SJSU SAN JOSÉ STATE UNIVERSITY

SJSU Undergraduate Research Grants

Stereolithography for Tissue Engineering

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Abstract

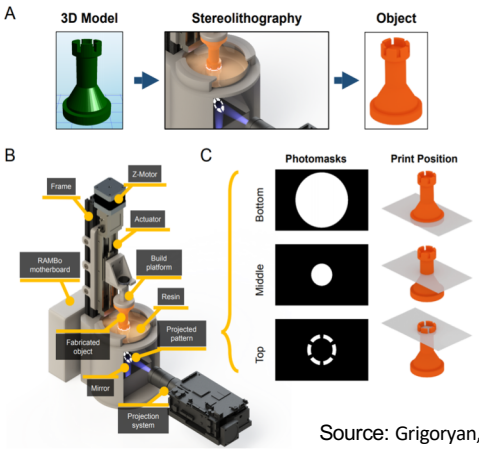
Traditional fused deposition Bioprinting suffers from a few problems with producing fine vasculature required to supply nutrients to tissue. The bioprinter that we are building will use stereolithography projection which is capable of up to 50 micron voxel resolution. The fine resolution along with selective gelation will enable testing of fine tissue vascularization models. We will determine how well cell viability performs in hydrogel vascularized by stereolithography techniques.

Project Activities or Findings

Main activities

- Building the open source bioprinter SLATE
- Synthesizing compatible hydrogels
- Testing the functionality of stereolithography bioprinting

Stereolithography Workflow



Source: Grigoryan, B (2019).

Extrusion Based Bioprinting

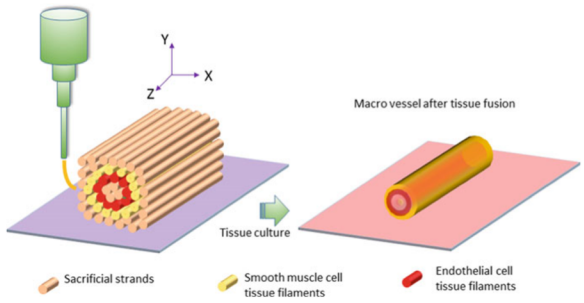


Fig. 7.8 Fabrication of macro-blood vessel using sacrificial filaments

Source: Naghieh, S & Chen, X. B. (2019).

Research Questions

- How will the capability of a Stereolithography bioprinter compare with an extrusion type bioprinter?
- How will a bioprinted vascular network perform with cells?
- Are simple microfluidic devices possible with this technology?

Citations

- Grigoryan, B., Paulsen, S. J., Corbett, D. C., Sazer, D. W., Fortin, C. L., Zaita, A. J., ... & Johansson, F. (2019). Multivascular networks and functional intravascular topologies within biocompatible hydrogels. Science, 364(6439), 458-464.
- Naghieh, S., & Chen, X. B. (2019). Scaffold design. *Extrusion Bioprinting of Scaffolds for Tissue Engineering Applications*.