see our Sound Library here); I am not able to distribute the ones I used.**

Below you can also see a red wire running from the positive voltage input over to the optional power switch. I didn't run a ground terminal because I am using the Li-ion Power Pack and it is connected via standoffs to the control board, providing a common ground.





I decided that all of my project enclosures were too small to hold the pumpkin stable so I grabbed a 2-pack of Rubbermaid Take-Along containers for <$3.00 and mounted the control board under the inside of the lid. The PIR sensor was mounted in the bottom section and secured with some bell wire. Once the lid is placed on the bottom section you have a stable platform for your pumpkin and the electronics are protected.

Spooky Code

✓ Run the included project code.

When power is applied the pumpkin may immediately respond to motion from you. Place the pumpkin in a location where people will walk by it and trigger it. It should also be dark so the glowing from the internal lamp can be easily seen lighting up the inside of the pumpkin. The code is written so that each time the PIR sensor is triggered, it will wait 6 seconds before checking again to give it a chance to settle. This should prevent it from going off constantly. If you want to make it wait longer just change the constant for the delay to the number of seconds you want it to wait and upload the updated code to the board.

The volume setting is one thing you will have to experiment to get right. Valid values range from 1-100 but the exact level you want will also be dependent on your speaker size, position inside the pumpkin, etc. I positioned my lamp behind the speaker so it would shine up and back illuminating the inside of the pumpkin, but not be seen from the front through the openings.

If you would like to change any of the I/O pin assignments used due to placement of components on your board, just be sure to reflect the change in the constants section of the code. This project is completely expandable and easy to modify. There is room on the board to add more sensors, expand the complexity, etc.

The Gory Details

The PIR sensor detects motion by sensing a sudden change in the PIR field in its view. This causes the output line to go high briefly, which is detected by the Propeller chip, that will then play a WAV file stored on a microSD card. It also flickers a light inside the pumpkin for the

duration of the sound file by pulsing the gate of a FET connected to an automotive light assembly set up within the pumpkin.

The WAV Player object is responsible for actually playing the WAV file while the underlying SD-MMC_FATEngine handles reading the data from the microSD card. The demo code was modified to handle this project.

The flasher method and player methods are launched into different cogs to that they can run at the same time. This is how the demo code originally handled playing the WAV and detecting the start and stop so I used that concept for this code as well.

Want to build more than one and connect them all wirelessly? Check out the follow-up project: Halloween Pumpkin Project with XBee (included in this project download).