CHAPTER 9

Project 2: Crazy Beams—Exercise Your Pet!

In this project we are going to try to give your pet (your cat or your dog) hours of harmless fun and exercise. This project is a little like the gem light project we looked at in Chapter 4. This time, though, we’re not out to do something ornamental; this time we have a functional aim in mind: keeping the animals entertained!

The idea for this project came from observing how much fun it can be to watch a cat or dog trying to catch the light spot cast from a presentation pointer. You’ve seen these things; they are very low-powered laser lights, usually no more than 5 mw and often built into a pen or a key ring. They are used to put a pinpoint of red light on a screen—usually to indicate a point or area of interest during a live presentation that uses a computer or a stills projector. A dog or a cat will happily spend a long time skittering around the floor chasing one of these light spots, while you, sitting comfortably in your chair, shine the light all around the room. The animal pounces on the light spot triumphantly. But then, the light spot escapes its grasp and it’s off again. Then the light disappears altogether. Where has it gone? It’s behind you! Your dog or cat can have hours of fun. The trouble is that the human wielding the pointer light usually gets tired of the game before the animal does!

So, what if there was a machine to do the light shining? One that could move the light around, casting multiple light spots, randomly speeding up and slowing down, making the light disappear and reappear again somewhere else. Endless fun! And, since a machine never gets tired, it goes on and on until the animal has had enough!

The Project

This project uses two very low power lasers attached to two servo motors. These motors allow the beams of light to be moved around in the horizontal plane. However, the laser and motor assembly are mounted on a spindle which allows them to be moved in the vertical plane by a third motor; this allows the AVR controlling the whole thing to move the beams around quite a large area.

The second laser and its associated motor are optional, you can just build the project with one laser and servo motor if you want to. Although the effect is better with two beams, the software doesn’t care if any (or all) of the motors are not really there. Commodity-priced servo motors don’t offer any positional sensing capability to the host computer, so unless you use far more expensive motors the Crazy Beams software has no way to sense the motor positions. This is not a problem, however; as we saw in Chapter 4, servo motors are pretty good at doing what they’re told!

If you have multiple animals to entertain, you could add a third or even a fourth motor and laser. That would make lots of beams for your pets to chase. If you’re scaling up the project in that way, though, you need to make sure your power supply arrangements are sufficient. The power requirements for each laser are low, but each additional servo motor adds quite a lot to the power supply load. Scaling up the project from a hardware point of view is not hard; there are lots of spare I/O pins on the AVR MCU chip and the software makes use of a motor descriptor array which can be extended.
Another way to scale up the project without extra motors and lasers would be to add prismatic diffusers, to split the beams multiple ways, although at reduced intensity. You can get some very pretty room lighting effects in this way too, but that’s beyond the immediate scope of this project.

Sourcing the Lasers

Presentation pointers that incorporate low-power laser diodes are widely sold and cheap, so my first thought was to try to extract the laser diodes I needed from two of these. Having tried this, I can’t recommend that approach. The problem is that those kinds of products are really not meant for disassembly: they seem to be put together as a friction fit under a lot of pressure. That means that you have to cut your way into them, making jagged edges and (in my case) deforming both the lens assembly and the laser diode in the process. My laser didn’t focus properly afterward and stopped working shortly after that. So, on the whole, pillaging a presentation pointer for its laser module seems like an unexpectedly tricky job that could take a lot of tries to get right!

Fortunately, you can buy just the laser diode and lens assembly separately and ready wired for use with a power supply; it does cost a little more, but it’s ready to go when you get it—and this is the route I eventually took.

Example products can be found at

- www.maplin.co.uk (UK) (search for LE07).

Example products can also be found at various eBay vendors (search for “laser diode module”). Make sure you get +4.5V or +5V lasers, which will simplify your power supply arrangements. Don’t get anything more powerful than 5 milliwatts because it will be too bright and possibly dangerous to your eyesight.

Caution Never regard a laser as harmless. Using one with the recommended power level is as safe as we can make it, but do not ever shine the laser directly into your own eyes or anyone else’s. Sight damage will occur. Also, make sure that the laser stays slightly unfocused when you set up your Crazy Beams project. This will diffuse the laser light slightly so that your pet’s eyes, if they happen to look at the unit, cannot be overexposed.

The lasers I used consume about 40 ma each, which is not a lot, but about twice as much as you would want to take from an MCU pin. So, we have to include our old friend the 2803 transistor array chip (see Chapter 3) to provide the drive that the lasers need. You could use just use NPN transistors, such as a couple of BC548s if you prefer—but by the time you’ve added a base resistor they’d probably take up almost the same amount of board space.

Project Build

The project consists of three major assemblies.

- A simple wooden frame.
- The horizontal motor/laser assembly.
- The electronics board. I just built the project on the test bed rig, but you could easily make a solder board version of it—it’s really just two chips.

---

1In fact an ATmega328 pin could sink about 40 ma, but it’s an absolute maximum value which—since we would be doing it on two pins (one per laser)—is not advised.