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A parabolic $\Delta_{p(\cdot)}$ problem

G. Warnault, J. Giacomoni[1] and S. Tiwari[2]

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SUMMARY

In this communication, we are interested in the parabolic partial differential equation involving the $p(x)$-laplacian:

$$(P_T): \begin{cases} \frac{du}{dt} - \Delta_{p(x)}u = f(x.u) & \text{in } Q_T := (0,T)\times\Omega \\ u = 0 & \text{on } (0,T)\times\partial\Omega \\ u(0,\cdot) = u_0 & \text{in } \Omega \end{cases}$$

where we assume that $T > 0$ and Ω is a smooth domain of $\mathbb{R}^d$ $(d \geq 2)$ and $f : \Omega \times \mathbb{R} \to \mathbb{R}$ is a Carathéodory function locally Lipschitz with respect to the second variable uniformly in the first. The variable exponent is a measurable function $p : \Omega \to (1, \infty)$ satisfying

$$1 < p^- = \operatorname{ess\,inf}_{\Omega} p(.) \leq p() \leq p^+ = \operatorname{ess\,sup}_{\Omega} p(.) < d$$

and $\Delta_{p(\cdot)}u$ denotes the formal differential operator div $\left[|\nabla u|^{p(x)-2}\nabla u\right]$.
We study the problem (P_T) under growth assumptions on the nonlinearity f and on the initial data u_0, under this conditions we obtain existence and stabilization results.

Keywords: parabolic equation, $p(.)$-Laplace, variable exponents

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[1]LMAP UMR CNRS 5142
Université de Pau et des Pays de l'Adour
Avenue de l'université - BP 1155
64013 Pau Cedex, France
guillaume.warnault@univ-pau.fr
jacques.giacomoni@univ-pau.fr

[2]Indian Institute of Technology Delhi
Department of Mathematics
New Delhi, India
swetatiwari.iitd@gmail.com