

The Delft Center for Systems and Control of the Delft University of Technology, The Netherlands, announces a Postdoc position (2 year) on the topic

Control of Inkjet Printheads

Mechanical, Maritime and Materials Engineering

The 3ME Faculty trains committed engineering students and PhD candidates in groundbreaking scientific research in the fields of mechanical, maritime and materials engineering. 3ME is the epitome of a dynamic, innovative faculty, with a European scope that contributes demonstrable economic and social benefits.

Delft Centre for Systems and Control

The Delft Centre for Systems and Control (DCSC) coordinates the education and research activities in systems and control at Delft University of Technology. The Centre's research mission is to conduct fundamental research in systems dynamics and control, involving dynamic modelling, advanced control theory, optimization and signal analysis. The research is motivated by advanced technology development in mechatronics and microsystems, sustainable industrial processes, transportation and automotive systems, and physical imaging systems. The group actively participates in the Dutch Institute of Systems and Control (DISC).

Project description

This project is a part of the *Octopus* Project, which is a joint endeavor of industrial and academic partners with the Embedded Systems Institute (see: <http://www.esi.nl/>). The academic partners are Delft University of Technology, Eindhoven University of Technology, Twente University and Radboud University Nijmegen. The carrying industrial partner is OCE, a world-leading manufacturer of professional printers. The Octopus project aims at improving the adaptability of OCE-printers to changing environment, changing media, changing customer desiderata and changing printer dynamics (due to wear, toner contamination, etc.). This project is partly funded by the Dutch Government. This particular vacancy pertains to the strengthening of the TU Delft team for a period of two years. The TU Delft team is led by Prof.dr.ir. R. Babuska and dr.ir. X.J.A. Bombois and its objective in the Octopus project is to develop control techniques in order to improve the performance of inkjet printheads.

The ability of inkjet technology to deposit materials with diverse chemical and physical properties on substrate has made it an important technology for industry. Apart from conventional document printing, Inkjet technology has been successfully applied to the manufacturing of e.g. solar panels, PCBs and flat-panel displays. A typical drop-on-demand (DoD) inkjet printhead consists of several ink channels in parallel. Each channel is provided with a piezo-actuator, which on application of a standard actuation voltage pulse can generate pressure oscillations inside the ink channel to push the ink drop out of the nozzle. The print quality delivered by an inkjet printhead depends on the properties of the jetted drop, i.e., the drop velocity, the jetting directionality and the drop volume. To meet the challenging performance requirements posed by new applications, these drop properties have to be tightly controlled.

The performance of the inkjet printhead is limited by two operational issues. The first issue is the *residual pressure oscillation*. Once the ink drop is jetted the pressure oscillations inside the ink channel takes several micro-seconds to decay. If the next ink drop is jetted before settling of these residual oscillations, the resulting drop properties will be different from the ones of the previous drop. The second operational issue is the *cross-talk*. The drop properties through an ink channel are affected when its neighboring channels are actuated simultaneously.

Given the nonlinear nature of the drop jetting process, a linear parameter varying (LPV) model (and/or a Takagi-Sugeno fuzzy model) can be considered in order to describe the ink channel dynamics. Robust control techniques based on these models can then be applied to design the actuation waveform for the piezo actuator.

Candidate profile

We are looking for a candidate with a Ph.D. degree in systems and control. Candidates should have good analytical and modeling skills and excellent communication skills.

Conditions of employment

The Post-Doc will be appointed for a period of two years and will work with other researchers in a multidisciplinary group. For a part of the project time the Post-Doc will be co-located at the OCE facilities in Venlo. As an employee of Delft University of Technology the Post-Doc will receive a competitive salary as well as excellent secondary benefits in accordance with the Collective Agreement (CAO) of the Association of Universities in the Netherlands (VSNU).

Information and application

Additional information about the vacancy can be obtained from: dr. ir. X.J.A. Bombois, tel. +31 15 278 5150, x.j.a.bombois@tudelft.nl, Delft University of Technology, DCSC, Mekelweg 2, NL-2628 CD Delft, the Netherlands.

Interested applicants should send their motivational letter and curriculum vitae to: Application-3mE@tudelft.nl or to Delft University of Technology, Ms. M. de Groot, Faculty 3mE, HR department, Mekelweg 2, 2628 CD, Delft, The Netherlands.

When applying for this position, make sure to mention vacancy number **3ME09-37**.

The position stays open and applications can be submitted until a suitable candidate has been found.

More information relating to the application procedure can soon be found on <http://www.esi.nl/>