Large time behavior of the coupled systems of two Korteweg-de Vries equations

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Abstract:

In this talk, we present some recent results related to Large time behaviour of the lower and higher order coupled systems of two Korteweg-de Vries equations under the effect of some boundary dissipation posed on a interval with some boundary conditions, [4, 5].

This kind of systems are know as a family of Boussinesq systems of KdV-Type and theis has been proposed in [2, 3, 6] to describe the bi-directional propagation of small amplitude long waves on the surface of shallow water.

We consider the following systems introduced in [2, 3] and [6], respectively,

\begin{equation}
\begin{aligned}
\eta_t + w_x + w_{xxx} + (\eta w)_x &= 0, & \text{in } (0, L) \times (0, +\infty), \\
w_t + \eta_x + \eta_{xxx} + w w_x &= 0, & \text{in } (0, L) \times (0, +\infty), \\
\eta(x, 0) &= \eta_0(x), & w(x, 0) = w_0(x), & \text{in } (0, L),
\end{aligned}
\end{equation}

and

\begin{equation}
\begin{aligned}
\eta_t + u_x &= a u_{xxx} + a_1 (\eta u)_x + a_2 (\eta u_{xx})_x + bu_{xxxxx} = 0, & \text{in } (0, L) \times (0, +\infty), \\
u_t + \eta_x &= a\eta_{xxx} + a_1 u u_x + a_3 (\eta u_x)_x + a_4 u_x u_{xx} + b\eta_{xxxxx} = 0, & \text{in } (0, L) \times (0, +\infty),
\end{aligned}
\end{equation}

with some relations between the coefficients and some boundary conditions.

Firstly, we deal with the local rapid exponential stabilization for a Boussinesq system of KdV-KdV type (1) with Dirichlet-Neumann boundary condition. Our main result for the system (2) is to design a parameter family of feedback laws for which the solution of the associated linearized system are exponentially decreasing in the energy space.

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References


