

## **Creating 3-D objects from inextensible sheet materials**

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Credit: Ecole Polytechnique Federale de Lausanne

Researchers have developed an algorithm for creating complex objects by cutting holes in sheets of inextensible, but flexible materials such as metal, plastic and leather. It has potential applications in many areas, including microengineering, bioengineering, fashion and architecture.

EPFL researchers, in collaboration with Carnegie Mellon University and



the University of Hull, have come up with a method for creating everyday objects – like a mask or a shoe – from sheets of inextensible material. The process consists of cutting regular holes into the material so that it can be stretched and create complex 3-D shapes. Previously, this was possible only with very simple objects.

EPFL researcher Mina Konakovic and her team have now come up with an algorithm that clears the way to creating much more complex shapes using <u>materials</u> that are flexible yet inextensible, such as plastic and metal. Cutting regular geometric shapes into the material changes its properties and makes it auxetic – which means it can stretch in two dimensions at the same time.

## From architecture to space engineering

The method developed by the researchers uses computer simulation to identify exactly where to make the cuts and how to shape the material to create the 3-D piece. Potential applications are far-ranging. "We could, for example, scan someone and create a piece of clothing that fits perfectly from a single piece of leather," said Mark Pauly, who runs EPFL's Computer Graphics and Geometry Laboratory. The researchers have tested their algorithm by making a high-heeled shoe, masks, a dress, and sculptures.

Thanks to its simplicity of use, the process could be applied in a wide range of fields, from small structures (microelectronics) to large ones (like building façades). The researchers will now look at what can be done by varying the cutouts rather than using a regular pattern. "It will be much more complex, but it could lead to some very interesting applications," said Pauly.

This research was presented at the SIGGRAPH conference



(International Conference on Computer Graphics and Interactive Techniques).

More information: <a href="http://www.siggraph.org/">www.siggraph.org/</a>

## Provided by Ecole Polytechnique Federale de Lausanne

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