Acoustic Manipulation and Assembly of Many Particles

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Abstract

Acoustic field can manipulate and assemble particles with little requirement on the specific properties, unlike magnetic fields or optical fields. Traditionally, acoustic manipulation relies on the energy well created by the so-called nodal points or line. To manipulate many objects independently, a large number of transducers are needed. However, by simply revisiting the original experiment conducted by Ernst Chladni in 1797, it is possible to create highly nonlinear but controllable acoustic fields using a single transducer with some modern tweak. This talk will present our work on single transducer acoustic manipulation that can manipulate many particles, for trajectory following, pattern transformation, or swarm formation. The discussion will cover three settings, motion of particle on a plate, motion of levitated particles, and our recent discovery of motion of particles underwater.

Biography

Quan Zhou received the M.Sc and Dr. Tech. degrees from Tampere University of Technology, Finland. He is currently heading the Robotic Instruments Group at School of Electrical Engineering, Aalto University, Finland. His main research interests are micro- and nano manipulation and automation methods. His work has been published in major international journals including Nature Communications, Physical Review Letters, Advanced Materials, Small and IEEE Transactions on Robotics. Prof. Zhou has won the Anton Paar Research Award for Instrumental Analytics and Characterization. He has served different editorial positions in several journals. Prof. Zhou was the coordinator of EU FP7 project FAB2ASM, the first PPP project of the European Economic Recovery Plan. He was also the chair of IEEE Finland Joint Chapter of Control System Society, Robotics and Automation Society and System Man and Cybernetics Society.