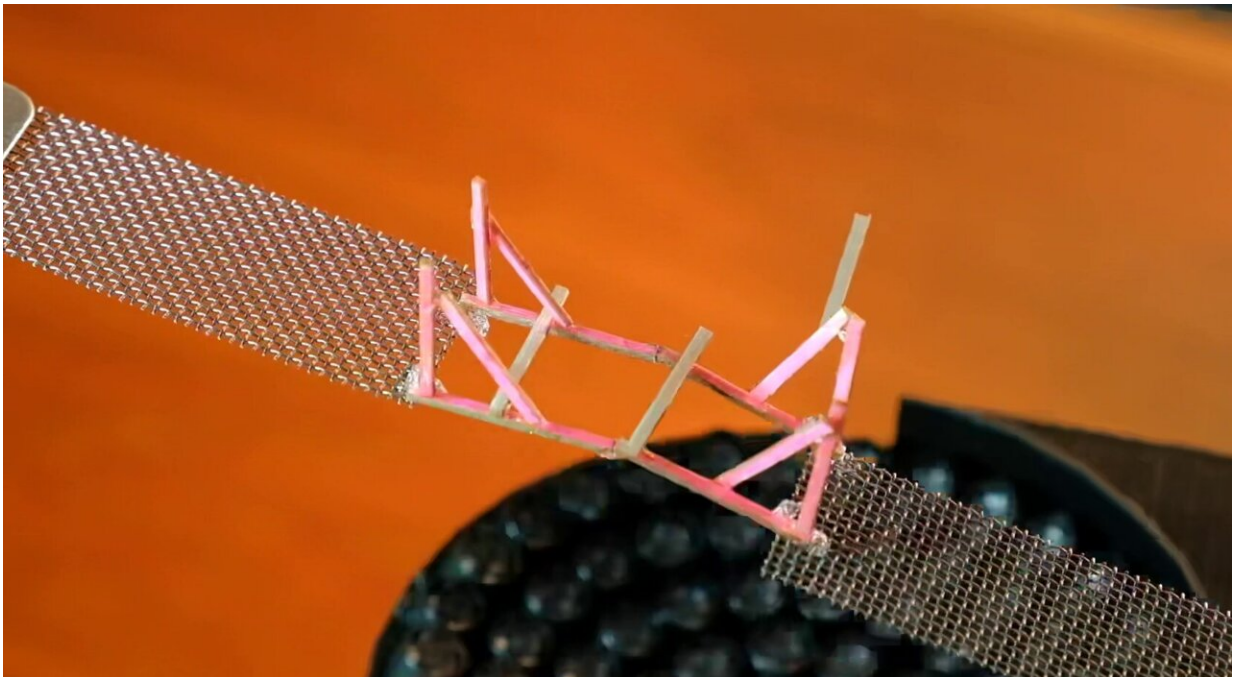


Novel construction system uses acoustic levitation to assemble parts

June 29 2022



Assembly of segments using acoustic levitation. Credit: UPNA/NUP-Public University of Navarre

LeviPrint is a system that uses acoustic manipulation for assembling objects without physical contact. It generates acoustic fields that trap small particles, glue droplets and elongated stick-like elements that can be manipulated and reoriented as they are levitated. It is a fully functional system for manufacturing 3D structures using contactless

manipulation.

It was developed by researchers from the UPNA/NUP-Public University of Navarre Asier Marzo and Iñigo Ezcurdia, who together with Rafael Morales (Ultraleap Ltd, UK) and Marco Andrade (University of São Paulo, Brazil) are authors of the paper "LeviPrint: Contactless Fabrication using Full Acoustic Trapping of Elongated Parts."

