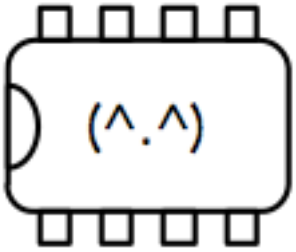
LED Experiment ch3



www.ZENMCU.com

Draft 1 2023-01-01

LED Experiment #3

This document is a supplement to com.zenmcu.0031-0_(zenai-community-of-robots).pdf.

I constructed a robot platform for further experiments. It uses a 3.3V rechargeable lithium battery, two continuous rotation servos, and the same pair of red LEDs from the previous experiment, brd0057e on a breadboard with some creative wiring.

Ok, I am the first to admit that this is an ugly kludge, but I did want to experiment with using heavy-ish copper wire as a structural element. So yeah, the LEDs stick out the front stupidly, and the silly servo wires has to be bundled up out of the way. But it was sufficient for the experiment.

I used two different methods of reading the LEDs; loop counting with a timer as a timeout, and just using a timer, with a timeout. They both worked about the same, but I prefer using the timer as it isn't sensitive to the CPU clock like loop counting is.

I observed several things:

The datasheet for the continuous rotation servos does not specify the pulse width range. My expectation was 1000 to reverse, 1500 to stop, 2000 for forward and in fact this was pretty close. I did experiment with these values some, and ended up using 1100, 1500, 1900 as the pulse widths for bwd, stp, fwd. Because my servo driver attempts to accelerate smoothly these values seem to work.

However, the two servos don't spin at the same speed, so if the robot just tries to drive forward it goes in a large circle. To account for this I had to adjust the pulse widths one servo slightly.

I expected my timeout value to be around 160 or 200 usecs because the LEDs should discharge in under 100 usecs when illuminated. However, I ended up needing to use a much larger timeout of 1500 usecs.

I set a hysteresis of 10 for the LED delta so that the chassis would turn only if the light differed by more than this amount. Obviously that is a sensitivity knob and warrants adjustment.

The range is only a few inches, which is as expected. Hopefully small wandering robots in a modest sized enclosure can discover each other, face each other, and maneuver close enough to establish a communications link.

Ambient light didn't seem to have much of an impact on performance.

I added a heavy paper divider between the LEDs to see if that made any difference in the behavior but it didn't really. It just made the robot look even stupider than it already does.

Lack of fine motor control resulted in overshooting, leading to oscillation.

Things to try:

Scale the fwd/bwd pulse widths based on the delta LED readings. I.e., turn faster if the delta is large, and slower if it is small.

Vary the hysteresis to dial in a decent sensitivity.

End