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**Abdon Eddy Choque Rivero\*** ([abdon@ifm.umich.mx](mailto:abdon@ifm.umich.mx)), Hacienda San Diego 341, Frac. Hacienda del Valle, 58000 Morelia, Michoacan, Mexico. *The inverse boundary problem for two-velocity elastic networks.*

The in-plane motion of elastic strings on a tree-like network is considered. The two-velocity wave equation for a two component vector displacement is assumed to hold on each edge of a tree. We investigate the inverse problem of recovering the physical properties, i.e. the velocities and lengths of each string, and also the topology of the tree and the angles between branching edges. We extend the approach and result of the paper (S. Avdonin, G. Leugering and V. Mikhaylov, *On an inverse problem for tree-like networks of elastic strings*, *Zeit. Angew. Math. Mech.*, **90** (2010), 136–150) to the case of variable velocities. It is shown that the inverse problem can be uniquely solved by applying measurements at all, or at all but one, boundary vertices. (Received September 21, 2012)