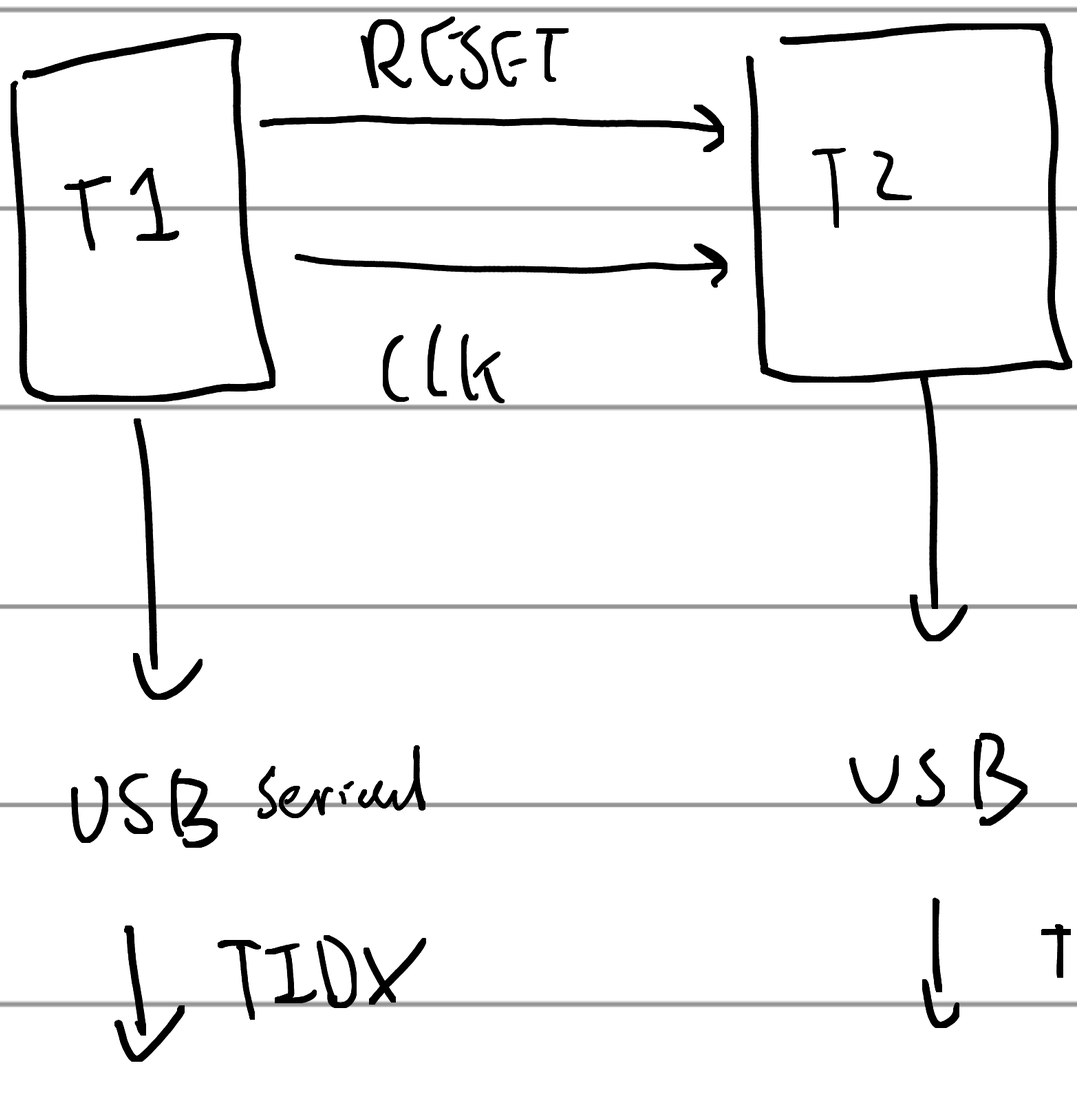
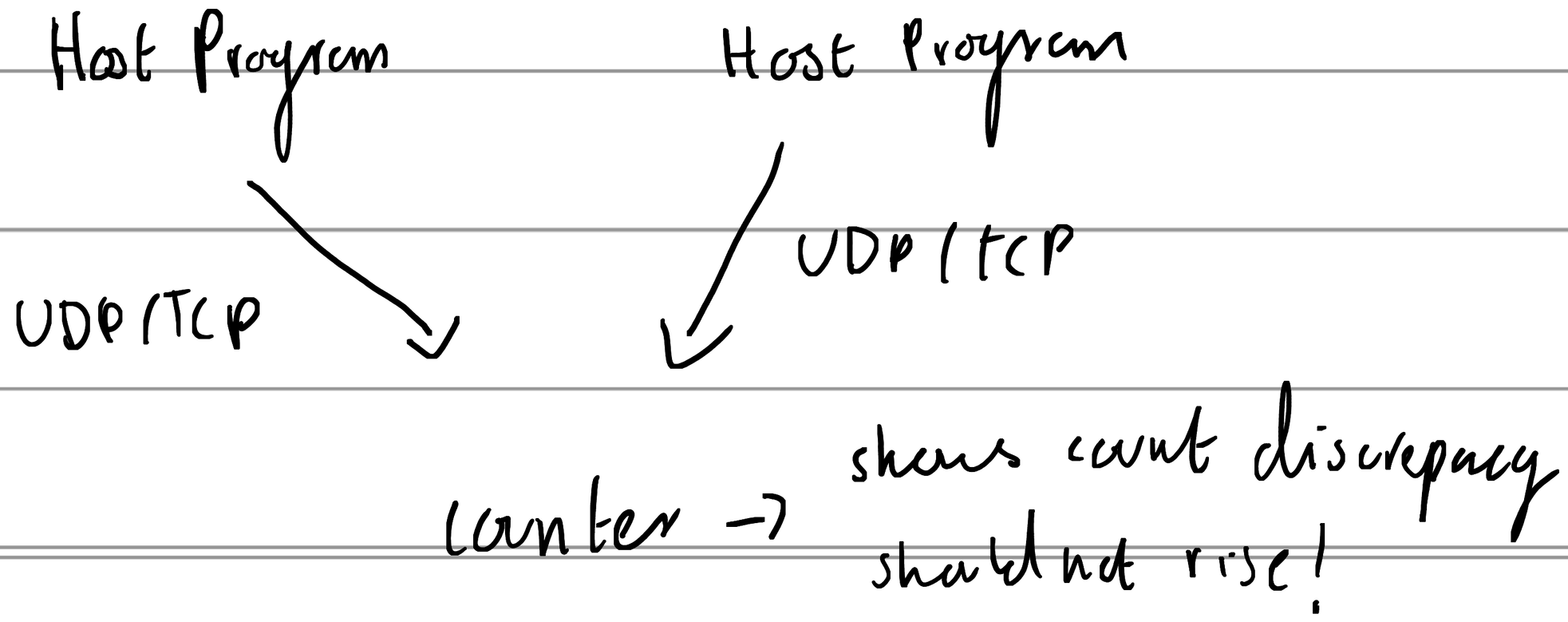
22/7/22

