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New structures of continuous MRA from discrete MRA

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ABSTRACT

We know that there exist two versions about **Multiresolution Analysis** (**MRA**): one of them is continuous, their elements are functions in $L^2(\mathbf{R})$, and it's usefull to build **wavelets** families in $L^2(\mathbf{R})$; the other one is discrete and it works over sequences in $l^2(\mathbf{R})$.

In continuous MRA we build a sequence of subspaces using a fixed transformation, $\mathbf{T}$, that allows us to form a subspace from last one, the difference depends on the choice of $V_0 \subseteq L^2(\mathbf{R})$. In discrete MRA we take $V_0 = l^2(\mathbf{R})$ and the choice is in the transformation.

From the point of view of Signal Theory we can affirm that continuous version is usefull for analogic signals and discrete one is for digital signals. Because of we get information about signals by means of samples, the study of discrete case raise in importance.

In this work we try to connect both MRA methods by means of the map $\mathbf{L} : l^2(\mathbf{R}) \to L^2(\mathbf{R})$ such that $\mathbf{L}(\{a_n\}) = \sum a_n sinc(t-n)$. The main result is that all discrete MRA produce a analogous structure to continuous one (in our case, analogous to continuous MRA), that allows the construction of new **orthonormal wavelets bases** in $L^2(\mathbf{R})$. We present some questions and give answers to some of them. For example, we analize the new wavelets families, we study the case when the new structure is equivalent to the old one and too we study when there exist some of relevant elements associated to a MRA.

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