סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ה׳ 3.3.2022 (ל׳ אדר א׳, תשפ״ב), בשעה 10:00 חדר ישיבות 217 בניין דן קהאן, קומה 2.
אם לא יתאפשר לבצע את ההרצאה בצורה פרונטלית, ההרצאה תועבר בזום:*
https://technion.zoom.us/j/99487984033

מרצה :   אילון טובי

מנחה :   פרופ׳ חבר יזהר אור

על הנושא:

Dynamics and stability of a planar three-link swimmer
with passive visco-elastic joint in ideal fluid

The seminar will be given in Hebrew

תקציר ההרצאה :

Autonomous swimming robots have a promising potential for various applications such as surveillance and protection around marine infrastructures, search and rescue missions, and maintenance operations within complex pipe systems. A common model assumes *ideal fluid*, where the viscosity is negligible and the swimmer-fluid interaction is induced by reactive forces originating from *added mass effect*. Our previous work used this model to study planar multi-link swimmers under kinematic input prescribing all joint angles. Inspired by biological swimmers in nature that utilize body flexibility, in this work we consider an underactuated swimmer where one joint is periodically actuated while the other joint is passive and viscoelastic, with torsional spring and damper. Analysis of the swimmer's nonlinear dynamics reveals that its motion depends significantly on the amplitude and frequency of the actuated joint angle. Optimal frequency is found where the swimmer's net displacement per cycle is maximized, under symmetric periodic oscillations of the passive joint. In addition, upon crossing critical values of amplitude and frequency, the system undergoes a bifurcation where the symmetric periodic solution loses stability and asymmetric solutions evolve, for which the swimmer moves along an arc. We analyze these phenomena using numerical simulations and analytical methods of perturbation expansion, Floquet theory and Hill's determinant. The results demonstrate the important role of parametric excitation on stability of motion for flexible underactuated locomotion.

בברכה,

פולט״ח אתי סאו
מרכז הסמינרים