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General Boundary Value Problems of the Korteweg-de Vries Equation on a Bounded Domain

In this talk we consider the initial boundary value problem of the Korteweg-de Vries equation posed on a finite interval

$$u_t + u_x + u_{xxx} + uu_x = 0, \quad u(x, 0) = \phi(x), \quad 0 < x < L, \quad t > 0 \quad (1)$$

subject to the nonhomogeneous boundary conditions,

$$B_1 u = h_1(t), \quad B_2 u = h_2(t), \quad B_3 u = h_3(t) \quad t > 0 \quad (2)$$

where

$$B_i u = \sum_{j=0}^2 (a_{ij} \partial_x^j u(0, t) + b_{ij} \partial_x^j u(L, t)), \quad i = 1, 2, 3,$$

and a_{ij}, b_{ij} ($j, i = 0, 1, 2, 3$) are real constants. Under some general assumptions imposed on the coefficients $a_{ij}, b_{ij}, j, i = 0, 1, 2, 3$, the IBVPs (1)-(2) is shown to be locally well-posed in the space $H^s(0, L)$ for any $s \geq 0$ with $\phi \in H^s(0, L)$ and boundary values $h_j, j = 1, 2, 3$ belonging to some appropriate spaces with optimal regularity. This a joint work with R. A. Capistrano-Filho of Universidade Federal de Pernambuco and Shuming Sun of Virginia Tech.