

Origami based tires can change shape while a vehicle is moving

27 April 2021, by Bob Yirka



Transformable wheel concept and demonstration. (A) The wheel can be transformed into two shapes according to the road condition. (B) The relationship between the diameter and width of the wheel. (C) The load-displacement response of the wheel in the shape-transition state. (D) We designed a single-passenger vehicle for installation of the transformable wheels. The operation and capacity of the wheels were demonstrated through a field test. Credit: *Science Robotics* (2021). DOI: 10.1126/scirobotics.abe0201

A team of researchers affiliated with Seoul National University, Harvard University and Hankook Tire and Technology Co. Ltd., has developed a tire based on an origami design that allows for changing the shape of a tire while a vehicle is moving. In their paper published in the journal *Science Robotics*, the group describes their new tire design and how well it worked when tested.

Origami is an art that involves folding [paper](#) to create a desired shape or figure. Originating with Japanese artists hundreds of years ago, it has

become an international pastime. In more recent years, it has caught the interest of engineers who have used origami designs to create usable objects out of plastics and metals. In this new effort, the researchers have extended an [origami](#) design called a waterbomb tessellation—it involves creating a single wheel that can have two configurations depending on how it is used by a person holding it. The researchers have ramped up the design by making its facets out of metals such as aluminum and connecting them together using other materials.

The researchers realized the design in a variety of sizes—some of which were as large as automobile tires. The design could switch between configurations while bearing a heavy load and while serving as tires on a vehicle in motion. To test the capabilities of the design, they created several wheels that served as tires on a variety of vehicles. In all cases, the main difference between the two configurations was height. They demonstrated, for example, a vehicle sporting the specialized tires in the tall configuration as it approached a low underpass—too low for the vehicle to drive under with its initial configuration. The driver switched the tires to the low configuration as the vehicle was still moving, allowing the [vehicle](#) to pass beneath the underpass.

The work by the team is still in its early stages and the vehicles they are making are not yet ready for the open road, but the group suggests their tires may someday be used in remote environments such as the moon or Mars, where the ability to change configurations to suit environmental conditions might come in handy.

More information: Dae-Young Lee et al. High-load capacity origami transformable wheel, *Science Robotics* (2021). DOI: [10.1126/scirobotics.abe0201](https://doi.org/10.1126/scirobotics.abe0201)

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