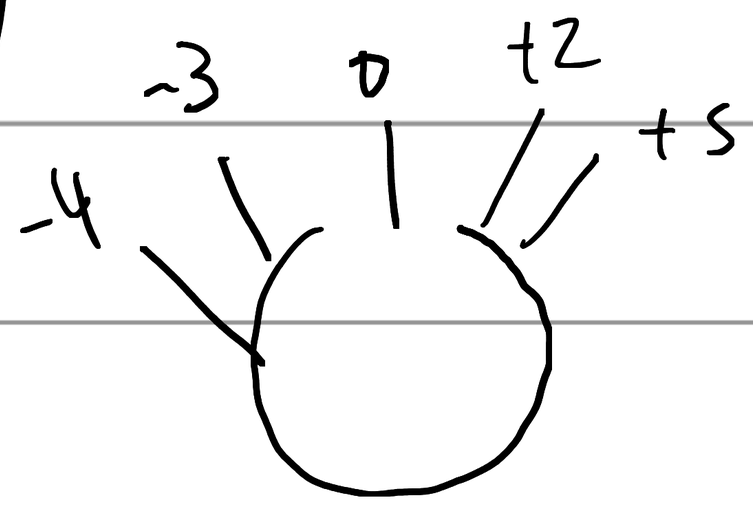
Thinking about synchronisation. I knew from testing that there is a fixed offset in terms of the number of CLK ticks, this indicates some initialisation issues, perhaps the RESET pulse will fix this? It's worth a test.





