

## סמינריון

הנדך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום א' 22.08.21 (י"ד),  
אלול, תשפ"א), בשעה 15:30 באמצעות הזום: <https://technion.zoom.us/j/99009590378>

מרצה: מיכאל אברמנקו

מנחה: פרופ' אילון רימון

על הנושא:

### **Development of Desktop Sample Handling Robot Based on Caging Grasps**

The seminar will be given in Hebrew

תקציר ההרצאה:

Although samples testing laboratories have high level of automation, it is still not possible to completely exclude a person from samples testing cycle. Laboratory personnel perform many preparatory operations that are too complex for robots. At the same time, the presence of a person in the laboratory is highly undesirable. Laboratory test tubes may contain radioactive, toxic, or virological samples inside that can harmfully affect human health. This seminar describes the design of a sample handling robot to replace a human during the phase of unpacking test tubes with samples entering the laboratory. Test tubes with samples are delivered to the laboratory with unique barcodes for identification. These barcodes should be scanned after unpacking the test tubes as they provide information about the contents of the test tube and what tests need to be performed. The packaging of the test tubes consists of several coatings: first, the test tube is wrapped in a soft plastic bag, then it is packed in a plastic container, and in another soft plastic bad. Handling soft bags is a complicated task even for the most advanced robotic hands. To solve this problem, this study uses caging grasp theory that allows to reliably grasp and immobilize the test tube packed in a plastic bag, without using complex sensors or computer vision. To simplify the design of the sample handling robot, the test tube is unpacked by cutting the plastic bag. Unscrewing the container cap requires a complex movement of the sample handling robot fingers. For this purpose, a differential mechanism for the sample handling robot gripper was developed. The differential mechanism also allowed to make the entire design of the sample handling robot more compact and energy efficient. This seminar describes the design of two generation of the sample handling robots. The first generation robot with simplified design was designed to validate the conceptual model and study the physical processes that occur during test tube unpacking. This allowed to experimentally determine the forces needed to cut the plastic bag and to unscrew the container cap. Based on the collected data, a second generation sample handling robot was developed, capable of performing the entire unpacking process, identification of the test tube by barcode, and arrangement of test tubes into trays. The second generation sample handling robot completes all the preparatory processes and transfers the tray with samples to the next testing step without human intervention. A positive economic effect is achieved due to the low cost of the robot and due to the design, that allows several sample handling robots to work in parallel.

בברכה,

שׁוֹפֵר אֶתִּי סָאס  
מרכז הסמינרים