

הנדך מוזמנות/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ה'
12.04.2018 (כ"ז בניסן, תשע"ח), בניין דן קאהן, אודיטוריום 1, 13: 30.

מרצה: רן שחם

מנחה: פרופ' יצחק בוכר

על הנושא:

Acoustic Levitation – Implementation, Control and Analysis

The seminar will be given in Hebrew

תקציר ההרצאה:

Near-Field Acoustic Levitation (NFAL), occurs when two planar objects are placed in close proximity and oscillate at an ultrasonic frequency relative to each other. As a result, the pressure in the squeeze-film (i.e., the small gap between these surfaces) is higher than the ambient pressure, due to nonlinear effects, the latter induces a levitation force.

The main components of an NFAL system are:

- Actuator – Produces the oscillations. Needs to be designed to generate high amplitudes at ultrasonic frequencies. The actuators consist of two parts, a Langvin actuator, and an amplifying horn. These two are impedance matched to have the same natural frequency and a desired mode shape and that frequency, one that has the maximum amplitude at the tip of the horn.
- Driver – Provides the power to the actuator needed for achieving sufficient amplitudes at the right frequencies, this is done by a method of impedance matching, in which the right coil is introduced into the electrical system in way which shapes the phase and shifts the natural frequency.
- Control – The driver and actuator are matched to have the same natural frequency (of the mechanical and electrical systems), this frequency varies with time and needs to be tracked and changed accordingly, this is done using a Phase Locked Loop (PLL).

The research's first part investigates some aspects of the latter two system components.

The second part of the research investigates several NFAL systems and ways to manipulate and control the levitated object:

Acoustic Motor - a device acting on an acoustically levitated object by manipulating the pressure and flow of a thin layer of air such that its rotation can be precisely controlled without mechanical contact.

Wafer Aligner - A stage capable of positioning a silicon wafer in the X-Y plane and performing rotation, on a thin layer of air without contact, using several Acoustic Motors.

Amplitude modulation - Finally, another way of manipulating a levitated object is investigated, where instead of generating travelling waves, the amplitudes of several actuators are differentiated, which affects the squeeze film in such a way that applies a force on the levitated object.

These systems can be implemented in many industries where delicate planar objects are handled, i.e., Clean rooms, display monitor manufactures etc.

בברכה,

פרופ' איתי אסא

מרכז הסמינרים