ABSTRACT

The current study considers the dynamics of air inflated structures and more specifically inflated beams. These structures essentially derive their structural rigidity from the internal pressure exerted by air. Such structures find applications, to name a few, in the domain of aerospace, construction of temporary structures, etc. These structures are incapable of resisting any compressive forces and once the tension in the member is annihilated by the compressive force, the structure loses its rigidity and tends to be structurally unstable. Thus the study of structures and their dynamics is necessary for better designing. The considered beam is modeled as a beam with two displacement fields corresponding to transverse and longitudinal deflection. For a simple linear system, the normal modes do not interact (or exchange energy) unless they have closely placed frequencies. However, depending on the degree of nonlinearity, the normal modes in a nonlinear system do interact even when their frequency ratios are not unity. To this end, in this work, we consider a cylindrical air-inflated beam and study the effect of pressure on the modal interaction between flexural and longitudinal normal modes.