Could call this service Network Counter.

If the discrepancy remains constant but changes after RESET is pulsed then it would be a good idea to have multiple runs in each direction. Ideally balancing out the errors in each direction.



Could the network counter store the difference? Then we could maybe apply the displacement negating the diff & thus symmetrise after.

I worry that discrepancy is due to Serial.print a different amount of data, if buffering is the issue then could make

the byte message length the same. Although the time to compute each part of the message may still differ atleast we can eliminate one source of miss syncing.

If going to do multiple forward / backward runs need a way to combine datasets.

A B C A B C C B A C B A

So take backward direction & swap channels A & C & then merge based of angular position.

24/7122

Plan for next week → check Teensys for water damage with simple LED program

→ So. current program just pipes data from /dev/tcmp

→ Need a new program something fast maybe c++, bind to /dev/tcmp, open UDP port to CIK computer on the network.

→ Network send & log program ☐

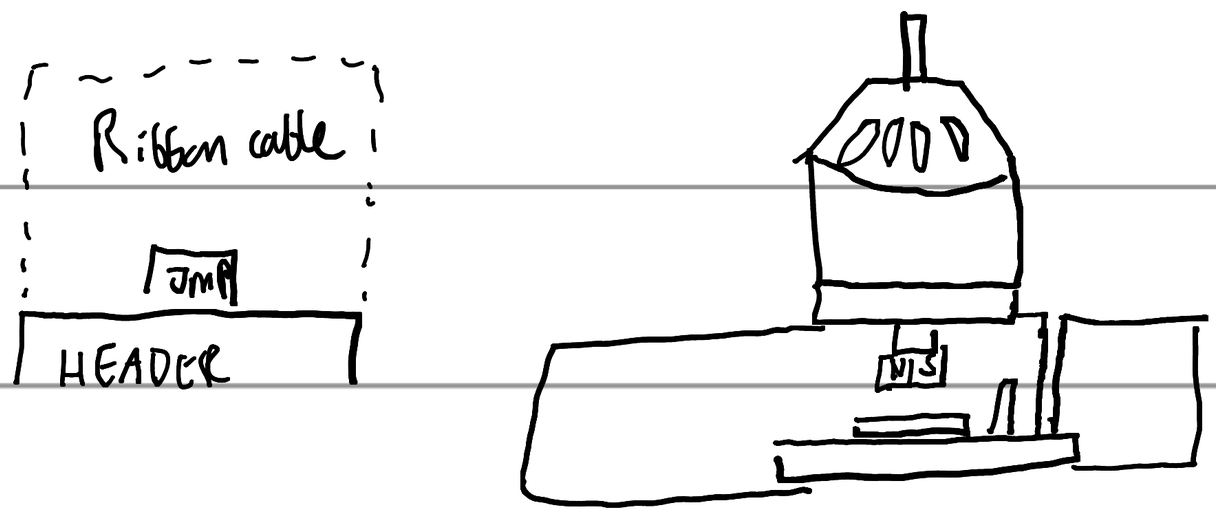
→ Network recieve & comp ☐

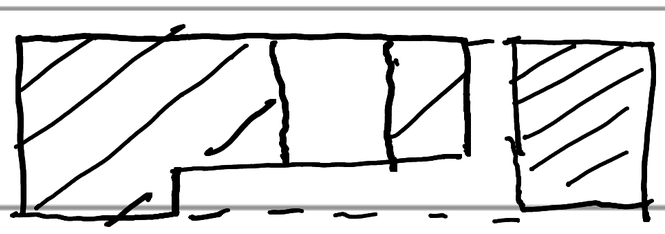
→ check ADC program ☐

→ check Encoder program. ☐

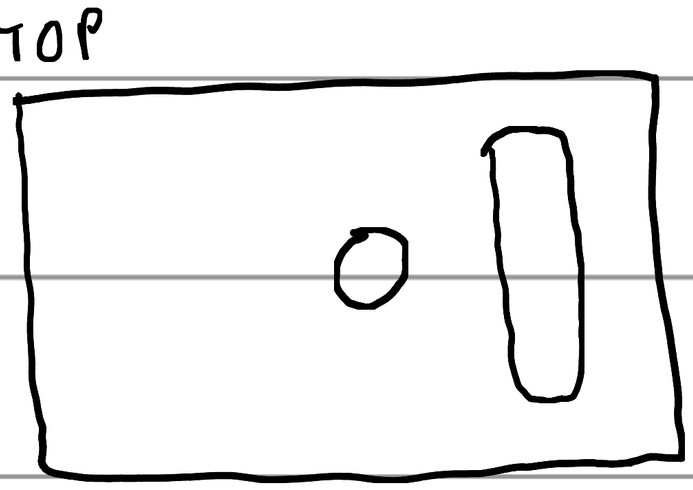
After playing with network sqme, do 1 simulated forward & backwards, test merging these datasets. Swap A & C.

Then need to actually mount the sensor.



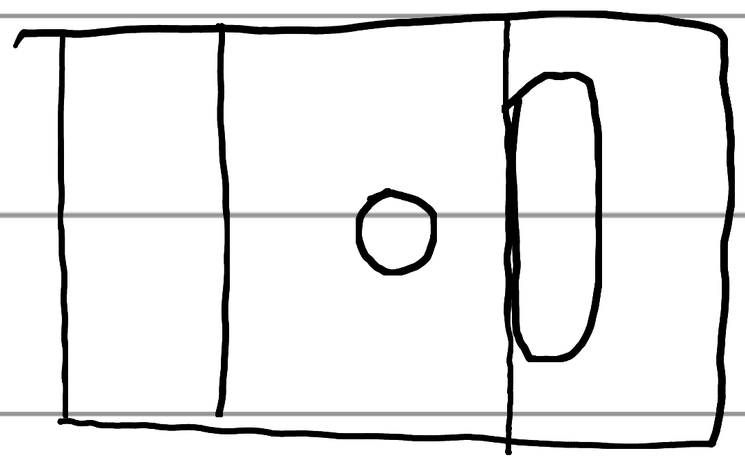


TOP



