Kernels of local Schrödinger semigroup

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We consider the Schrödinger operator of the form $H = -\Delta + V$ acting in $L^2(\mathbb{R}^d, dx)$, $d \geq 1$, where the potential $V : \mathbb{R}^d \to [0, \infty)$ is a locally bounded function. The corresponding Schrödinger semigroup $\left\{e^{-tH} : t \geq 0\right\}$ consists of integral operators, i.e.

$$e^{-tH} f(x) = \int_{\mathbb{R}^d} u_t(x, y) f(y) dy, \quad f \in L^2(\mathbb{R}^d, dx), \ t > 0.$$

We will present new estimates for heat kernel of $u_t(x, y)$. Our results show the contribution of the potential is described separately for each spatial variable, and the interplay between the spatial variables is seen only through the Gaussian kernel.

We will present applications of those theorems for two common classes of potentials. For confining potentials we get two sided estimates and for decaying potentials we get new upper estimate.

The talk is based on joint work with Kamil Kaleta [1].

References

[1] M. Baraniewicz, K. Kaleta, *Integral kernels of Schrödinger semigroups with nonnegative locally bounded potentials.* ArXiv:2302.13886v1, 2023+.