WEAK SOLUTIONS FOR RANDOM NONLINEAR PARABOLIC EQUATIONS OF NONLOCAL TYPE

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Abstract. We consider the equation

\[ u_t - a(\int_D u\,dx)\Delta u = \gamma u + f \text{ in } D \times [0,T[ \] (1)

where the constant \( \gamma \) is positive, \( a = a(s) \) is continuous function with Lipschitz’s constant \( L \), such that \( 0 < p \leq a(s) \leq P \) where \( p \) and \( P \) are constants. We consider the following initial condition

\[ u(x,0) = u_0(x) \] (2)

and Dirichlet boundary condition

\[ u = 0 \text{ on } \partial D \times [0,T[. \] (3)

The system (1) – (3) arise in various physical situations. For instance, when we study a questions related with a culture of bacteria \( u \) could describe the population of these bacterias subject to spreading, where the diffusion coefficient \( a \) is supposed to depend on the entire population in the domain rather than on the local density, that is, the measurement are not made at a point but represent an average in a neighborhood of a point.

We study the existence and uniqueness of weak solutions for a random version of class of nonlinear parabolic problems of nonlocal type with additive noise. We stress that there are no results for this random version in the literature related with the system (1) – (3) described above, therefore, this is the first result in this direction.

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