Low-Cost Touchscreen Driven Programmable Dual Syringe Pump for Life Science Applications

Valentina E. Garcia, Jamin Liu, Joseph L. DeRisi

PII: S2468-0672(18)30026-9
DOI: https://doi.org/10.1016/j.ohx.2018.e00027
Article Number: e00027
Reference: OHX 27

To appear in: *HardwareX*

Received Date: 24 March 2018
Revised Date: 3 May 2018
Accepted Date: 3 May 2018

Please cite this article as: V.E. Garcia, J. Liu, J.L. DeRisi, Low-Cost Touchscreen Driven Programmable Dual Syringe Pump for Life Science Applications, *HardwareX* (2018), doi: https://doi.org/10.1016/j.ohx.2018.e00027

Title: Low-Cost Touchscreen Driven Programmable Dual Syringe Pump for Life Science Applications

Authors: Valentina E. Garcia*[1], Jamin Liu*[3], Joseph L. DeRisi[1,2,3]

*These authors contributed equally to this work

Affiliations:

[1]Department of Biochemistry and Biophysics, University of California San Francisco, California, United States of America

[2]Chan Zuckerberg Biohub, San Francisco, California, United States of America

[3]UC Berkeley-UCSF Graduate Program in Bioengineering, University of California, Berkeley and San Francisco, California, United States of America.

Contact email: joe@derisilab.ucsf.edu

Abstract:
Syringe pumps are powerful tools able to automate routine laboratory practices that otherwise consume large amounts of manual labor time. Commercially available syringe pumps are expensive, difficult to customize, and often preset for a narrow range of operations. Here, we show how to build a programmable dual syringe pump (PDSP) that overcomes these limitations. The PDSP is driven by a Raspberry Pi paired with a stepper motor controller to allow maximal customization via Python scripting. The entire setup can be controlled by a touchscreen for use without a keyboard or mouse. Furthermore, the PDSP is structured around 3D printed parts, enabling users to change any component for their specific application. We demonstrate one application of the PDSP by using it to generate whole cell lysates using a cell homogenizer in an automated fashion.

Keywords: *Dual syringe pump, 3D printing, customization, Plasmodium falciparum cell extract, cell homogenizer*

Specifications table

Hardware name	Programmable Dual Syringe Pump (PDSP)
Subject area	Educational Tools and Open Source Alternatives to Existing Infrastructure
Hardware type	Biological sample handling and preparation
Open Source License	CC-BY-SA 4.0
Cost of Hardware	$347.29 ($603.29 with optional parts)
Source File Repository	https://3dprint.nih.gov/discover/3dpx-008783

1. Hardware in context

Syringe pumps have a wide variety of uses across fields from engineering to biology. Their primary purpose is to continuously dispense precise volumes over a set amount of time. They save time