This compact and cheap lidar could steer small autonomous vehicles

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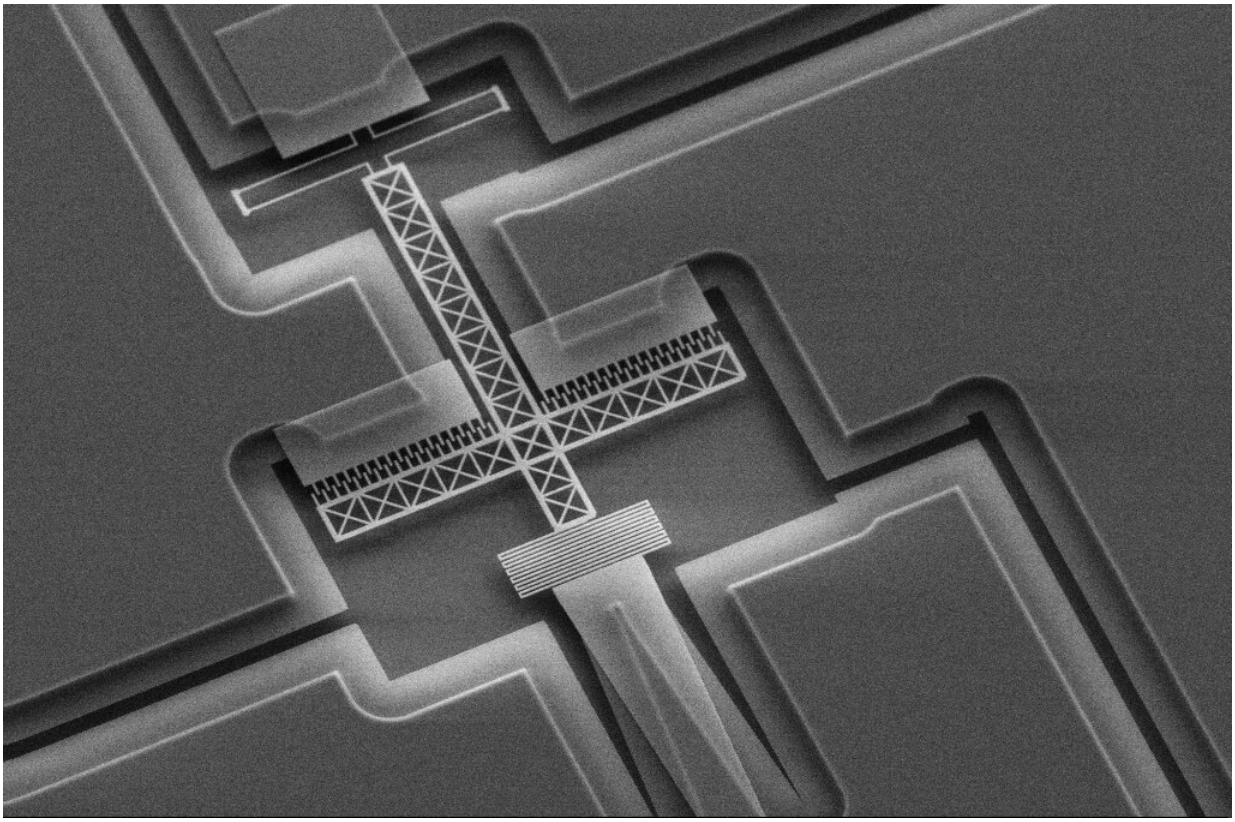

A close-up look at a miniature optical beam steering component that promises to enable lighter and less costly autonomous vehicles. Credit: Kristinn Gylfason

Researchers in Sweden have developed cheaper, lighter and more efficient lidar technology that could pave the way for smaller

autonomous craft such as drones and robots, and help enable better profitability in the vehicle industry.

For autonomous vehicles, lidar is an essential technology to recognize and detect surrounding objects. A team at KTH Royal Institute of Technology has taken aim at the key component of lidar, optical beam-stearing, and developed a device that is significantly cheaper to manufacture, lighter and more resource-efficient than previous variations of the technology.

Carlos Errando-Herranz, a postdoc at KTH's 's Division of Micro and Nanosystems, says that this version of lidar would cost about USD 10 each given large production volumes, weigh a few grams (including peripheral equipment) and consume some 100 milliwatts. The research was reported in the journal *Optics Letters*.

Errando-Herranz says that the miniaturized beam-stearing device measures approximately 100 micrometres, and is best observed under a microscope.

"We use the same production techniques as for manufacturing accelerometers and gyroscopes for smartphones," he says. "This means the costs can be really low on large volumes."

Errando-Herranz says that the technology can enable more craft, such as robots or drones, to be self-flying or self-driving for example.

The advance could also eliminate the need for remote control on drones that are designed to deliver emergency medical equipment to remote places, such as defibrillators, says Kristinn B. Gylfason, Associate Professor at KTH.

"Robots and drones are absolutely possible application areas," Gylfason

says. "Current lidar systems are also too expensive for self-driving cars. The vehicle industry is very cost sensitive. Other possibilities are facial recognition for smartphones, such as Apple's Face ID."

The difference with the KTH approach to lidar is that it uses micro-electromechanical optical beam steering.

"A traditional lidar is based on mounting an array of lasers on a rotating tower, like the Velodyne puck," Gylfason says. "Our approach to lidar is based on integrated micro-opto-mechanics, where we have built a tuneable grating into the surface of a silicon chip. By modifying the grating period, we decide in which direction the beam should sweep."

Optical beam steering can also be used for three dimensional imaging in medical diagnostics, with a technique know as Optical Coherence Tomography. With this miniaturized technology, a scanner could be inserted into the body during keyhole surgery and used to identify changes in tissues.

More information: Carlos Errando-Herranz et al. Low-power optical beam steering by microelectromechanical waveguide gratings, *Optics Letters* (2019). DOI: 10.1364/OL.44.000855

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