

Abstract

The spectrum of a periodic signal, especially its absolute value is needed in many cases in embedded signal processing tasks. The calculation of the spectral coefficients is traditionally made with Discrete Fourier Transformation (DFT), however, it can be disadvantageous sometimes due to the block processing operation. So it is expedient to examine, what kind of possibilities exist about using recursive spectrum calculation methods. These algorithms refresh the value of spectral coefficients with the necessary calculations after every sample of the signal.

In my thesis, I investigate the feasibility of implementation of such recursive algorithms in an embedded system with moderate computational capacity.

During my work I collected information about the state-space signal representation used in recursive spectrum calculation methods. Then I examined two different algorithms, that could produce the Fourier-coefficients according to this signal model. I made examinations in Matlab environment from the viewpoint of practical implementation of algorithms in an embedded system. I considered the effect of some recommended simplifications, and I came to the result, that the two methods became the same one.

I implemented the simplified algorithm on an embedded development board in the form of a C language software. During the programming I made further simplifier, efficiency increasing modifications.

Finally I investigated the performance of the system by measurements. Beside that, I also examined some of its properties. During my measurements I paid attention to what effect it had on the fixed point arithmetic processor, if floating point variables had been also used at programming, and what effect it had, if the problem had been solved without them.