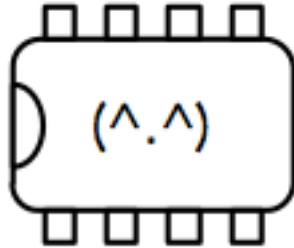


ZenAI Community of Robots ch6



www.ZENMCU.com

Draft 1 2023-03-28

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zenai-0.0a #5

I have had numerous non-hobby related activities to attend to so I have not made great strides forward recently. However, I did decide to go ahead and try my hand at some circular PCBs.

In the spirit of trying to do something I believe I can actually finish, I designed a circular robot board, r0001c, for a SAMD10C, dual motors, and line following using an LED to light the floor for a pair of CdS LDRs.

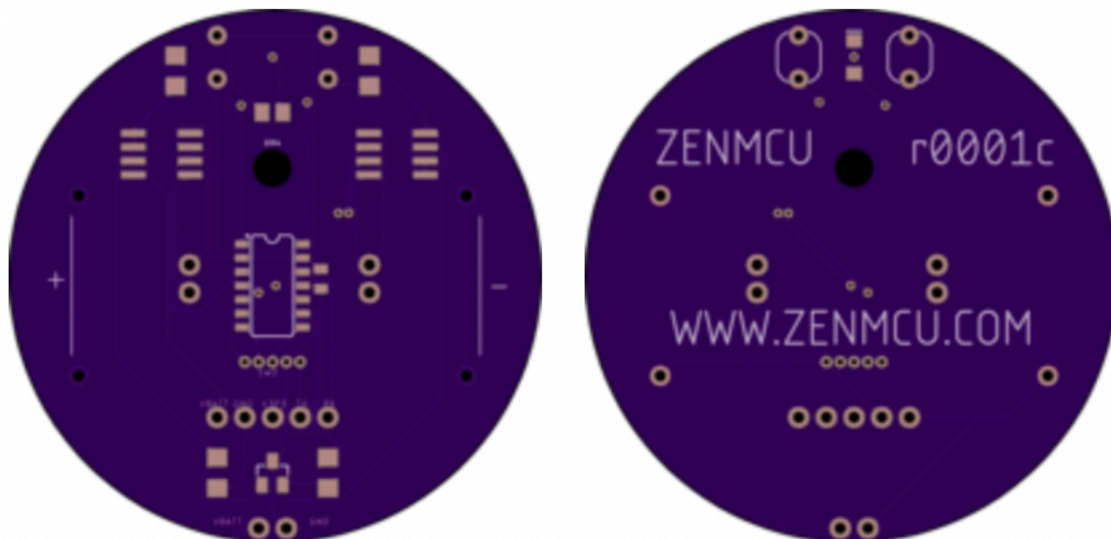
Like Robigotichi and contemporaries the LDRs are paired with caps and are operated as one-shots; charged through a pin then timed until discharge. Similar to the LEDs but it takes only one pin per sensor. (Yet another really crude DIY ADC.)

It has an LDO for a battery and, since tiny slide switches somehow cost between 1 and 5 dollars now, I decided to use a jumper as a power switch.

I added a 5 pin vertical bus with VBATT, GND, V3P3, TX, RX to go to another board as an add-on. And I added a hole for a hex standoff to help support an expansion board. The battery is to be held in place by two contacts made of cleverly bent paperclips.

I am not confident about the placement of the components. The SWD pins are near the center of the robot, under the edge of the battery, and possibly on top of the motors. The expansion bus is sort of arbitrarily located near the LDO, and the hole for the standoff is kind of roughly opposite that.

But, at least it's a start. I ordered three boards, and building at least one of these should be informative and help to refine the design.

