GTIIT MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Wednesday, January 28 2026 at 10:00 Israel time (16:00 China time)

GTIIT classroom: E508, North Campus

Online: https://technion.zoom.us/j/92574686115

Improving Locomotion Energy Efficiency of Legged Robot by Energy Recycling

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Legged robots are well-suited for human-designed environments and have demonstrated strong potential. However, the energy efficiency of legged robots remains insufficiently investigated. A common phenomenon in rigid-legged robots is energy dissipation caused by foot-ground collisions, which significantly reduces overall energy efficiency. Although spring-like compliant mechanisms can reduce dissipation and recycle energy, their passive timing often mismatches the gait cycle and undermines both walking efficiency and stability. To overcome this limitation, we propose an energy-recycling rimless wheel that uses a lockable clutch mechanism to store energy at foot contact and reinject it in the next gait cycle. Simulation results show that the clutch mechanism can reduce the energy cost by up to 16.13% compared to the viscoelastic-legged configuration. The proposed system further demonstrates robust and consistent stability. In the experiment, the energy-recycling rimless wheel is able to walk down a 1° slope, achieving a Cost of Transport (CoT) of 0.02. In addition, we briefly discuss basic simulation results of stable gait generation on level surface using a rimless wheel with spring-clutch mechanism and torque actuation of an upper body link. This work highlights the potential of energy-recycling strategies for improving walking efficiency and their applicability to more complex legged robotic systems.

Seminars Coordinator: Prof. Sefi Givli

Note: the seminar will be given in English