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COMFIX Algorithm

Given: Radar Observations within comfix.dat

Find: Classical Orbital Elements

Process:

1. Open constants – WGS84Data.m
2. Open input and output files
3. Create a loop to continually continue calculations while not at the end of the input file
4. Read in data
   1. Observation Data
      1. Site latitude-degrees
      2. Site longitude-degrees
      3. Site altitude-meters
      4. Universal Time-Solar time
         1. Yr-Year
         2. DDD-Days between 1-365
         3. HH-Hours between 1-24
         4. MM-Minutes between 1-60
         5. SS.SS-Seconds between 1-60
      5. Satellite ID
      6. Range-kilometers
      7. Azimuth-degrees
      8. Elevation-degrees
      9. Range rate-km/sec
      10. Azimuth rate-degrees/sec
      11. Elevation rate-degrees/sec
   2. Convert Units
      1. Convert all units in degrees to radians and degrees/sec to radians/sec (same formula)
      2. Convert Universal Time to Julian Day
         1. Find the Month Number by inputting Year, and Day Number into DayOfYr2MDHMS.m
         2. Find the Julian Day by inputting the Year, Month, Day, Hour, Minutes, and Seconds into JulianDay.m
5. Find GST and LST
   1. Input Julian Day and site longitude into GSTLST.m
      1. Declare global SidePerSol from WGS84Data.m
      2. Unpack Julian Day back into Year, Month, Day, Hour, Minute, Second by inputting Julian Day into InvJulianDay.m
      3. Find GST0 by inputting Year into GSTim0
      4. Find the fractional day by inputting Year, Month, Day, Hour, Minute, and Second into FindDays.m
      5. Calculate GST
      6. Calculate LST
      7. Perform a rev check to ensure the GST and LST are between 0 and 2π
6. Calculate Site Vector
   1. Input LST, Site latitude(L), site altitude(H) into site.m
7. Calculate the range vector(
   1. Input range(ρ), azimuth(az), elevation(el) into rvtopos.m
   2. Calculate range vector in SEZ system
   3. Convert range vector( from SEZ to IJK system
      1. Perform rotations to represent range vector into IJK system
         1. Multiply SEZ vector by ROT2 then ROT3
            1. where β = π/2-site latitude
            2. where = π/2-LST
   4. Calculate range rate vector()
      1. Input range rate(, azimuth rate, and elevation rate( into rvtopos.m
      2. Calculate range rate vector in SEZ system
      3. Convert range rate vector( ) from SEZ to IJK system
         1. Perform rotations to represent range rate vector into IJK system
         2. Multiply SEZ vector by ROT2 then ROT3
            1. where β = π/2-site latitude
            2. where = π/2-LST
8. Calculate Position and Velocity Vectors
   1. Calculate Position Vector
   2. Calculate Velocity Vector
9. Calculate Classical Orbital Elements
   1. Calculate a, e, i , Ω, ω, and ν given R and V using Elorb.m
10. Output data to output file
    1. Range vector(SEZ)
    2. Range rate vector(SEZ)
    3. Site vector
    4. Range vector(IJK)
    5. Range rate vector(IJK)
    6. Position vector
    7. Velocity Vector
    8. GSt
    9. LST
    10. Semi major axis
    11. Eccentricity
    12. Inclination
    13. Right ascension of ascending node
    14. Argument of perigee
    15. True anomaly
11. Go back to step 3 and repeat loop until end of input file
12. Close input and output files