ON A SEMI-LINEAR SYSTEM OF NONLOCAL TIME AND SPACE REACTION DIFFUSION EQUATIONS WITH EXPONENTIAL NONLINEARITIES

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Abstract
We study the semi-linear system of nonlocal in time and space reaction diffusion equations

$$\begin{cases} u_t + (-\Delta)^{\eta/2} u &= \dfrac{1}{\Gamma(1-\gamma)} \displaystyle\int_0^t (t-s)^{-\gamma} e^{v(s)}\, ds, \quad x \in \mathbb{R}^N, t > 0, \\ v_t + (-\Delta)^{\eta/2} v &= \dfrac{1}{\Gamma(1-\delta)} \displaystyle\int_0^t (t-s)^{-\delta} e^{u(s)}\, ds, \quad x \in \mathbb{R}^N, t > 0, \end{cases} \tag{1}$$

supplemented with the initial data

$$u(x,0) = u_0(x), \;\; v(x,0) = v_0(x), x \in \mathbb{R}^N, \tag{2}$$

with $u_0, v_0 \in C_0(\mathbb{R}^N)$, $N \geq 1$, $0 < \eta \leq 2$, $0 < \gamma, \delta < 1$ and Γ is the Euler gamma function. Here u_t stands for the derivative in time of u and $(-\Delta)^{\eta/2}$ for the fractional Laplacian operator.

we show the local existence and uniqueness of a mild solution of (1)-(2). Moreover, blowing-up solutions are shown to exist and their time blow-up profile is presented.

Bibliography

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