

Integration of global positioning system and inertial navigation system with different sampling rate using adaptive neuro fuzzy inference system

ABSTRACT

Integration of the Global Positioning System (GPS) and Inertial Navigation System (INS) has become increasingly common in the last two decades, because the characteristics of GPS and INS are complementary and the integration between both systems will maximize their advantages and minimize their weakness. Over time, inertial navigators drift from their preset alignments. Or, the initial alignment may have been corrupted by vehicle motion, with imperfect transfer of alignment and velocities to the navigator. Also, there may not have been enough time to perfect alignment. In such case, navigators can be benefit from aiding such as GPS. The integration between the GPS and INS leads to accurate navigation solution by overcoming each of their respective shortcomings. And to make this integration possible the difference between the GPS and INS systems in sampling rate must be solved before any integration can be work properly. In this paper, the GPS low rate problem is solved by predicting or extrapolating the mislaid reading data of the GPS to be attuned with those of INS data using Adaptive Neuro Fuzzy Inference System (ANFIS). Hence, the gap between the two systems reading data is solved to provide synchronization between the INS and GPS systems. So, it is possible to compare the reading data of both systems. Three strategies have been proposed and the results shows superior performance in predicting missed GPS data with lowest mean error.

Keyword: Global positioning system (GPS); Inertial navigation system (INS); Adaptive neuro fuzzy inference system (ANFIS); Navigation systems; Sampling data rate