ME – M.Tech (Res) Thesis Defense

Stick-Slip, Detachment Waves and Interface Fracture

Mr. Mohd. Aaquib Ansari, M.Tech (Res) Student, Department of Mechanical Engineering, IISc

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Meeting link: Click here to join the meeting (Microsoft Teams)

ABSTRACT

Intermittent motion of frictional interfaces–commonly called stick-slip–is a universal occurrence in a range of different systems from earthquakes to automobile brakes. Recent work has established that stick-slip at the interface between a hard and a flexible object occurs via the propagation of slow waves. Two of these waves, subsequently called d-waves, involve local interface detachment and travel at speeds that are orders of magnitude lower than elastic wave speeds. In this work, a mixed-boundary value elastodynamic model is developed for explaining the occurrence of these waves in frictional contacts. Solutions are obtained for very low wave speeds by performing a perturbation expansion and resorting to numerical techniques. The consequences of this model are evaluated for both compressible and incompressible materials and reveal some interesting analogies with standard interface crack problems. Consequently, the potential of d-waves for 'strengthening' interfaces with pre-existing flaws will be explored and used to generate a 'phase diagram' for interfaces. It is also speculated that such d-waves, seen in several other systems, all arise from linear elastic phenomena in the low velocity limit.

ABOUT THE SPEAKER

Mohd. Aaquib Ansari obtained his Bachelor's degree in Mechanical engineering from Aligarh Muslim University, Aligarh in 2018. He joined the M-Tech (Res) programme at IISc in August 2018. His primary research interests are in applied mechanics and contact phenomena.