check where mounting screws could go, the encoder & motor need to be very well secured to avoid introducing displacement.

Bottom



2/8/22

So teensy's appear fine after water damage.

Tried the code I made some observations.

→ Teensy gives the RESET pulse before logging from tty ACM0.

Resolution to this could be wait for first byte I then start the process of resetting.

work on custom logger I wait for init then send a byte to Teensy I start logging.

Python logic needed ... bind to Teensy Acm, open socket (baud serial), send byte ... start logging.

Parsing code done. (wait for bytes from serial)

Two laptops refuse to connect via local wifi, but both can contact my home server, so will load the network-multicapture-sync program.

4/8/22

Testing setup 2 teensys + 2 host computers + 3rd network computer for syncing.

Interesting results; had to reduce the logging rate to 7,500 Hz, remove logging to disk & with power cables disconnected.

Seems susceptable to:

Host computer speed (small laptop logging encoder values) might be the cause of buffering.

Network latency / bandwidth, play with encoder write volume.

Network sync only really needs time so could reduce the data transmitted & UDP packet size (SIZ). (time only packet)

Writing to disk could be a bottleneck, check where we are writing (tmp ram disk) could try buffering in memory in python.

Try a faster computer for the encoder host, put this on ubuntu server where we run the sync program.

If network packet is ok sized then sync program could buffer output.

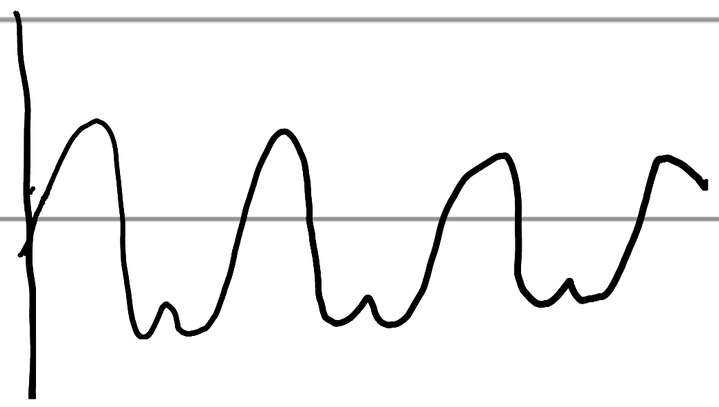
How much Hz do we really need?

