Abstract Template

Title: Automated Venting Technique Used In Microfluidic Digital Logic Lab-on-a-chip Device

Manasi M. Raje[1], Elliot Hui[2]

[1]Shield Diagnostics, Santa Clara, CA, USA
[2]Department of Biomedical Engineering, UC Irvine, USA

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I. Abstract Body (up to 250 words)

Microfluidic digital logic is an emerging technology which can be useful to automate a variety of lab processes in order to bring lab tests and diagnostics to low resource settings where it can be difficult to establish expensive and advanced labs [1]. Microfluidic digital logic derives its concept from the digital logic in electronics and aids to automate complex liquid handling processes. The basic logic circuits are designed using valves and pneumatic resistors in a way that can be used to pump fluid around in the chip in order to transport the fluid or to mix it or store it. Automation of such basic aspects of a microfluidic device can help to eliminate the wieldy machinery that is required to drive a microfluidic chip. For example the computer program, mechanical/electrical pumps and syringe pumps can be replaced by on-chip pneumatic logic circuits.

The heart of this work is a serial dilution circuit which has been previously reported in detail [2]. The logic blocks designed around the dilution ladder do the job of selecting the program, pumping the diluent and making sure all the logic signals are routed correctly without any leakage or impeding attenuation. The circuit that receives and routes all other signals incorporates a feature to check the quality of dilution, the feature is called the venting network. This network uses the logic of its host circuit to vent appropriate valves during the corresponding cycle of dilution in order to avoid leakage and maintain optimal speed of dilution. This work demonstrates engineering of solutions around the challenges associated with large scale integration of complex microfluidic technologies. This technique can prove to be useful for many other challenges involved in design as well as application of microfluidic lab-on-a-chip devices.

II. Image:

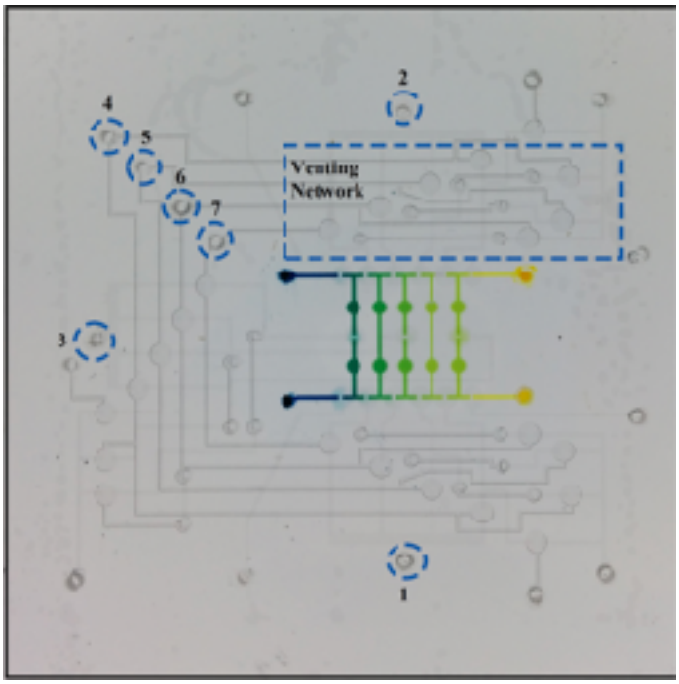


Figure: Image shows the numbered inputs and outputs of the microfluidic logic circuit [1] and the venting network.

III. Reference:

1. Raje, M. M. UC Irvine, 2015. ProQuest ID: Raje_uci_0030M_13374
2. S. Ahrar, M. Hwang, P. N. Duncan, E. E. Hui, Analyst, 2014, 139, 187.

IV. Biography:

Manasi Raje is a microfluidics R&D engineer working in Bay Area, California. She is working at Shield Diagnostics and developing diagnostic devices for affordable testing of infectious diseases. She holds training in Biomedical Engineering and Electronics Engineering. Manasi has experience in the design and fabrication of a variety of lab-on-a-chip devices. She developed a number of application specific and high-throughput-attempting micro fabrication methods during her time at JBEI that let to a patent. Her microfluidic roots are based in Hui lab at UC Irvine where she developed microfluidic digital logic circuits for on-chip automation of lab processes which let to multiple publications, presentations and a national award. She is involved in multiple conferences and technical committees in field of Microfluidics.

V. Presenting author details



Full Name: Manasi Raje
Contact number: 9492459572
Twitter account: @RajeManasi
Linked In account: https://www.linkedin.com/feed/
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