GLOBAL WELL-POSEDNESS FOR A COUPLED MODIFIED KdV SYSTEM

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We prove the sharp global well-posedness result for the initial value problem (IVP) associated to the system of the modified Korteweg-de Vries (mKdV) equation

$$\begin{cases} \partial_t u + \partial_x^3 u + \partial_x(uv^2) = 0, \quad u(x,0) = \phi(x), \\ \partial_t v + \partial_x^3 v + \partial_x(u^2 v) = 0, \quad v(x,0) = \psi(x), \end{cases} \tag{0.1}$$

where $(x,t) \in \mathbb{R} \times \mathbb{R}$; $u = u(x,t)$ and $v = v(x,t)$ are real-valued functions.

For the single mKdV equation such result has been obtained by using Mirura's Transform that takes the KdV equation to the mKdV equation. We do not know the existence of Miura's Transform that takes a KdV system to the system we are considering. To overcome this difficulty we developed a new proof of the sharp global well-posedness result for the single mKdV equation without using Miura's Transform. We could successfully apply this technique in the case of the mKdV system to obtain the desired global well-posedness result for data $(\phi, \psi) \in H^s(\mathbb{R}) \times H^s(\mathbb{R})$, $s > 1/4$.