ID contributo: **179** Tipo: **Presentazione orale**

A Physics-Based Model for Vacuum-Pressurized Structured Fabrics

venerdì 5 settembre 2025 10:15 (15 minuti)

Structured fabrics, such as traditional knitted sheets or chain mail armors, typically exhibit low bending stiffness under ambient pressure. However, recent studies have shown that applying even a small confinement pressure (approximately 93 kPa) can increase their stiffness by more than 25 times compared to their relaxed state. This remarkable property paves the way for the development of lightweight, tunable, and adaptive fabrics with potential applications in wearable exoskeletons, haptic interfaces, and semi-active vibration control devices.

This study introduces a preliminary analytical model, integrated with a sphere-packing model based on Hertzian contact theory, to elucidate and predict the effects of confinement pressure on the homogenized Young's modulus and the resulting vibration response of these structures. The model is validated through experimental data, demonstrating a strong correlation between theoretical predictions and measured results across various confinement pressures. The findings highlight the potential of vacuum-pressurized structured fabrics as a versatile solution for adaptive vibration control in advanced engineering applications.

Autore principale: RUSTIGHI, Emiliano (Universita' degli Studi di Trento)

Coautore: Prof. GARDONIO, Paolo (Universita' degli Studi di Udine)

Relatore: RUSTIGHI, Emiliano (Universita' degli Studi di Trento)

Classifica Sessioni: Modellazione

Classificazione della track: Modellazione