In signal processing and system identification for $H^2(\mathbb{T})$ and $H^2(\mathbb{D})$ the traditional trigonometric bases and trigonometric Fourier transform are replaced by the more efficient rational orthogonal bases like the discrete Laguerre, Kautz and Malmquist-Takenaka systems and the associated transforms. The Malmquist-Takenaka system can be expressed with the Blaschke products multiplied by a weight. The one term Blaschke products form a group with respect to function composition that is isomorphic to the Blaschke group, respectively to the hyperbolic matrix group. Consequently, the background theory uses tools from non-commutative harmonic analysis over groups and the generalization of Fourier transform uses concepts from the theory of the voice transform. The successful application of rational orthogonal bases needs a priori knowledge of the poles of the transfer function that may cause a drawback of the method. In this talk we present a set of poles and using them we will generate a multiresolution in $H^2(\mathbb{T})$ and $H^2(\mathbb{D})$ and we define a projection operator at every level of the multiresolution using some special Blaschke products. The construction is an analogy with the discrete affine wavelets, and in fact is the discretization of the continuous voice transform generated by a representation of the Blaschke group over the space $H^2(\mathbb{T})$. The constructed discretization scheme gives opportunity of practical realization of hyperbolic wavelet representation of signals belonging to $H^2(\mathbb{T})$ and $H^2(\mathbb{D})$ if we can measure their values on a given set of points inside the unit circle or on the unit circle. Convergence properties of the hyperbolic wavelet representation will be studied.

MSC : 43A32, 42C40, 42C40, 33C47, 43A65, 41A20.

Keywords : hyperbolic wavelets, multiresolutin, voice transform, interpolation operator, orthogonal rational kernels, wavelet rational kernels.