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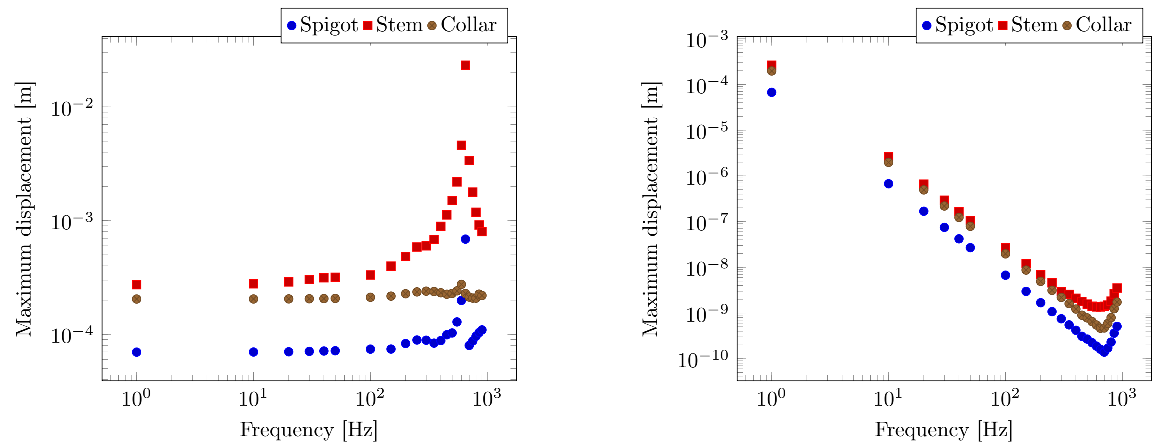
Abstract

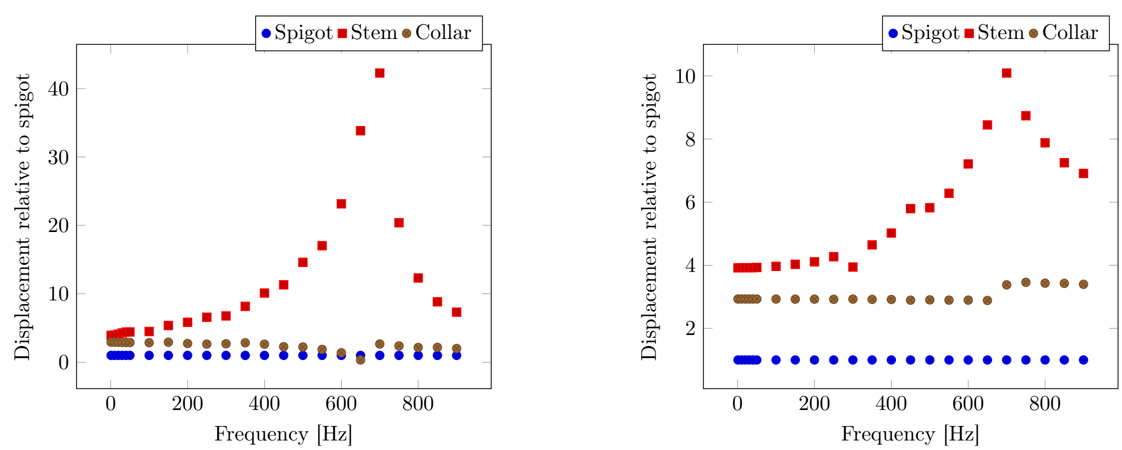
1. Introduction



(a) Constant displacement

(b) Constant load

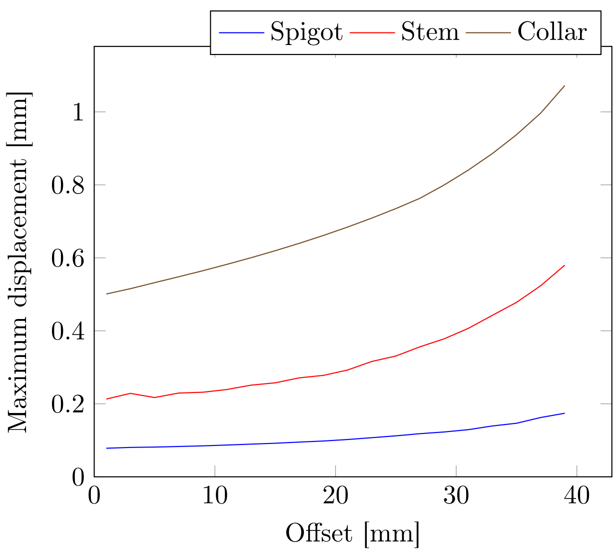
Figure 1.1: Maximum displacement as a function of frequency for 100 periods. (a) displacement: 0.2 µm, (b) load: 0.2 µN.



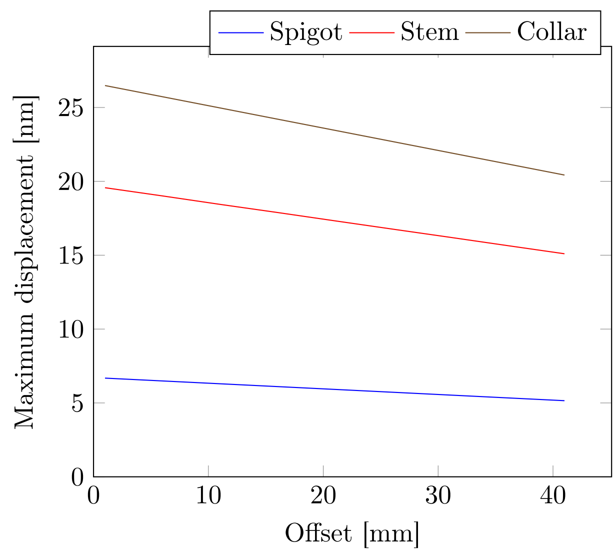
(a) Constant displacement

(b) Constant load

Figure 1.2: Maximum displacement relative to spigot as a function of frequency. (a) displacement: 0.2 µm, (b) load: 0.2 µN.



(a) Constant displacement



(b) Constant load

Figure 1.3: Maximum displacement as a function of the offset from base of spigot

2. Modelling

2.1 Model specifications

PMMA density of 1180 kg m^{-3} **(citation missing. took from Wikipedia)**. Bone density is 1750 kg m^{-3} to 2500 kg m^{-3} with the low-end representing a cortical diaphysis of a tibia [1] and in the high end, of a femur [2].

Orthotropic model that does not consider cancellous bone [3, 4]. In Abaqus the exact model is E*ngineering Constants*, not *Orthotropic*.

Young's Modulus	**Poisson's ratio**	**Shear Modulus**
E_1: 12.00 GPa	ν_{12} : 0.22	G_{12} : 5.61 GPa
E_2: 20.00 GPa	ν_{13} : 0.38	G_{13} : 4.53 GPa
E_3: 13.40 GPa	ν_{23} : 0.35	G_{23} : 6.23 GPa

Table 2.1: Material properties. Directions 1 and 3 are radial, direction 2 is axial.

Two models of bone were produced: a simplified hollow cylinder, and CT reconstruction using InVesalius [5] and Bonemat [6, 7]. CT scan datasets were from the Laboratory of Human Anatomy and Embryology, University of Brussels (ULB), Belgium

3. Conclusion

4. Discussion

4.1 Bone density

Other authors have used similar density values when modelling bone as an isotropic material [8].

4.2

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