Calculating Non-Equidistant Discretizations Generated by Blaschke Products

Levente Lócsi

In many cases non-equidistand discretizations (or non-uniform divisions) have been proven very useful. Many examples can be found from the fields of computer graphics to FFT analysis by engineering sciences.

In [1] we introduced a very elegant way of handling non-uniformity in the case of signals (e.g. ECG signals) with regions of high variability and therefore more detail, dense discretization needed, and with constant-like regions where less detail, sparse discretization is enough. The Blaschke functions, Blaschke products and their associated argument functions are used to describe a suitable non-equidistant discretization. The inverse image of an equidistant discretization according to an argument function is considered.

One can give an explicit form of the inverse of an argument function associated to a Blaschke function: the inverse can be simply calculated. But in the case of Blaschke products, the inverse of the argument function has no explicit form, numerical methods are needed to solve the arising non-linear equations. We have as many equations as the number of points in the discretization to generate.

In the work to be presented here we analyse the efficiency of methods like the well-known bisection method and Newton's method applied to this problem. By taking advantage of non-uniformness, we may solve the equations at hand in a clever order also to be explained. The advantages and disadvantages of these methods and their combinations are to be analysed.

References

[1] L. Lócsi. Discrete approximation of ECG signals, *International Conference on Applied Informatics 2010*, submitted.