הטכניון – מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ה' 29.01.15 (ט' בשבט, תשע"ה), בבניין ליידי-דייויס, חדר 641 בשעה 14:30.

ירצה: יובל שפירא

מנחה: פרופ"ח מרים זקסנהויז

על הנושא:

היבטים בדינמיקה ובקרה של רובוטים דו-רגליים המבוקרים בהשראה ביולוגית

Dynamics and Control Aspects of Biologically Inspired Walking Biped Robots

להלן תקציר ההרצאה:

In recent years there is a growing interest in developing humanoid robots for various tasks: health care for the elderly, powered leg prosthesis, maneuvering over rough terrain and more. One of the main challenges is to generate human like locomotion that can cope and perform the way we do in our day-to-day life.

The research investigates lateral balance of bipedal walking while exploiting the natural dynamics of the biped. We use as a case study a class of biped robots called Passive Dynamic Walkers (PDW). The 2-dimensional planar PDW can walk down a gentle slope using only their natural dynamics without any need for control or actuation. The potential energy of the slope compensates for energy loss sustaining the forward motion of the biped. This mechanism demonstrates stable bipedal walking with admirable properties of energy efficiency and human like gait motion. The 2-dimensional PDW is restricted to planar motion unlike humans who rock from side to side. However, extending the walker to 3-dimensions, which includes also lateral roll motion, results in an unstable gait.

The main objective of this research is stabilization of lateral motion to generate stable 3-dimension bipedal walking. The dynamic system is a non-linear hybrid system with an unstable limit cycle. We propose a decoupling controller to synchronize the lateral and sagittal motion of the biped that produces stable 3-dimension bipedal walking. The proposed controller generates a stable limit cycle in the vicinity of the unstable limit cycle. This facilitates exploiting the natural dynamics of the mechanism for its energy efficiency and natural looking gait. The stability of the limit cycle is investigated using the linearized Poincare map. Other stabilizing controllers that use the linearized Poincare map to stabilize the lateral motion are also investigated for comparison. Problems of implementing these controllers on potential physical robots are discussed.

בברכה,

פרופ'/מ אמיר גת
מרכז הסמינרים