To be prepared for the exercise on Nov 13, 2019
(10 points total)

Reference Systems

Task 1 (3 points)

a) Compute the geocentric coordinates (x y z) for the two locations:

A: φ = 48°46' 33" N λ = 9° 10' 58" E h = 300 m
B: φ = 88°46' 33" N λ = 9° 10' 58" E h = 300 m

each based on the following reference ellipsoids:

- "Bessel 1841" with a = 6 377 397.2 m and f = 1:299.15
- WGS 84 with a = 6 378 137 m and f = 1:298.257 22
- PZ-90.11 with a = 6 378 136 m and f = 1:298.257 84

What is the total difference between the solutions? Which of the three geocentric position components has the largest difference?

b) Compute the geocentric coordinates (x y z) for the defined locations, based on a sphere with R = 6378 000 m and compare them with the geocentric WGS84 coordinates.

Task 2 (4 points)

a) The reading of a measurement epoch is Thursday 7th November 2019, 8:00:00 CET (Central European Time). Convert this reading into the following time frames (remind leap seconds at this time defined by TAI-UTC = 37 sec):
   - GPS time frame (week number, TOW)
   - GLONASS time frame
   - Galileo time frame

b) The reading of a GPS measurement epoch is WN = 2079, TOW = 203400 s/week. Convert this reading to local time in Stuttgart (date, day of the week, time).

Task 3 (3 points)

The main measurement principle of GPS is based on transmission time. Calculate the measured distance between satellite and receiver in the case of

a) error-free clocks at both sites (GPS time system)
b) an error-free clock at the satellite and an error(bias) of 1 ms at the receiver clock

using the following time readings

- transmit time at GPS-satellite T = 194418.000 s/week GPST
- receive time at the receiver t = 6 h 0 m 18.070 s GPST