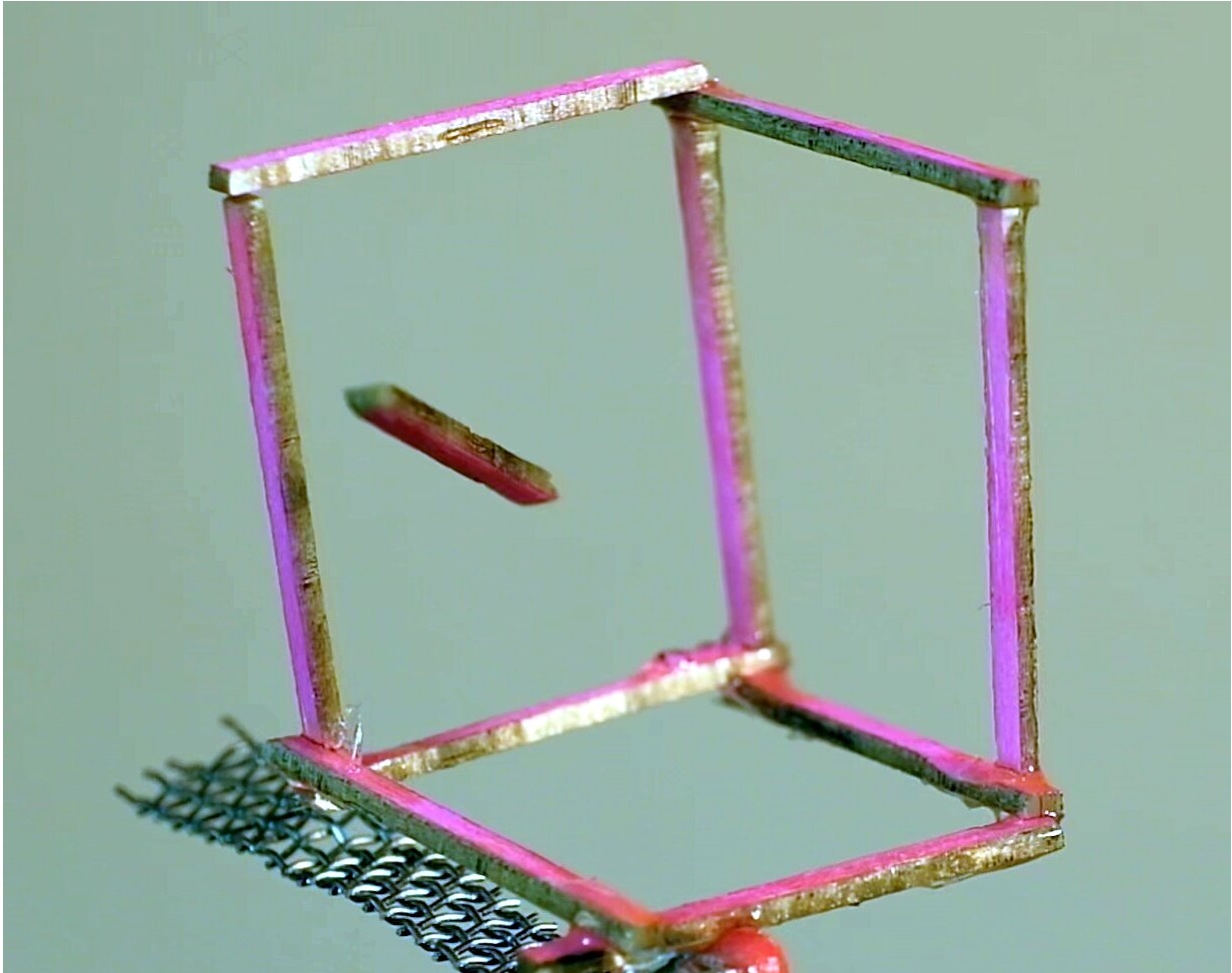
This research is due to be presented in August in Vancouver (Canada) at SIGGRAPH, a conference on [computer graphics](#) and [interactive techniques](#) where companies such as Nvidia, Disney Research and Facebook Reality Labs present their work.

Asier Marzo, lead researcher and member of the UPNA/NUP's Smart Cities Institute (ISC) says, "we have designed a levitator combined with a [robotic arm](#) and a liquid dispenser to manufacture complex objects without contact."

Unlike regular assembly and manufacturing techniques, in which parts are in direct contact with the machine, acoustic manipulation has been used to position and orient parts without touching them during the assembly process. "We can manipulate small, brittle parts, as well as liquids or powders, thus making the processes more versatile. There is less cross-contamination, as the manipulator does not touch the material. Furthermore, it enables manufacturing techniques that cannot be achieved using traditional 3D printing, such as adding elements on top of existing parts or manufacturing inside closed containers from the outside," said Iñigo Ezcurdia, Ph.D. student and lead author of the research.

The researchers write that "levitation of [small particles](#) and droplets has been achieved before, but no existing work has managed to trap in position and orientation elongated objects; this research allows using

segments, sticks or beams for the fast and contactless manufacturing of robust, lightweight and complex structures."



