SRIYANI RATHUGAMAGE,

A Membrane in Dynamic Adhesive Contact

We analyze a model for dynamic adhesive contact between a stretched viscoelastic membrane and a reactive obstacle that lies beneath it. The model consists of a hyperbolic equation for the vibrations of the membrane coupled with a nonlinear ordinary differential equation for the evolution of the bonding function.

The new feature in the model is the choice of the adhesion rate exponent which allows for complete debonding of the membrane from the support in finite time.

The existence of the unique weak solution for the model with viscosity is established using a sequence of approximate and truncated problems, a priori estimates on their solutions, and a fixed point argument. The solutions are found to be quite regular. We also use these estimates to pass to the limit of vanishing viscosity and obtain a weak solution of the inviscid problem.