13.14: Summary So Far

1. Gather together the three observations $(t,\ \alpha,\ \delta)$.
2. Convert t from UT to TT. (See Chapter 7.)
3. Calculate or look up and interpolate the solar coordinates.
4. Calculate the geocentric direction cosines of the planet. (Equations 13.5.1-3)
5. Calculate the first approximation to the geocentric distances, using $a_1 = b_1$, $a_3 = b_3$. (Equations 13.7.4-6)
6. Calculate the heliocentric distances. (Equations 13.7.7-8)
7. Improve a_1 and a_3. (Equations 13.8.32-34) Do steps 6 and 7 again.
8. Optional. Calculate $\dot{r}^2$ (Equation 13.10.4) and improve a_1 and a_3 again (Equations 13.10.9-10) and again repeat steps 6 and 7.
9. Make the light travel time corrections for the planet, and go back to step 3! Repeat 6 and 7 but of course with your best current a_1 and a_3.
10. Calculate $f_1,\ f_2,\ f_3$ and the three values of M^2 and N. (Equations 13.13.1, 13.12.27-28) and solve Equations 13.12.25-26 for the sector-triangle ratios. The method of solution of these Equations is given in chapter 1, section 1.9.
11. Calculate new triangle ratios (Equations 13.12.4a,b) – and start all over again!

By this stage we know the geocentric and heliocentric distances, and it is fairly straightforward from this point, at least in the sense that there are no further iterations, and we can just proceed from step to step without having to repeat it all over again. The main problem in computing the angular elements is likely to be in making sure that the angles you obtain (when you calculate inverse trigonometric functions such as arcsin, arccos, arctan) are in the correct quadrant. If your calculator or computer has an $\mathrm{ATAN2}$ facility, make good use of it!