MECHANICAL ENGINEERING STUDENT SEMINAR

Thursday, September 25, 2025, at 15:00, Israel time
Online: https://gtiit.zoom.us/j/95197607780

Search and Rescue (SAR) Robot

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Natural disasters such as earthquakes, mine collapses, and cave accidents often create confined and unstable environments that endanger human rescuers and make timely intervention critical. Search and rescue (SAR) robots have been developed to reduce human risk, but existing systems — including tracked, legged, snake-like, and growth-based continuum platforms — rarely achieve some essential qualities simultaneously: low-cost fabrication, controllability, programmable shape, multi-modal locomotion, shape stability and reversibility. This limitation motivated the development of a new approach capable of adapting to path constraints and retracting to its initial position after task completion.

This work presents a straw-inspired search-and-rescue robot that enables controllable and reversible growth through the use of multistable frusta-based structures and pressure-driven actuation. Motorized clamping units selectively anchor and release the body, allowing the robot to extend step by step, steer, and retract when required. The development process included conceptualizing the motion strategy, building a prototype, and conducting experiments to evaluate basic locomotion performance.

Experimental results show that the robot can perform forward growth, turning, and retraction under controlled conditions, demonstrating the feasibility of this approach. The multistable structure holds its shape without continuous power input, which supports stable operation during deployment.

Overall, this study provides a proof-of-concept for a reversible, pressure-driven continuum robot for SAR applications. The results establish a foundation for future work aimed at improving turning precision, reducing system size, and integrating sensing for autonomous navigation in realistic environments.

Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Shmuel Gal.