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Continuous Wavelets on Nilpotent Lie Groups and Admissibility

Let N be a simply connected, connected non-commutative nilpotent Lie group with Lie algebra \mathfrak{n} . Let H be a subgroup of the automorphism group of N . Assume that H is a commutative, simply connected, connected Lie group with Lie algebra \mathfrak{h} . Furthermore, let us assume that the linear adjoint action of \mathfrak{h} on \mathfrak{n} is diagonalizable with real eigenvalues. Thus, $N \rtimes H$ is a completely exponential solvable Lie group. We consider the quasiregular representation $\tau = \text{Ind}_H^{N \rtimes H}(1)$ acting in $L^2(N)$ as follows

$$\tau(n, 1) f(m) = f(n^{-1}m), \tau(1, h) f(m) = |\det(Ad(h))|^{-1/2} f(h^{-1}mh).$$

In our talk, mainly motivated by the admissibility of τ , we will discuss the decomposition of τ into its irreducible components. We will also present the following recent results. If $G = N \rtimes H$ is unimodular, then τ is never admissible, and if G is nonunimodular, τ is admissible if and only if $H \cap \text{Cent}(G)$ is trivial. We will also discuss how these results can be generalized to other type of exponential Lie groups.