

Chapter 4

GLOBAL POSITIONING SYSTEM (GPS) SATELLITE NAVIGATION

The history of navigation is one of the longest and most important quests in the evolution of civilization. Through GPS, technology has at last provided a near-perfect solution, now available freely for everybody to use. GPS receivers have quickly become indispensable, not only by professionals such as seamen or pilots, but also to hikers and basically to anybody enjoying the outdoors. The accuracy of present small hand-held units will soon approach 15 meters (as a 'selective availability'-feature, degrading the precision for non-military users, is being phased out). One can for example use these to record the position where one leaves a car in a big car park. Used simply as clocks, they provide local time to about 10^{-7} seconds - of course far higher accuracy than is ever needed in everyday life. Together with 'differential correction', accuracies can be as high as one millimeter, potentially making all other surveying techniques obsolete, both for global (e.g. piloting) and local (e.g. construction site) usage.

Section 4.1 recalls very briefly the history of navigational devices, from ancient days until the breakthrough of GPS. Section 4.2 summarizes the principles of GPS. We formulate in Section 4.3 a test problem that is solved in two different ways in Section 4.4. This is followed by some error analysis in Section 4.5.