



DYNAMICAL SYSTEMS SEMINAR

An energy formula for fully nonlinear parabolic PDEs in one spatial dimension

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Abstract. Besides the classical questions of existence and regularity of partial differential equations (PDEs), energy (or Lyapunov) functions can also be used in order to prove stability of equilibria, or to indicate a gradient-like structure of a dynamical system. Matano (1988) constructed a Lyapunov function for quasilinear non-degenerate parabolic equations with gradient dependency. We modify Matano's method to construct an energy formula for fully nonlinear parabolic PDEs of non-degenerate or degenerate type with Dirichlet or nonlinear Robin boundary conditions. Since this talk is aimed to undergraduate students, we explain our proof methodology by means of examples with mainly two necessary techniques: the implicit function theorem and integration by parts.

References

- [1] P. Lappicy and B. Fiedler. A Lyapunov function for fully nonlinear parabolic equations in one spatial variable. *São Paulo J. Math. Sci.* **13**, 283–291, (2019).
- [2] P. Lappicy and E. Beatriz. An energy formula for fully nonlinear degenerate parabolic equations in one spatial variable. *In preparation*, (2021).