

Semi-analytical model of periodic coated viscoelastic contact.

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Semi-analytical contact models (SAMs) are faster to compute than finite element, particularly when modelling viscoelastic contact [1]. However, these methods generally only offer linear viscoelastic models. This paper proposes a layered periodic formulation [2, 3] in which each layer exhibits distinct viscoelastic response, thus increasing the complexity of the material's behaviour.

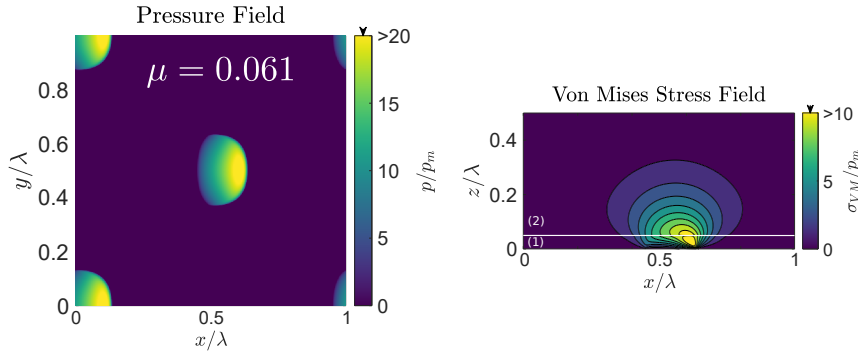


Figure 1: Layered diagram

The left side of Figure 1 shows the pressure field of the contact between a flat coated viscoelastic surface and a periodic bi-sine rigid surface. This field exhibits asymmetry between the front and rear of the contact, with the right side of the contact being more heavily loaded than the left side. This is due to dissipation causing a delay in the mechanical resonance of the body, between the front and rear of the contact.

Furthermore, the right-hand side of Figure 1 shows a cross-section of the equivalent von Mises stress in the xz plane. Between layers (1) and (2), a clear discontinuity is visible in the largest yellow area. This yellow area is larger and more widespread in layer (2) than in layer (1). This is a consequence of a well-known result in contact mechanics: the maximum von Mises stress is always found in the sublayer rather than at the contact point, provided there is no Coulomb friction. It is also due to the material in layer (2) having greater viscoelastic dissipation than that in layer (1), which explains the greater asymmetry in layer (2).

References

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