VAKHTANG PUTKARADZE, University of Alberta
Geometric approach to the dynamics of tubes conveying fluid

We derive a fully three-dimensional, geometrically exact theory for flexible tubes conveying fluid. The theory also incorporates the change of the cross-section available to the fluid motion during the dynamics, sometimes called collapsible tubes. Our approach is based on the symmetry-reduced, exact geometric description for elastic rods, coupled with the fluid transport and subject to the volume conservation constraint for the fluid. Using these methods, we derive the fully three dimensional equations of motion. We then proceed to the linear stability analysis and show that our theory introduces important corrections to previously derived results, both in the consistency at all wavelength and in the effects arising from the dynamical change of the cross-section. We also derive and analyze several analytical, fullynonlinear solutions of traveling wave type in two dimensions. Finally, time permitting, we present the variational scheme for discretization of dynamics. This research has been supported by NSERC and the University ofAlberta.