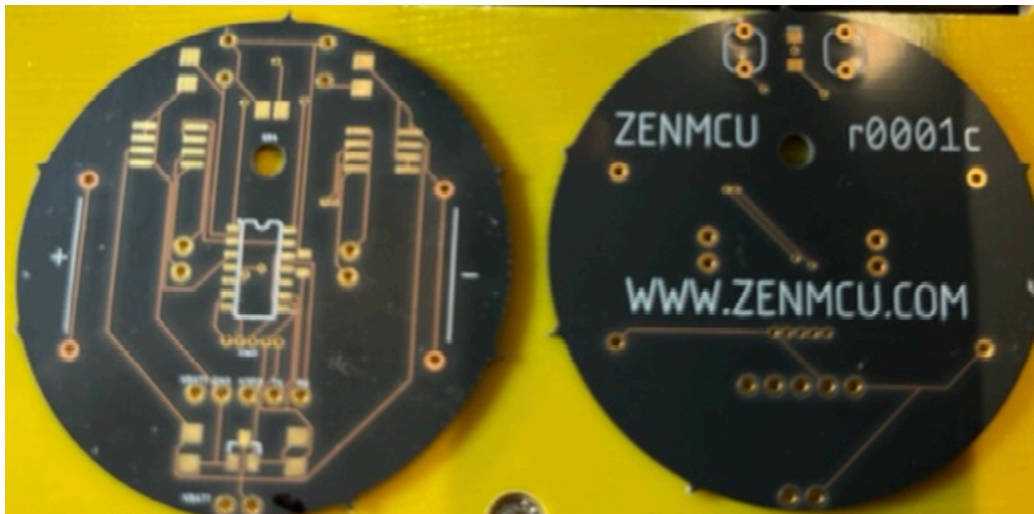


Architecturally this design is a Spanda card. While it is capable of operating on its own, and accepting 4th scripts via the HIF UART, the long term intent is for this to be controlled by another MCU; the Base, in Spanda terminology. However, I have taken to calling the r0001c the "Rykor", and the future controlling MCU as the "Kaldane". If you are not familiar with Edgar Rice Burroughs' Mars stories then that will mean nothing to you. If you are then that may make some sort of twisted sense.

In any case, this is an intermediate step on the way towards getting to the real robot colony. I'm hoping that this is a significant evolutionary step along the way, resulting in a platform to build upon. I think the form factor is close to what I'd hoped for, and the decomposition of responsibilities between the Rykor and the (future) Kaldane seem to make some sense.

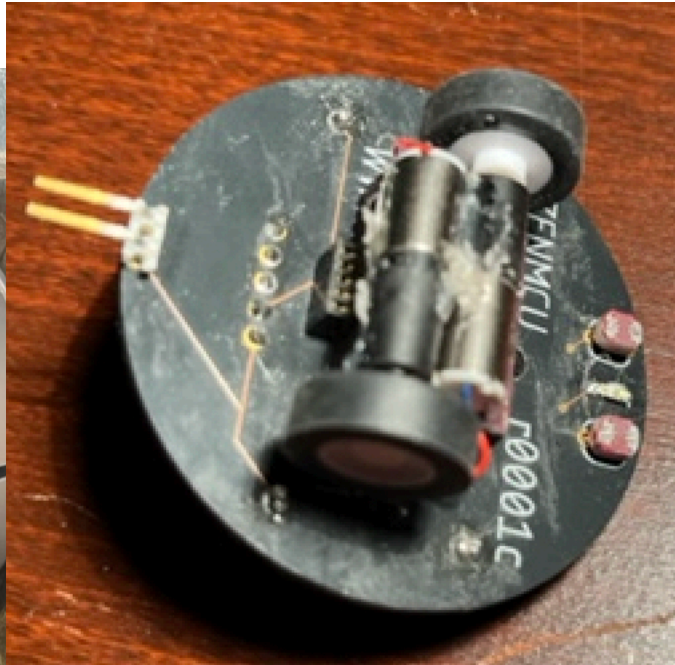
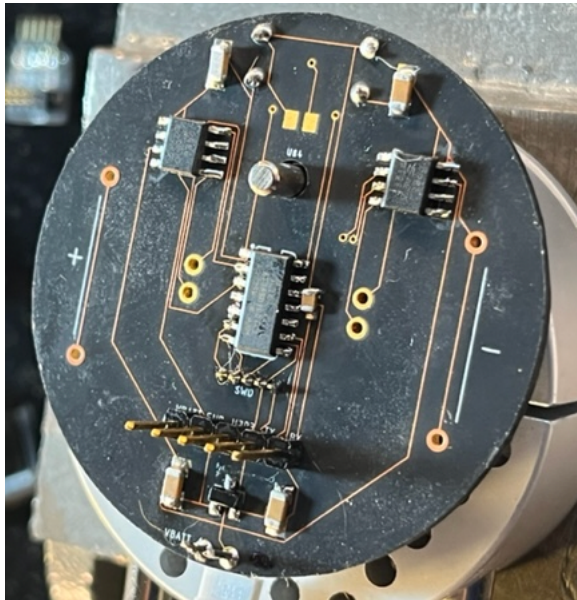
There are obviously other ways to do this that may actually be better, but I cannot keep building things in my head without actually trying them forever. I have to actually make a start, even if it is potentially naive.

So after waiting a couple of weeks to get the boards back, I finally started building one of these. The board is spacious and the parts are all easily soldered.



