Self-adjustable smart cloaking with an elastic and electromagnetic crystal

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Until now, electromagnetic cloaks using metamaterials that consist of rigid structure for one shape. These cloaks are designed using transformation optics and optical conformal mapping based on coordinate transformation from Maxwell’s equations. Most of the cloaks render an object invisible, compressing the object to a point (omnidirectional cloak) or a line (ground-plane cloak). In these cases, compressing means mapping from virtual space to physical space during design process, not physically deforming.1,2 Invisible objects rendered with a cloak that fits variable-sized objects has been a tantalizing goal for scientific researchers. Here we demonstrate a smart cloak that fits variable-sized objects using smart metamaterials whose inner electromagnetic properties automatically changes as boundary elastic deformations.3 Based on this concept, we built and experimentally tested a smart cloak whose functionality derives from quasiconformal coordinate transformations.

Acknowledgment
This work has been supported by the Low Observable Technology Research Center program of Defense Acquisition Program Administration and Agency for Defense Development.

References