Mathematics and CS Seminar

Metamaterial Devices

Alexandra Ion
ETH Zurich

Host: Bernd Bickel

3D printers allow for arranging matter freely in space, thereby enabling the fabrication of arbitrary shapes with complex internal structures. Such structures, typically based on 3D cell grids, are known as metamaterials. Metamaterials have been shown to incorporate extreme properties such as change in volume, programmable shock-absorbing qualities or locally varying elasticity.Traditionally, metamaterials were understood as materialsI think of them as *devices*.I argue that viewing metamaterials as devices allows us to push the boundaries of metamaterials further. In my research, I propose unifying material and device and develop metamaterial devices. To instantiate these new types of devices, I investigated three aspects of such metamaterial devices: (1) materials that process analog inputs, (2) materials that process digital signals, and (3) materials that output information to the user by changing their outside textures. I believe that future materials will be able to sense their environment, process that information and produce output or reconfigure themselvesall performed without electronics, but within the material structure itself. Such materials can be fabricated from one block of a single material; thus, they require no assembly and miniaturize well. The intricate cell-structure that enables such materials is very challenging to design as all cells need to move in concert, which demands efficient computational design tools. By solving the challenges around design tools, I argue that such intelligent materials will push the boundaries of e.g., medical implants, soft robotics, aeronautics, or energy harvesting materials.

Monday, March 2, 2020 10:00am - 11:00am
Mondi Seminar Room 2, Central Building

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.