הטכניון – מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

TECHNION – Israel Institute of Technology
Faculty of Mechanical Engineering

SEMINAR - סמינר

הינך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ד' 26.06.13 (י"ח בתמוז תשע"ג), בשעה 13:30 בחדר 641 בבניין ליידי דייויס.

יצרה :

פרופ'/מ יזהר אור
הפקולטה להנדסת מכונות, הטכניון

על הנושא:

Dynamics and control of locomotion – from micro-swimming to walking

להלן תקציר ההרצאה:

Locomotion is the ability of a living creature or a robot to propel itself by physical interaction with the surrounding environment. The dynamics of locomotion systems is inherently nonlinear and poses theoretical challenges of modeling and analysis, as well as developing nonlinear control strategies for steering and stabilization while optimizing performance. In this talk, several research works on dynamics and control of locomotion will be overviewed. The talk will focus on analysis of two particular modes of dynamic locomotion: micro-swimming and legged locomotion.

In micro-swimmers locomotion, the motion is governed by low-Reynolds number hydrodynamics where viscous forces are dominating while inertial effects are negligible. This applies for both swimming microorganisms and artificial micro-robotic swimmers for biomedical applications, which are currently under development in several research groups around the world. In this talk, several simplified dynamic models of microswimmers are formulated as a nonlinear control system. It is shown how structural symmetries can be exploited for open-loop stabilization of shape kinematics and of boundary tracking, as well as gait generation. Leading-order analysis of a micro-swimmer with a passive elastic tail is also presented. Some of the theoretical results are validated by motion experiments with macro-scaled prototypes in viscous fluid.

Dynamic legged locomotion is characterized by hybrid dynamics due to impact and contact transitions. Classical theoretical models of simple bipedal walkers typically ignore the possibility of foot slippage by assuming ground friction which is unrealistically large. Recent results on analysis of bipedal walking under low friction and stick-slip transitions will be presented. The influence of stick-slip transitions on orbital stability and on energetic efficiency will be discussed.

בברכה,

פרופ'/ת צוק שרינסקי
מרכז הסמינרים