$\frac{12}{2} \times 6 = 36$ steps

$\frac{7.5}{36}$ 20% there

rpm estimate

5,000 rpm → 10 k rpm



36,000 sps 18,000 sps gonna need something in this region. 18 → 36 k ideally double 72k + or more.

Step 1 new pc

Step 2 reduce logging

Step 3 retest

Step 4 reduce network packets

Step 5 retest

use ethernet cable? NO!

So eliminating slow laptop helps. Sort of stable

without writing to disk + with sync + service (device 1 encoder)

~50K (stable for about 10 mins)

Sort of stable with writing to stdout @ 50K. (a few mins)

Overclocking laptop hurts sync.

5/8/22

So tried to find the bottleneck

→ Tested network rate ~ 150mbps

→ Tested write to disk speed similar to network

→ Tested python vs nodeJS.

NodeJS is far faster for this sort of operation.

Turns out python serial library will not do a baud rate > 3000 (2048)

Rewrite in nodeJS allow baud rate of 5,000,000 more than enough. Now recording at x2 100 Hz with stability.

Need to fix code for nodeJS as is a mess, add arguments & fix package

write program to process network transmitted data, need to visualise data with drift run to make sure data is free from encoder noise.

Need to update documentation

6/8/22

Updated documentation.

Updated sync program & displaying maximum difference & current between device time.

Bug device 0 prints the baud number while waiting for start ... this messes up the sync program (diff & mdiff). suppress this print.

Took first network capture, affected by not unplugging laptop.

2nd network capture, affected by printing baud rate & start.

Step 1 → Remove bad print ✓

2 → Perform 3rd network capture.

3 → sync combine program

→ take last time from each device.

→ Remove any subsequent readings from device & dataset.

→ organise into two lists

→ from the last point in dataset 2,

find matching data point

→ merge lines into final format

→ print missing combinations & skip them. If something remains in the other list

→ when at end 0 or 1 step if not found in other dataset & no more entries in the other list (its exhausted)

used pandas with groupBy time, aggregate a set of lines, eliminated unmatched ✓

Next checkout combined dataset & try smoothing.

The smoothing parameters need to be command line arguments.

& sensible defaults documented. theta_variance

alpha

Check for noise in VN! Fingers crossed!

7/8/22

Probably better to re-write sync program in JS, worried about the latency causing data to be lost.

In source program need an on('close') handler so that we process exit after Teensy is unplugged.

1718122

Network sync via UDP is too lossy & TCP is too slow for the required transmission rate. Abandoning network transmission. writing via fs (node) was also too slow to show even if writing to /tmp ram disk. writing to /tmp was too slow. New strategy buffer list in node program only write to disk on Ctrl+C or if teensy disconnected, don't send anything by the network. Write to tmp on exit.

Data combiner is finished, created node program to merge the two data files from each host computers /tmp directories.

Testing

Problems with breadboard connectivity.

Problems if the drill is too slow, one channel is bigger than others.

Reminds me of last time with the parity bit.

Tried to remove time print from ADL as it changes very quickly (parity), but this time did not seem to have an effect, it was more to do with drill speed & checking connections. Also reduced log speed to 90kHz.

Got a few good runs with laptop plugged in and not plugged in! Kind makes me doubt how necessary the opto setup was fct: do remember huge frequency noise which in the latest run (run17-4) is totally absent (clean!) Lobbing about 90% data patches from the data combine program.

Todo:

→ use tip to transfer the data from nebula-device-server to the sync. (open connection on teensy unplug or ctrl-c) ✓

→ have sync program combined to data before writing it to the calibration dataset folder (do this after two connections close) ✓ suppress nebula errors → disk

→ chain commands

→ Readme cleanup ✓

→ ssh automation?

→ npm script to detect python env is active ✓

18/8/22

✓

Branch from main → FEATURES/ original - code-working

looking at network sync via tcp. ✓ Finished result

Still looks good, updated readme.

Updated FEATURES/ calibration from FEATURES/

calibration - network 2 ✓

Update main with F/ calibration. ✓