

Construction of analytic wavelets

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In this talk I will present a multiresolution analysis in the Hardy space of the unit disc, respectively of upper half plane. The construction is an analogy of the discrete affine wavelet multiresolution, and in fact it can be derived from the discretization of the continuous voice transform generated by a representation of the Blaschke group. The levels of the multiresolution are generated by analytic wavelets i.e. by the Malmquist-Takenaka system, with a special localization of the poles. The n -th level of the multiresolution has finite dimension (in classical affine multiresolution this is not the case) and still we have the density property, i.e. the closure in norm of the reunion of the multiresolution levels is equal to the Hardy space. The projection operator to the n -th resolution level is in the same time a rational interpolation operator on a finite subset of quasi lattice points. If we can measure the values of the function on the points of the quasi lattice the discrete wavelet coefficients can be computed exactly. This makes our multiresolution approximation very useful from the view of the computational aspects. The multiresolution approximations can be used in system theory to describe the spectral behavior of discrete, respectively continuous-time-invariant systems.

References

- [1] Feichtinger H. G., Pap M., Hyperbolic wavelets and multiresolution in the Hardy space of the upper half plane, *Blaschke Products and Their Applications: Fields Institute Communications* 65, New York: Springer Science+Business Media BV, 2013. pp. 193-208 (ISBN:978-1-4614-5340-6)
- [2] Pap M., Hyperbolic Wavelets and Multiresolution in $H^2(\mathbb{T})$, *Journal of Fourier Analysis and Applications*, J. Fourier Anal Appl (2011) 17, 755-776, DOI: 10.1007/s00041-011-9169-2.
- [3] Pap M., Schipp F., The voice transform on the Blaschke group II., *Annales Univ. Budapest., Sect. Comp.* 29 (2008) 157-173.
- [4] Pap M., Schipp F., The voice transform on the Blaschke group I., *PU. M. A. Vol. 17* (2006), No. 3-4, pp. 387-395.
- [5] Eisner T., Pap M., Discrete Orthogonality of the Malmquist Takenaka System of the Upper Half Plane and Rational Interpolation, *Journal of Fourier Analysis and Applications*, September, 2013, DOI 10.100/s00041-013-9285-2