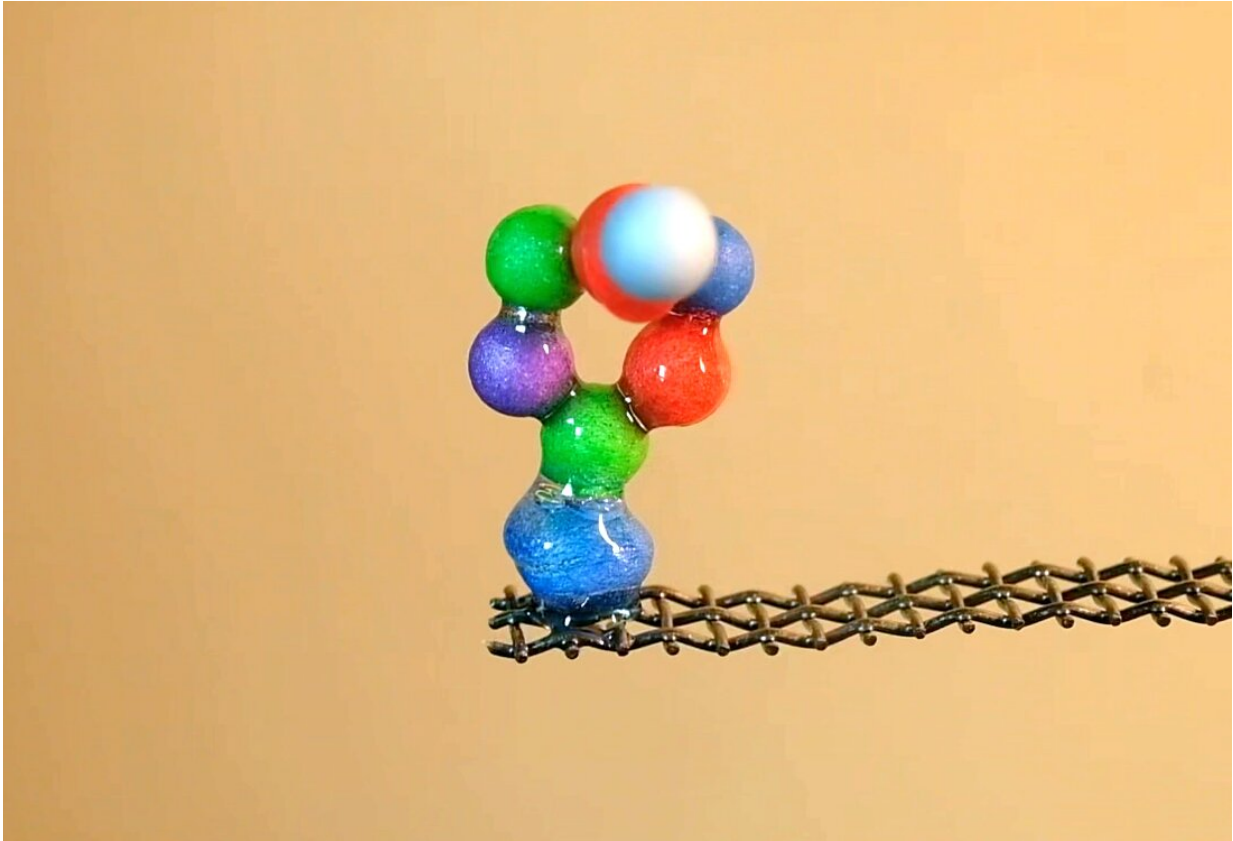
Creating a cube using 12 segments. Credit: UPNA/NUP-Public University of Navarre

Some of the proposed techniques include the use of a glue that solidifies with ultraviolet light. Parts made only of glue can be manufactured, yet structures are usually made by assembling particles and elongated segments using this glue. For example, the system uses the acoustic

levitator to trap a droplet of glue dispensed by a syringe. The droplet is levitated into the position where the next part will be added. The system picks up a segment or particle, positions it next to the previous ones in contact with the glue and uses [ultraviolet light](#) to dry the [glue](#) so that the new part is attached to the structure.



Structure created only with UV glue. Credit: UPNA/NUP-Public University of Navarre



Structure created with spherical particles. Credit: UPNA/NUP-Public University of Navarre

The ultrasonic field can pass through fabrics, meshes and other materials. For example, the researchers built a ship inside a bottle by levitating materials from the outside through a small opening. The researchers say that if Leviprint is adapted to operate in aqueous media, it could assemble complex structures in cell culture media and perhaps even inside living beings.

More information: Research paper: www2.unavarra.es/gesadj/servicio_comunicacion/Archivos%20PDF/AsierMarzo-PrePrint/Preprint-trabajo-Leviprint_SIGGRAPH.pdf

Provided by Elhuyar Fundazioa

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