Hardware/Software Codesign for Wireless Systems (E168b)

Harris

Lab 5: Navigation Data

Once the signal from the satellite is acquired, the navigation data must then be pulled off so that position can be determined. Navigation bits are transmitted at 50 Hz which corresponds to 20 repetitions of the PRN code sequence. The data can then be received by checking the polarity of the code sequence over a 20 ms time period. The data is transmitted in 5 words, each of which starts with the same preamble. The preamble is an 8 bit pattern that is used as a reference for finding the starting point of the data. Your task will be to write code that extracts the data from the signal, determine the starting point of the signal and which word is first in the set.

You will again use the 37 seconds of data taken from Trimble as well as your tracking code. This time, we provide the tracking results rather than the raw data. The tracking results contain the IP data for each millisecond integration. We also provide readTrackResults.m file that pulls out a vector of 37000 IP values from the tracking results for a specified satellite. The values should have the same polarity for 20 consecutive milliseconds. You will then correlate your results with the preamble to find the words in your data set. Remember that the preamble might be inverted if the Costas loop locks 180 degrees out of phase. You will also extract the bits that represent the number of the subframe and the TOW from the data. Generate a vector containing 1500 data bits of a frame starting at the first preamble that you successfully detect. Remember that there should be one data bit for every 20 ms, not one per ms.

Your Matlab code should accept the satellite number. It should call IPdata = readTrackResults(sat). It should return the preamble offset, the data bits starting at the preamble, and the first subframe number and TOW of the first subframe.

The data set contains several satellites. For your testing purposes, satellite 5 has a preamble starting at millisecond 3047. When your code is working, use it to determine the preamble location and the subframe number and time of week for satellite 24.

What to Turn in

1) Your Matlab code.
2) At what offset does the first preamble occur for satellite 24?
3) Which subframe is first for satellite 24? What is the TOW?
4) How long did you spend on the lab?