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Simulations of Shock-induced Bubble Collapse near Hard and Soft Objects[1] MAURO RODRIGUEZ, ERIC JOHNSEN, University of Michigan, Ann Arbor — Understanding the dynamics of cavitation bubbles and shock waves in and near hard and soft objects is important particularly in various naval and medical applications. Two examples are therapeutic ultrasound procedures, which utilize this phenomenon for breaking kidney stones (lithotripsy) and ablation of pathogenic tissue (histotripsy), and erosion to elastomeric coatings on propellers. Although not fully understood, the damage mechanism combines the effect of the incoming pulses and cavitation produced by the high tension of the pulses. To understand the damage mechanism, it is of key interest to quantifying the influence of the shock waves on the material and the response of the material to the shock waves. A novel Eulerian numerical approach for simulating shock and acoustic wave propagation in viscoelastic media is leveraged to understand this influence. High-fidelity simulations of the bubble collapse dynamics for various experimental configurations (i.e. the viscous or viscoelastic material surrounding the bubble and neighboring object's rigidity are varied) will be conducted. In particular, we will discuss the shock emission from collapse and its propagation in the neighboring object, including stresses thereby produced.

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