

€1.5 million from the EU for innovative research at the Technion dealing with disaggregated satellites

The free-flying satellite modules will form a fractionated satellite in space

The European Research Council (ERC) will provide €1.5 million for research by Prof. Pini Gurfil of the Faculty of Aerospace Engineering at the Technion, who proposes launching satellites in parts, so that a complete satellite whose components communicate with each other wirelessly will be constructed. The ERC Starting Independent Researcher Grant is considered Europe's most prestigious research award. Its aim is to encourage pioneering frontier research in any field of science, engineering and scholarship.

“In unexpected situations, such as damage from space debris, a satellite might not react well and could discontinue its original task; functional and financial damages are thus unavoidable,” explains Prof. Gurfil. “For example, if the payload is damaged, the entire system becomes unusable, and in order to complete the task, the entire instrument must be replaced. This procedure is very expensive and time-consuming. It is much easier to change a payload module than launch a new satellite.”

This idea led to a new concept in space engineering termed disaggregated spacecraft. In disaggregated space architectures (DSA), several separate modules communicate with each other via wireless communication links, thus forming a single virtual platform. Each module has its own designated function or functions: navigation, attitude control, power generation and payload operation. The independent modules are able to distribute resources among themselves and do not have to be very close to each other to operate. They only have to be in relative proximity, such that they form a cluster.

DSA constitutes a new type of space engineering, which is expected to be more efficient in terms of responsiveness; responsiveness is the ability to adapt to unexpected scenarios resulting from several sources of uncertainty at different levels of task design and execution. The final goal of the proposed research is to develop innovative technology that will enable actual flight in a DSA formation; specific objectives include (a) development of algorithms for long-term semi-autonomous maintenance of the cluster and the cluster network, while allowing for the addition of new modules or removal of such modules; (b) finding methods for reconfiguration that guarantee cluster safety and mission-critical functionality; (c) design of distribution/gathering of the cluster, with the purpose of avoiding collision with space debris; (d) development of logic and ways to share resources within the flock network, with the ability to react in real-time; and (e) verification of these algorithms and methods in the Distributed Space Systems Laboratory, a research laboratory developed by Prof. Gurfil. The proposed research will create the necessary infrastructure for a space demonstration circa 2016.