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MULTIPATH PREDICTION MODEL FOR GLOBAL POSITIONING SATELLITES USING NEURAL NETWORK

Abstract

Global navigation systems are widely used in all day to day situations both civil and military, thus the positioning multipath error given by the satellite is desired to be as small as possible. The multipath error represents one of the main problems encountered by global positioning systems and this effect usually occurs when the antenna is close to reflecting surfaces. Due to this effect, the signal arrives by different paths to the antenna, thus, lengthening the measured satellite pseudorange.

This research paper presents our approach in approximating the multipath based on several characteristics of both the satellite and the receiver using artificial neural networks (ANN) and genetic algorithm as method for training. The considered parameters related to the satellite that are used for the input and training of the ANN are the longitude, latitude, azimuth, elevation and PRN. Moreover, in the logic of the ANN algorithm, the generated multipath coefficient resulted from the RINEX observation files was compared with the output of the ANN. Regarding the parameters of the static receivers, they are represented by the actual coordinates and the manufacturer. Additionally, characteristics and types of antennas can be fed to the neural network during the training in order to update the created ANN or to improve it, depending on the user's needs.

The created neural network has the purpose to make the multipath classification from 0 to 5 meters with a resolution of 10 centimeters. Furthermore the ANN shall generate a model that predicts the multipath based on the input parameters, thus the user will obtain the approximated multipath of the desired satellite-receiver pair.