

Learn how to:

- Automate a Light
- Automate Your Porch Light
- Remotely Monitor a Pet
- Make Your House Talk
- Create Time-Shifted FM Radio
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O'REILLY®

HOME HACKING PROJECTS

for Geeks



Tony Northrup & Eric Faulkner

Remotely Monitor a Pet

3

Cost



\$300 or less

Time



three or four hours

Difficulty



3 out of 5



My wife, Erica, is an overprotective mother. We don't actually have any kids, though—just a cat. Sammy's not even the kind of cat that you really need to worry about; he's healthy, young, and built like a goat. But Erica still worries. Erica worries so much that we can't take an overnight trip without spending half the time wondering if the cat is okay.

Erica and I got married a couple of years ago and went on a honeymoon cruise. We hired a pet sitter to come and feed the cat on a daily basis, and to reassure Erica that everything was okay, I set up a cheap webcam and some motion detection software. It worked terribly.

Of course, it was still better than nothing—we were able to connect to the Internet from the very slow satellite link on the ship, and browse through a directory of webcam pictures to verify that Sammy was alive and that the pet sitter was feeding him. However, the motion detection software was very unreliable. The video from the webcam had so much noise that the motion detection software triggered almost constantly. It would even take pictures throughout the night, when there was total darkness and the camera couldn't capture an image. Worst of all, I actually *paid* for that software.

The camera was in the room with my computer, but the cat didn't spend much time in that room. So we had to look at hundreds of pictures to find

What You Need

- Three X10 lamp modules or wall switches
- Three indoor X10 motion detectors
- Three wireless cameras
- A wireless video receiver (compatible with wireless cameras)
- An X10 wireless transceiver
- X10 Powerline Serial Controller
- Eight AAA batteries
- A stable Internet connection that allows inbound connections (broadband helps)
- A computer running Linux
- A video capture card with composite video input
- Sticky poster adhesive
- A screwdriver

For a list of specific parts used in this project, refer to Exhibit A at the end of this chapter.

a single one that actually had the cat in it. This was especially tedious because the webcam software just dropped the pictures into a folder. I used Windows 2000's Internet Information Server's directory-browsing capability to view the list of pictures from a browser, but this was slow because it didn't display thumbnails.

Clearly, it's time for something better. This time around, I'm going to set up a Sammy-monitoring system that can do the following things:

- Take pictures in three locations: the cat's food bowls, the cat's favorite window, and the cat's litter box.
- Take pictures only when there really is motion. No more false alarms.
- Turn lights on when necessary so the camera has adequate light to take a picture.
- Don't take pictures when it's too dark.
- Automatically process pictures to improve image quality.

- Allow me to browse thumbnails of the pictures from an Internet café.

And of course, it needs to be cheap. Figure 3-1 shows this project's conceptual architecture. As you can see, the pet triggers the motion detector, which sends a signal to your computer, which in turn will take a snapshot through the remote camera nearest the pet. Then, the picture will be timestamped and saved to a Web page, where you can view it anywhere in the world.

Project Overview

This project builds on the preceding projects by leveraging X10 switches, motion detectors, an X10 computer interface, and a custom Perl script. It also introduces several new components: wireless cameras, a video capture card, photo album software, and the Apache Web server software. Note that this project runs only on the Linux platform—just about any major Linux distribution should do fine.

With a little bit of effort, you could probably modify this project to run on a Windows system. The only component that I couldn't find was the Windows equivalent of the *webcam* tool that's part of XawTV. If you can find a command-line tool that saves a single picture file from your video capture card, you can make this project work in Windows.



Figure 3-1. The conceptual design is simple, but the execution will be complex.

The first step in this project is installing the hardware. If you want to be able to view pictures after the sun goes down, you'll need to install X10 light switches or modules to provide additional lighting for the cameras when a picture is going to be taken. An additional benefit of this is that it helps to simulate activity in the house—as your pet moves from camera to camera, the lights in different rooms will turn on, and your home will seem occupied (by more than a cat).

You'll then need to place three X10 cameras around your house. These wireless cameras transmit on the 2.4 GHz frequency, the same frequency used by 802.11b and 802.11g networks. The cameras don't seem to have any impact on the performance of my wireless network, though. Only one camera can transmit at a time, and fortunately, they are smart enough to turn themselves off when a different camera turns on. The cameras also turn off when there's no motion, so if they do interfere with your network, it will be only occasionally.

The three motion detectors will be installed in the rooms where the cameras are. When a motion detector is triggered, it will send an X10 signal that will be processed by three separate devices: the wireless camera in the same room, the light in the room, and the X10 computer interface (and the Perl script). This has the effect of changing the video feed into our video capture card to the active camera, turning on a light, and notifying our script that it's time to take a picture.

You'll need to connect your computer to the X10 network using a computer interface, as discussed in the “[Connect the X10 computer interface](#)” section of [Chapter 2](#). If you don't already have one installed, you'll also need to add a video input card to your computer. Finally, you'll need to connect the X10 wireless video receiver to your video input card.

