Diffusive wavelets and the Heisenberg group

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One important subject of the time-frequency analysis on groups is the decomposition of functions into matrix coefficients of irreducible representation a further discussion leads to decomposition by a different concept, namely wavelets. Powerful tools of harmonic analysis can be utilized to investigate wavelets on compact groups. Thanks to the Peter-Weyl theorem (giving a decomposition of L^2-functions in terms of irreducible representations) on compact Lie Groups $\mathcal{G}$ exists a elegant way to express the heat kernel, which is the main ingredient for the concept of *diffusive wavelets*.

In the case of noncompact groups arise difficulties, which end up in the fact that there is no equivalent of Peter-Weyl theorem in that case.

In many different fields of mathematics and physics the Heisenberg group H_n plays an important role. In wavelet theory on $\mathbb{R}^n$ it arises naturally.

I will discuss diffusive wavelets for the case of compact groups to introduce the general idea. The main point then will be to transfer the concept to H_n.

The concept of diffusive wavelets can be established on H_n thanks to the fact it is a nilpotent group, which posses a Plancherel measure. Because of this enormous interest to the Heisenberg group it is well investigated and the Plancherel measure of it is explizite known.

Considering the Sub-Riemannian structure on H_n we will discuss the spectral decomposition of the corresponding sub-heat kernel which leads to the construction of *diffusive wavelets on H_n*.