Ephemerides and Pseudoranges

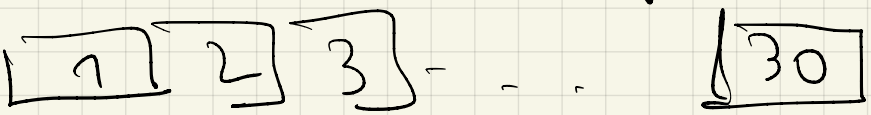
Last week: We obtained the bits transmitted by the visible satellites as $\{\pm 1\}$ values.

Goal of this week:

- Detect the beginning of a subframe in the sequence of bits (going from bits to pages).
- Extract the ephemeris from pages
- Compute the pseudoranges.

Recall the data structure:

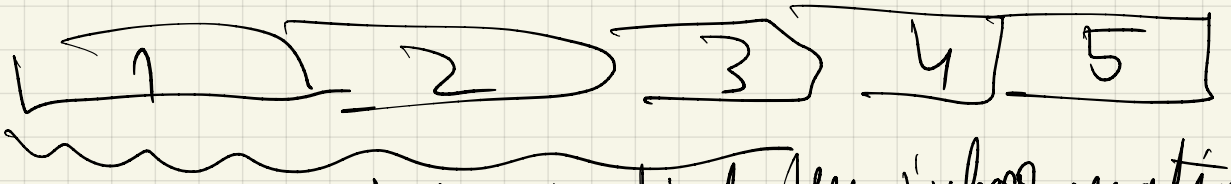
Word is made of 30 bits:



Subframe is made of 10 words (300 bits)

(words)

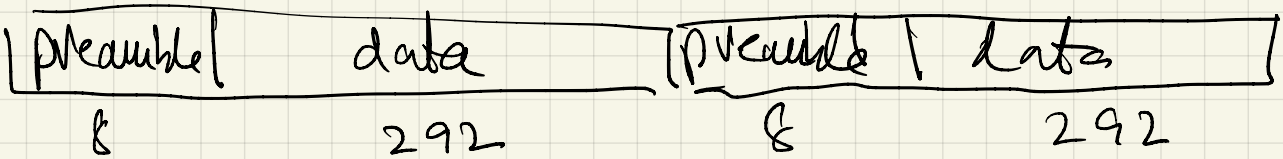
Page is made of 5 subframes



where we find the information needed for computing the position.

First task: determine the position of a subframe (the 1st) in the received sequence of bits.

Each subframe starts with a known preamble (8 bits).



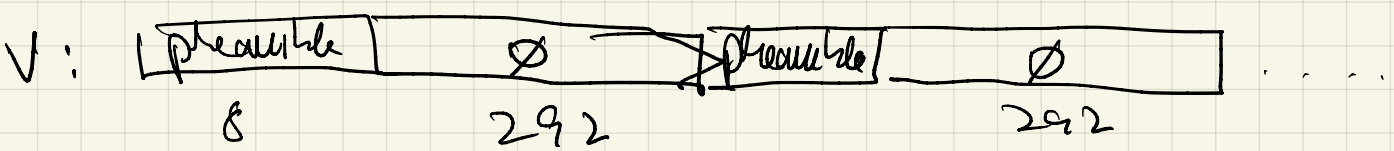
The preamble is stored in &psc.preamble as a sequence of 0's and 1's.

Convert into ± 1's $\begin{cases} 0 \to 1 \\ 1 \to -1 \end{cases}$

logical bits

As the data can contain the preamble,

you correlate with several preambles.



Correlate the received bits with V.

You will find several maxima. You take the first one.

Note: The result of the correlation is real. You can use round( ) to make sure the result of the correlation is integer (as it should be).

When decoding the bits we assumed that the first bit was an 1.

If the part of the correlation is positive, our assumption was correct.

If negative, we invert all the bits.

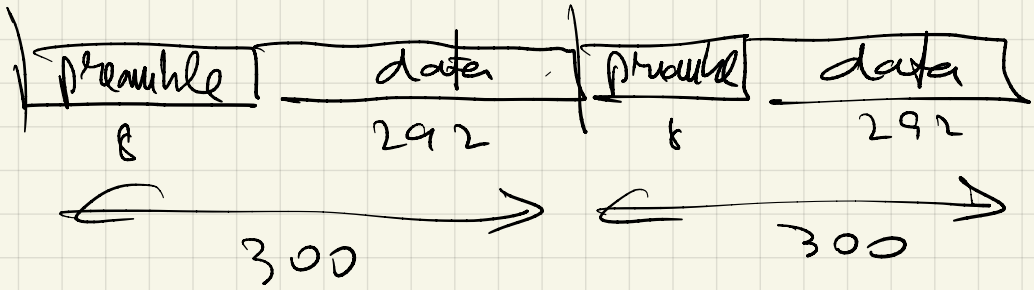
Then you convert $\begin{cases} 1 \rightarrow 0 \\ -1 \rightarrow 1 \end{cases}$

Remove all the bits in front of the

index corresponding to the maximum of correlation.

Remove bits at the end, such that we have a sequence of length which is a multiple of 300.

At this point we have: ← 20 | 1 values.



Next we check the parity.

Word is made of 30 bits.