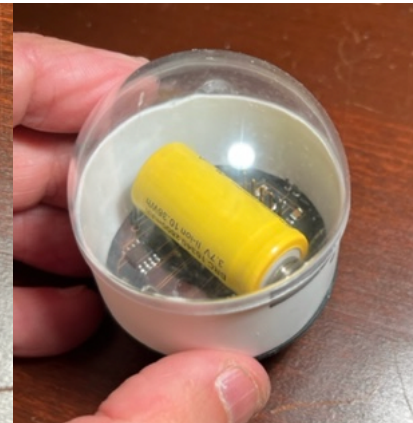
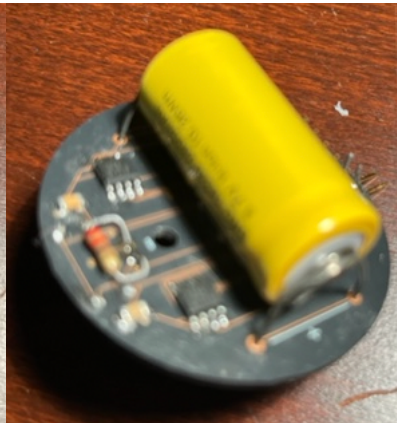
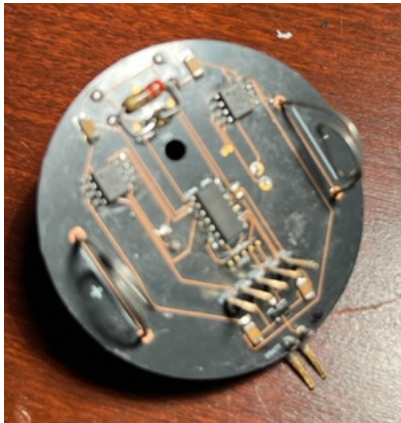
I was quite happy about the following:

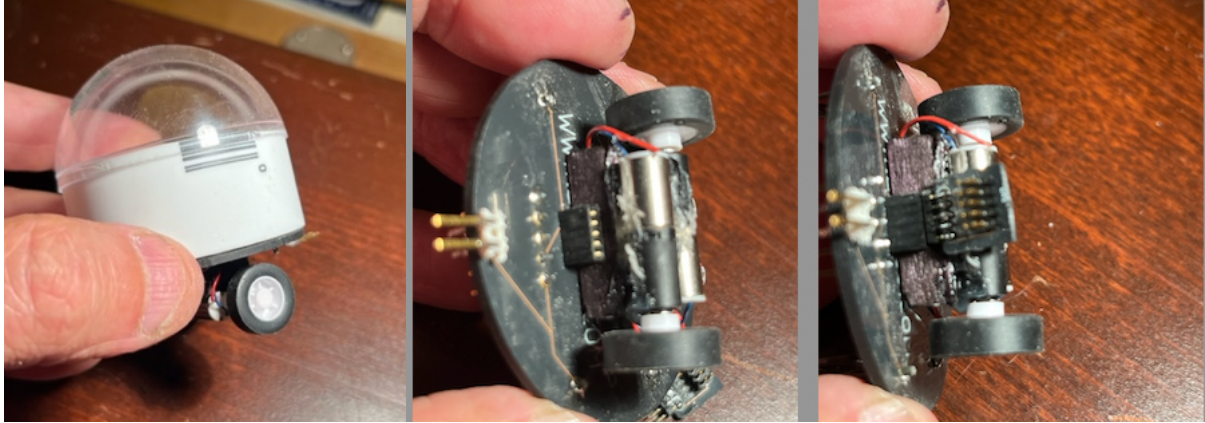
- Soldering was easy, except for the motors.
- Paperclip battery holder seems to work fine.
- First power on via USB-UART bridge and JLink, debugger connected successfully, no errors.



I have concerns about the following:

- I wanted the board to fit into the body tube of the robot, but I actually made it the outside diameter rather than the inside diameter. So it does not fit into the tube, although the dome fits it perfectly. Unfortunately, because the battery sits on top of the MCU it is just tall enough to prevent the dome from seating correctly.
- I decided I could glue the tube to the top of the PCB to raise the dome high enough to clear the battery. It looks like there is enough clearance around the edge of the board.
- The physical motor mount is crappy, and I need to improve it. Hot glue is not great for mounting motors so I ended up attaching the motor mount to the PCB using super double sided tape (the kind I use to hold PCBs on the pad for milling). I think this will be ok for now.
- The SWD connector is poorly located, and interferes with the motors with the SWD-Dapta is inserted. It should be towards edge, and should be a normal 10 pin header.
- SWD and power jumper kind of interfere with tail skid so I need to be clever. I probably should have used a switch, tiny switches are crazy expensive (like \$4).





Bring it up and testing each gazinta/gazouta revealed the following problems:

- The LED was laid out backwards in the schematic. and changed from 220 ohms to 470 ohms.
- The right motor worked, but the left did not. Turns out I soldered the motor driver chip 180 degrees off. In spite of trying hard to not do that. I removed it and resoldered it on in the correct orientation. Mischief managed.

Once I fix these issues I should be ready to see if my dual LDR plus LED line following concept actually works. Also, in the absence of a Kaldane to tell it what to do I may make an I/R dapta so I can remotely receive telemetry etc.

I have a good deal still to do to finish this experiment...

Ok so now that I have fixed all of the numpty errors I made building this thing its time to get the FW working.

[] I actually need a tail skid still, and I need a wheel skirt, and I need to paint the whole thing so it looks like I at least made some attempt.

[] I observed that the motors are much faster than I expected, so I need to add speed control using my SW PWM.

[] I need to read the LDRs as one-shots and use them in conjunction with the LED to follow a line.

End