הטכניון – מכון טכנולוגי לישראל **הפקולטה להנדסת מכונות**

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 15.08.16 (יא' באב, תשע"ו), בבניין דן-קאהן, קומה 0, אודיטוריום 1, 14:30.

ירצה: דנה סולב

מנחה: פרופ"ח אלון וולף
מנחה שותף: פרופ' מיילס רובין

על הנושא:

Non-Rigid Kinematics in Various Biomechanical Applications Using Cosserat Point Theory

The seminar will be given in English

להלן תקציר ההרצאה:

Accurate quantitative motion analysis plays an essential role in understanding normal function as well as pathological conditions of human biomechanical systems. Optoelectronic stereophotogrammetry (OESP) is currently the state of the art in human motion analysis. This technique involves placing markers on the skin surface of the analyzed body segments, and capturing their locations in space as a function of time. When the movement of the skeletal system is of interest, this noninvasive technique suffers from a critical limitation caused by the relative movement between the skin markers and the underlying bone, which is often referred to as the Soft Tissue Artifact (STA). STA is the most significant source of error in OESP, and satisfactory solution for its compensation has not been devised yet, despite numerous efforts.

We present a novel method, based on the theory of a Cosserat, to analyze non-rigid body kinematics using OESP in order to reduce the STA and estimate more accurately the underlying bone pose. Specifically, a cluster of markers on a body segment is divided into triangular sub-clusters, which are characterized by triangular Cosserat point elements (TCPEs). The non-rigid kinematics of the TCPEs are computed and analyzed to select TCPEs which more accurately estimate the underlying bone pose. The method was first evaluated using an experimental setup that consists of a rigid pendulum, with a deformable implant attached to it, to simulate the soft tissue around a bony segment. Then, the method was further developed and tested using *ex-vivo* and *in-vivo* data of the lower limbs. The results showed that the errors due to the STA can be reduced using the TCPE method, compared to commonly used least-squares methods.

Moreover, the TCPE kinematics was further developed for the purpose of respiratory motion analysis. In this method, chest wall kinematics measured by OESP is analyzed to evaluate respiratory function. The breathing patterns of healthy and neuromuscular patients were analyzed in terms of their TCPE parameters, and the results showed that they can be used to detect asynchronies and asymmetries which are related to respiratory inefficiency due to muscle weakness.

בברכה,

פרופ'/מ אמיר גת
מרכז הסמינרים