Alternative methods are available to compute the dynamic response of both linear and nonlinear systems. The proposed approach utilizes highly reduced order models to determine the response of a system with local nonlinear connection elements at a limited set of nodes; the approach involves approximating the system as piecewise linear rather than employing a nonlinear solution scheme. Once the time response is calculated at the reduced set of nodes, a single transformation matrix is used to expand the results to full space regardless of the configurations encountered.