Sandia Automated Molecular Biology Platform:

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February 25, 2015
Sandia MedTech Showcase
Technology Overview

- Automate laboratory sample preparation at the microfluidic scale
- Flexible fluidic hub to seamlessly connect capabilities together
- Programmable processing and workflow
Underlying Technology

Based on principles of electrowetting-on-dielectric (EWOD) and dielectrophoresis

- voltage is applied to electrode pads in an addressable 2-D array (glass, PCB, etched films)
- All aqueous droplets can be manipulated (buffers, ETOH, DMF, bleach... beads, cells, polymers...)
- Teflon-coated surface minimizes surface fouling and contamination

46-pad laser-etched design

~120 VAC @ 15 KHZ
Core architecture is the Sandia Digital Microfluidic Hub

- Use microliter droplets as sample cargo containers
  - Operated “digital” fashion
  - Virtual tubes or microreactors
  - Merge, mix, split (virtual pipetting)
Key Advantages

- Standardized fluidic interface for transporting fluids and reagents
- Overcomes limitations due to volume scales
- Programmable processing and workflow
Differentiating factor from existing technology

Translate robotic liquid handler workflow to the microscale

1. Fragmentation & adapter ligation
2. DNA purification and buffer exchange
3. PCR amplification
4. Size Selection
5. QC & titrate for loading flow cell

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DNA purification and buffer exchange
PCR amplification
Size Selection
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Commercial Applications

- Diagnostic sample preparation
- DNA forensics
- Small-scale laboratory automation
- Analytical instrument QC integration
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M. Bartsch et al., US8,940,147 2015
H. Kim, et al, PLOS ONE 2013
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