There will be some software to install, too. Hopefully, your Linux distribution will automatically detect your video capture card, but you'll need to install XawTV and the webcam component if they're not installed by default. You'll need Perl and a handful of modules for your script. And finally, to provide remote access to your pictures, you'll need to configure a web server (if you don't already have one) and a web-based photo album.

Beware of Humans

Of course, the traditional answer to pet monitoring is to get your neighbor to check up on your pets. But beware of human error—a good friend recently asked his neighbor to care for his pets while he was on vacation, and the neighbor *completely forgot!* My friend's dog and cat were severely malnourished when he returned from vacation.

Motion Detection

You want to take a picture only when your pet is active, so you need to know when your pet is moving and which room he is in. As you're probably well aware of by now, this feat can be easily accomplished using motion detectors.

For this project, you have two main considerations when choosing a motion detector: it needs to connect to your Linux computer (which is located in a different room) and it needs to be cheap. After looking around on the Web, I decided the best option was a wireless X10 motion detector. They cost only \$20 each, they're wireless and battery powered, and a Linux computer can intercept their signals using a simple script.

1. Install X10 light switches or lamp modules

The webcams you'll be using in the Image Capture phase of this project can't see in the dark. In fact, they produce terrible pictures in anything less than bright sunlight. So, if you want to capture pictures of your pet moving around in the evening or in a room without bright natural light, you'll need to add some X10-enabled lighting.

If you've already replaced all the light switches in your house with X10 light switches, or if you're using night-vision cameras, you can skip to the next step. If not, and you want to capture pictures 24 hours a day, you'll need to replace the light switches in the relevant rooms with X10-enabled switches. For detailed instructions, refer to the “[Replace the switch](#)” section of [Chapter 1](#).

You need all the lighting you can get. A desk lamp that can be pointed downward at the location where your pet will be is a great way to ensure that your pictures turn out well. If there's not enough light, the Perl script you'll create in the Image Capture phase will attempt to brighten the picture.

If you don't have built-in lighting in the room where you plan to put the camera, or if you just want to avoid wiring, you can use X10 lamp modules. To configure a lamp module, follow these steps:

1. Set the house code of the lamp module to C.
2. Set the unit code of the lamp module to 2, 3, or 4. Make note of the unit code you use in each room.

We're using 2, 3, and 4 because the wireless transceiver has the unit code of 1. While this doesn't stop you from using that address for other things, it will audibly click on and off each time a signal is sent to that unit code.

3. Plug the lamp you wish to control into the lamp module.
4. Position the lamp so that it casts light onto the area where your pet will likely be. The more light you can get on the pet, the better the pictures will turn out.
5. Plug the lamp module into the wall.

2. Install the wireless transceiver

The motion detectors used in this project are wireless, so you won't be forced to place them in less-than-ideal locations just to be near a power outlet. The wireless transceiver receives signals from the motion detector and relays them across the wired X10 network. For detailed instructions on configuring wireless transceivers, refer to “[Connect the wireless transceiver](#)” in [Chapter 1](#).

3. Configure and install the motion detectors

Many motion detectors include the option to operate only in darkness; if your motion detector has this feature, be sure to configure it to operate at all times, regardless of the ambient light level. If you are using the X10 wireless motion detectors, follow these steps to configure them:

1. Press the Unit button once. The red light will flash.
2. Press and hold the House button. The green light will turn on. After about three seconds, the motion detector will report its dusk/dawn setting as follows:
 - The red light will blink once if the motion detector is set to detect motion at both day and night.
 - The red light will blink twice if it detects motion only when it's dark.
3. Release the House button. If the red light blinked twice, change the setting by holding the House button for three seconds until the red light blinks again. The red light will then report the new setting with one blink.

For instructions on configuring the house and unit codes of your motion detectors, refer to “[Install and configure the motion detector](#)” in [Chapter 2](#). As always, you can configure any house and unit codes you like; however, the script in the Image Capture phase of this project uses a house code of C and a unit code of 2, 3, or 4 to match the unit codes of the cameras and lights.

You need to install one motion detector in each room that will have a camera. Since the motion detectors are wireless, you have much more flexibility when placing them than you will when placing the cameras. Follow



Figure 3-2. Carefully positioning the motion detector greatly reduces the number of false alarms.



Figure 3-3. Poster adhesive is an easy way to secure your motion detectors.

these guidelines when positioning the motion detectors:

- Place the motion detector so that it will be as close to your pet as possible. [Figure 3-2](#) shows how I positioned a motion detector in the window frame of my cat's favorite window.
- Point the motion detector toward a wall. You want to avoid triggering it when you're walking past (even if just while getting ready for your trip), so do your best to isolate the small area where your pet is likely to be.
- Position the motion detector in an out-of-the-way location so that it isn't accidentally knocked over.

Rest the motion detector on a flat surface and secure it with poster adhesive. This is especially important if you have a cat, as cats like to bat at things. The adhesive works best if you stick small pieces in each corner of the back of the motion detector, as shown in [Figure 3-3](#).

The motion detectors have a wider angle of view than the cameras, so if you find yourself getting a lot of false alarms, it may be that the motion detector is seeing movement outside the range of the camera. You can reduce the motion detector's range of view by covering part of the lens with opaque tape.