

MECHANICAL ENGINEERING STUDENT SEMINAR

Sunday, March 10, 2024, at 13:30, D. Dan and Betty Kahn Building, meeting room 217.

Heliostat accurate control methods under shading and blocking

Irjuwan Abunajeeb

MSc Candidate, Grand Technion Energy Program

Adviser: Prof. Carmel Rotchild

Concentrated Solar Power (CSP) is an essential technology in the field of renewable energy, which can offer both baseload and dispatchable power. It has several advantages, and its contribution to the global effort in transition to more sustainable and environmentally friendly energy sources is estimated to increase. This is because CSP technologies address one of the challenges associated with intermittent energy sources such as wind and solar by incorporating thermal energy storage, allowing generation to be shifted to periods without solar resources, and providing backup energy during periods with reduced sunlight that can be caused by cloud cover. Enhancing optical efficiency is a key concept in CSP technology development. This research aims to improve the solar field's tracking accuracy by presenting and implementing two new tracking methods and comparing them to prior art. The first method uses the diffracting properties of light to detect the orientation of the heliostat by attaching a diffractive optical element (an axicon) to the heliostat, and by recognizing the diffraction pattern that the axicon produces, the deviation amount was measured. The second method was based on putting a specular bent bar along each edge of the heliostat (or mirror facet), and according to the place of the specular spot, which is the sun's reflection, the deviation from the receiver was obtained. I will show that these methods are superior in supporting high solar field efficiency compared to prior art.

Note: the seminar will be given in English