

Abstract

The estimation of the signal parameters of a sine wave has an important role in the measurement technology. While using the digital data processing in a noisy environment, the preprocess of the data is essential. Preprocessing can be done by using the least squares method.

The estimated parameters of the input sine wave can be used to qualify a three-phase system, or an analog-to-digital converter, or for system identification, or to measure impedance. My thesis is about examining the sensitivity of the Least Squares and the Total Least Squares methods, depending on the uncertainty of sampling. In the sampling uncertainty, we may assign a later timestamp to the digital samples that affect the statistical properties of the estimation algorithms. When using the Least Squares method, it is not possible to take care of the shift of the samples, while the Total Least Squares method has a solution to count with the errors in the sampling time.

I examine the estimation error of the algorithms in a simulation environment, and as a proof of the feasibility of the theory, I present a C language implementation, which is verified by running the code on a Cortex M4-based microcontroller.