A new application of the fixed-points theory for the control of kinetic energy of a continuous structure

Abstract

The fixed-points theory was originally used to determine the optimum tuning and damping ratios of a vibration neutraliser that may flatten the frequency response function (FRF) of a simple structure. Although the theory has also been used for the control of vibration of a continuous structure, applications have been limited only to point control. In this paper, a new application of the theory is discussed, which is for the global control of vibration of a continuous structure. The theory is used to determine the optimum tuning and damping ratios of the vibration neutraliser that flatten the global response of the structure. Kinetic energy is used as a measure of the structure's global response, and the application is demonstrated on undamped and damped simply supported beams. It is found that by using these optimum values, it is possible to remove the effects of the dominant mode leaving only the effect of the residual modes in the global behaviour. This shows that the theory can also be used to reduce the vibration of a continuous structure at all points instead of at a particular point only, such as in the conventional application.