Investigation on vibration analysis of beam structure with different types of joints

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ABSTRACT
Modal analysis is widely used in order to identify the dynamic behaviour which are natural frequencies and mode shapes of a structure through the approach of experimental as well as finite element analysis. Beam which is commonly used in the industries of construction had gained the interest as the topic of research. This project intended to investigate the vibration analysis on dissimilar cantilever beam structure with different joints which will be conducted through finite element analysis (FEA). In FEA, cantilever beam structure is modelled by using dissimilar materials which is stainless steel 304 and aluminium 6061. Two types of element connector which are bar element (CBAR) and beam element (CBEAM) are modelled in FEA and applied to replicate real connections (welded joint and riveted joint). Besides, several element sizes are computed for mesh convergence analysis and the presence of crack is modelled and analyzed. Finite element modal analysis is simulated to determine modal properties. Natural frequencies of element connectors and real connections are compared to the equivalent rigid body method. From the FEA, it is found that the discrepancies of errors that occurred between CBAR with theoretical welded joint and CBEAM with theoretical riveted joint have proved that such joint element strategy best in representing real connectors. Thus, CBAR and CBEAM are compatible to resemble the real connection in the beam structure. The best element size is observed as well as the comparison between uncrack and crack beam structure is carried out.

KEYWORDS
Vibration; Finite element analysis; Bar element; Beam element; Joint

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