Stability for an interface transmission problem of wave-plate equations with dynamical boundary controls

Zahraa Abdallah[†,⋆]

[†]Université Savoie Mont Blanc, Laboratoire de Mathématiques, Campus scientifique, 73376 Le Bourget du Lac Cedex, France

[⋆]Lebanese University, Faculty of Sciences, Khawarizmi Laboratory of Mathematics and Applications-KALMA, Hadath-Beirut, Lebanon

abdallazahraa02@gmail.com

We investigate a two-dimensional transmission model consisting of a wave equation and a Kirchhoff plate equation with dynamical boundary controls under geometric conditions. The two equations are coupled through transmission conditions along a steady interface between the domains in which the wave and plate equations evolve, respectively. Our primary concern is the stability analysis of the system, which has not appeared in the literature. For this aim, using a unique continuation theorem, the strong stability of the system is proved without any geometric condition and in the absence of compactness of the resolvent. Then, we show that our system lacks exponential (uniform) stability. However, we establish a polynomial energy decay estimate of type $1/t$ for smooth initial data using the frequency domain approach from semigroup theory, which combines a contradiction argument with the multiplier technique. This method leads to certain geometrical conditions concerning the wave's and the plate's domains.