機械工学セミナー
Mechanical Engineering Seminar
2018年度第2回 (No.13)　2018-No.2 (No.13)
主催： 慶應義塾大学理工学部機械工学科
Department of Mechanical Engineering, Keio University

日 時 (Date)
2018年7月10日(火) (July 10, 2018 (Tue.)) 13:30~14:30

場 所 (Venue)
14棟2階ディスカッションルーム1 (Discussion Room 1, Building 14)

講演題目 (Title)
Fluidic Microassembly with Surface Tension Effects

講演者 (Speaker)
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ABSTRACT:
This talk relates to fluidic assembly relying on surface tension effects, based on examples developed these last years: capillary gripping, capillary self-alignment, assembly platform supported by droplets or bubbles. It will be built along two axis.
Firstly, we will present the underlying capillary forces models, emphasizing current research challenges: dynamics of surface tension effects, coupling between the degrees-of-freedom of a liquid meniscus, reliability and repeatability issues due to evaporation, contact angle hysteresis, control of surface tension effects.
Secondly, recent results will be shown on a new approach of thermo-capillary micromanipulation. This consists in creating a laser-controlled temperature gradient on a liquid-air interface, leading to a surface tension gradient field which is used to move 500 µm components along trajectories located at the interface. This technique is considered to be complementary to capillary self-assembly patterns (Cheerios effect), since it can move individual components. Similar to but unlike natural or Marangoni convection, this technique does not rely on any thermodynamic instability (ie. neither Rayleigh nor Marangoni numbers thresholds are required). Moving particles can be triggered with a 37mW laser power, leading to a temperature difference smaller than 5C degrees while leading to velocities up to 5 mm/s. The current results include the open loop proof of concept, the experimental characterization of the particle velocity as a function of the laser-particle distance, which is then used to closed-loop control the particle trajectory until a target location. These results are supported by simulation results (Comsol, solving the coupled thermal and flow physics). Recent development on use of light patterns as well as control of particles against a perturbation induced by a neighboring particle.

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