Notes on truck tests of "Rev4". Started 2010-07-03, DJL

2010-07-03, 4pm – Test 1

Two anomalies:

1. GPS did not get fix within 10 min or so
2. Launch was falsely detected (2 of 2 attempts) on the ground.

No steering attempt was made.

Only a tiny file (tt1.hex) was found upon downloading data. This contained only the INIT record.

Causes determined:

- The log file was short because I'd changed the log file length determination routine in DumpLog() to use FlashFlushPtr as an endpoint instead of reading the flash for 0xFFs. This doesn't work after a power cycle.

- FlushFlashImmediately() probably doesn't work properly. It loops until it returns 0, but that doesn't mean there are no (sub-row-sized) bytes left unflushed. (Need to ensure that all buffered bytes are actually flushed.)

Note that:

- Row size (write size) is 512 bytes
- Page size (erase size) is 4096 bytes. The end of the log is indicated by the remainder of the PAGE being empty (0xFF), not the ROW.

Without a log file, reasons for anomalies 1 and 2 could not be determined.

2010-07-04, 1pm – Test 2

Log problems have been fixed & bench tested.

Anomalies:

1. GPS took a long time to get a fix (but eventually did)
2. Launch was falsely detected on the ground.

On this try the GPS again took a log time to get a fix, but eventually did when sitting still outdoors.

Observation of the log shows that the GPS lost track of the satellites immediately when the truck motor turned on. My best guess at this point is that the noise from the truck's

DC (brushed) motor – either via the power supply or via RF noise – causes this problem. (I fear the servo motor might do the same thing.) I'll try it again with the motor running off an independent power supply and with some aluminum foil to (maybe) keep away some of the RF noise.

The false launch detection was clearly caused by the same thing – the motor induced noise in the pressure sensor input, which caused the launch detect. (I'm glad it was nothing more serious than this.)

2010-07-04, 2:30pm – Test 3

This time the truck motor was independently powered (4xC cells) from the CPU (6xNiMH), and there was an aluminum shield protecting the motor from the GPS.

There was no false launch detection.

There were no more problems with GPS reception.

Anomalies:

1. No servo motion

The log indicates that servo commands *were* being generated to the servo, but for unknown reasons, the servo didn't move from position 0 when in FLIGHT DESCENT mode. The servo worked OK when tested afterward.

I'm adding a servo test mode to state TEST_S.

Cause determined:

- The berg clip was missing from jumper VSERVO_IN. (!) Seems it had gotten pulled out while setting up the board in the truck.

2010-07-05, 11am – Test 4

Good GPS fix, within < 5 min or so.

Anomalies:

1. False launch detect immediately upon switching from AUTOARM SAFE to ARMED DANGER.

Cause determined:

- Two possible causes identified:
    - This may have been a result of testing with TEST_S (which greatly increases launch detect sensitivity) without power cycling.
    - Alternatively (or in addition), the pressure sensor was exposed to sunlight (it has a known sensitivity here; in the rocket it's always in the shade). A sunshade (piece of black electrical tape – not airtight, of course) was added.

2010-07-05, 12:20pm – Test 5

Truck steered itself for the first time. No obvious direction. I suspect the 200 mS GPS fix interval is too short, given the low ground speed of the truck, to produce meaningful course information.

Anomalies:

- Many bad GPS checksums reported in the log

This problem was not reproducible on the bench.

2010-07-05, 5pm – Test 6

Truck took quite a while to learn to steer, but appeared to succeed.

estimatedGPSLag appears to be in the range of 2.2 to 2.8 (* DT = 0.44 to 0.56 seconds).

Part of the reason for the slow adaptation was many turn rates that appeared to be excessive (or perhaps simply so tight that the GPS was unable to get a meaningful turn rate).

For the next try, the servo limits were adjusted to increase the minimum turn radius.

2010-07-05, 6:15pm – Test 7

Learned to steer much quicker this time, but it often bumped into the curb before learning to steer. The increased turn radius means it needs a larger test area when learning.

estimatedGPSLag was a bit lower – typically 1.6 to 2.1 DT units. It seems that servo lag is a big fraction of total lag.

I'm not convinced at this point that the 200 mS GPS fixes are 'real' (as opposed to interpolated). Will try with slower rates.

It may be worth building a GPS test rig to determine "real" fix rate.

On further thought, the low (working) values for estimatedGPSLag indicate that the fix rate is REAL. It has to be.

==> Change initial lag to DT*2 (is DT*1 now).

==> Limit range of estimatedGPSLag to min(DT*8, 3.5s)