
Contributed Papers
Communications libres
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ABDUS SATTAR MIA, University of Saskatchewan
Conservation laws of the nonlinear two-fluid model

A nonlinear model has been derived by Camassa and Choi (1999) to approximate the two-dimensional Euler equations of incompressible motion of two non-mixing fluids in a channel. We derive conservation laws for the two-fluid model using the direct conservation law construction method. Eight different conservation laws are found, including the conservation of mass, horizontal momentum, and energy. The conserved quantities for the Camassa-Choi model are compared with those for the full incompressible Euler system. A physical interpretation is given for each of the conservation laws of the two-fluid model.

MARCO ANTONIO PÉREZ, Université du Québec à Montréal
Relative extensions and natural transformations from disk and sphere chain complexes

In 2004, J. Gillespie constructed for every object C in an Abelian category \mathcal{C} , and every chain complex X over \mathcal{C} , a natural isomorphism $\text{Ext}_{\text{Ch}(\mathcal{C})}^1(X, D^m(C)) \cong \text{Ext}_{\mathcal{C}}^1(X_{m-1}, C)$, where $D^m(C)$ is the m th disk complex centred at C . If in addition X is exact, one also has $\text{Ext}_{\text{Ch}(\mathcal{C})}^1(X, S^m(C)) \cong \text{Ext}_{\mathcal{C}}^1(X_m/B_m(X), C)$, where $S^m(C)$ is the m th sphere complex centred at C . We extend Gillespie's results for pre-covering classes $\mathcal{F} \subseteq \text{Ob}(\mathcal{C})$, to the more general context where $\text{Ext}_{\mathcal{C}}^1(-, -)$ is replaced by the first right derived functor $\mathcal{F}\text{-Ext}_{\mathcal{C}}^1(-, -)$ of $\text{Hom}_{\mathcal{C}}(-, -)$, computed by using left \mathcal{F} -resolutions of the left variable.

M. CAROL WILLIAMS, Texas Tech University
Strengthening the Mathematical Content Knowledge of In-Service Teachers

We will describe the implementation and effectiveness of our new multidisciplinary graduate program for elementary teachers. With support from the US Department of Education and faculty from the the TTU Math Department, Physics Department, and College of Education, we have strengthened both the mathematical content knowledge of the participating teachers and their ability to correctly and clearly describe mathematical concepts to their students.