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On a notion of solution to a forward-backward parabolic equation in one space dimension, and its regularizations

We consider a forward-backward parabolic equation obtained as the gradient flow of a nonconvex functional of the gradient in one dimension. The example we are interested in is when the integrand of the functional is a double well potential. The resulting gradient flow equation is forward-backward parabolic, and therefore ill-posed in general. We are interested in defining a possible notion of solution to this equation. To this purpose we will regularize the problem, either by space discretizations, or considering the Cahn-Hilliard equation, and discuss various properties when the regularizations parameters tend to zero.