Designing a Universal Liquid 3-Dimensional Printer

Abstract

Purpose: Liquid three-dimensional (3D) printing using non-traditional materials has a vast range of applications, however, current technology have failed to create a low-cost and efficient system. Researchers have demonstrated that liquid 3D printing is useful when working with living cells, soft materials, and even industrial-grade materials, however, research and applications are restricted by prohibitory costs and limited print material capacity deposition systems. The current project aimed to address both the problems of cost and print material capacity by creating a low-cost, universal liquid 3D printer apparatus. **Method**: A novel method of material transport, using a peristaltic pump, was created in this project. The apparatus is platform-independent, thus is able to be used with a variety of existing low-cost 3D printers. The apparatus is comprised of three main components: the extruder assembly, pump system, and reservoir. An open reservoir is used to store the print material, allowing for more material to be added mid-print without disrupting the ongoing run. A peristaltic pump is used to transport the material from the reservoir to the extruder assembly. The extruder then deposits the material through a needle into the build area. A common test print was fabricated and data regarding the dimensional accuracy of the given print was collected. **Results**: This prototype has provided a proof of concept that liquid 3D printing can be accomplished with a peristaltic pump system with dimensional accuracy. The printer has also been shown to be suitable for bioprinting and gel suspension printing. **Conclusion**: This project can have profound impact on 3D printing technologies as printers capable of using non-traditional build materials cheaply and efficiently become more prevalent.