

## **ABSTRACT**

In this article, the intact and damaged multi-walled carbon nanotubes (MWCNTs) models were performed in micro-beam structures to detect the damaged parts. To that end, numerical analysis using ABAQUS software was implemented to achieve free vibration including the calculating of natural frequencies and normalized mode shapes. Vibration-based damage detection techniques were proposed to assess and localize the damaged parts. Within this study, the damage was presented in terms of reducing the local stiffness at 10%, 20%, and 30%  $E_c$  at each location. Then to accomplish the detection task, the irregularity of the higher derivative index was calculated. According to the computed results, the peak of the irregularity index precisely shows the effect of the defect, although it was unseen in the mode shape.