

### **Changes made in Header file:**

- 1) Changed the values of constants in the header file
  - Number of maximum satellites
  - Number of maximum channels
  - User motion size
  - Number of subframes
  - Wavelength and central frequency (changes to 1176.45 MHz)

### **Changes made in the main code:**

- 1) Changed the logic of PRN code generation in codegen() function to construct NaVIC PRN codes.
  - Since each NaVIC satellite has different initial condition for generation of G2 polynomial, initial conditions are defined for each sv/prn according to ICD
- 2) Changes made in date2gps function: (This function is actually for date to irnss time conversion)
  - Changed starting year from 1980 to 1999
  - Number of days from Jan 1,1999 to August 22,1999 is 234 days. This value is subtracted to compute the number of days elapsed since Aug 21/Aug 22,1999
- 3) Changes made in gps2date function: (This function is actually for irnss to utc time conversion):
  - Number of leap days for NaVIC is 1542.
- 4) Changes made in eph2sbf() function:
  - Initialized various ephemeris parameters related to NaVIC.
  - For subframe creation, we assumed the first 30 bits and last 30 bits as 2 words respectively. And the remaining 292 bits divided into 8 words of 29 bits each.
  - In subframe 3 and 4 we are sending the null message (Message type 0) which is alternate 0s and 1s.
- 5) Changes made in readRinexNavAll function:
  - The navigation file for NaVIC satellites is in RINEX version 3.03 which has a different format from version 2. So we made appropriate changes to read the rinex file.

- 6) Commented the `ionosphericDelay` function since no ionospheric related data related to NaVIC satellites is there in `rinex` file.
- 7) Changes made in `computeCodePhase` function:
  - Since all the words per subframe is not of same length and have different time period, we used a flag to write the necessary conditions.
- 8) Changes made in `checkSatVisibility` function:
  - To increase the number of satellites visible, we wrote codes so that elevation is greater than 0 for all the satellites present in `rinex` file.
- 9) Added the `calculateCRC24Q` function to calculate CRC, `fecEncoding` function to compute the FEC. Also added other helping function like `decimaltoBinary`, `appendBits` to help in constructing the fec and crc.
- 10) Added the interleaver function.
- 11) Changes made in `generateNavMessage`:
  - Changed the timing parameter in `g0.sec` calculation
  - Made appropriate changes in codes for calculating week number and TOW count and placing them in subframe.
  - Called the `crc` function, combined the 292 data bits, called the `fecCoding` functions, added the sync word and created the master frame.
- 12) Made changes in `allocatChannel` function to read and do processing of satellites present in RINEX file.
- 13) Changes made in Generate baseband signals section of main function:
  - Changed the expression of path loss.
  - Used flags and conditional statements to do processing of `chan[i].bit` and `chan[i].word` since all words are not of same length.

**Changes made in the Rinex navigation file: Original file is DECE\_real\_only navic file**

- 1) In `DECE_real_only navic_3` file, the satellites are arranged in ascending order of the PRN and descending order of Epoch time.
- 2) In `DECE_real_only navic_4` file, the satellites are arranged in ascending order of the PRN and same Epoch time with only one set of all satellites.