

Rapid Prototyping of Electric Circuits Using 3-D Printing

Gerardo Carranza

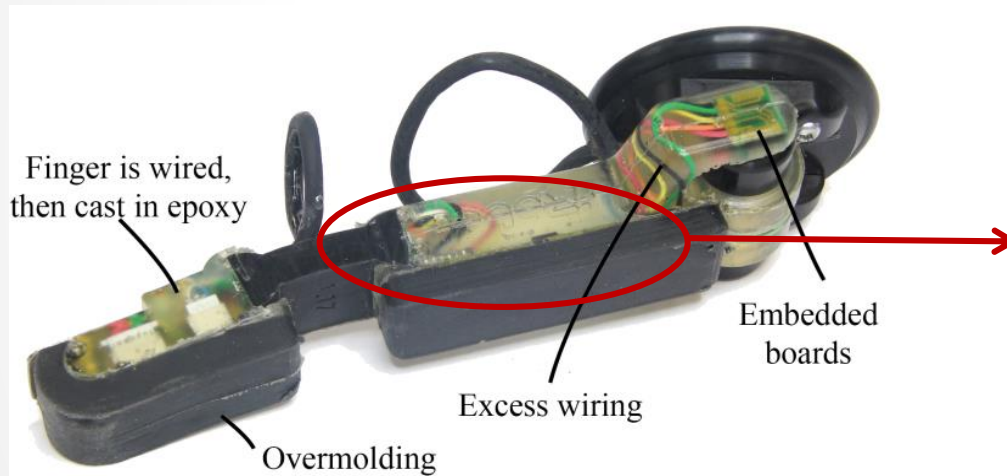
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P.I: Dr. Aaron Dollar, John J. Lee Associate Professor of
Mechanical Engineering & Materials Science

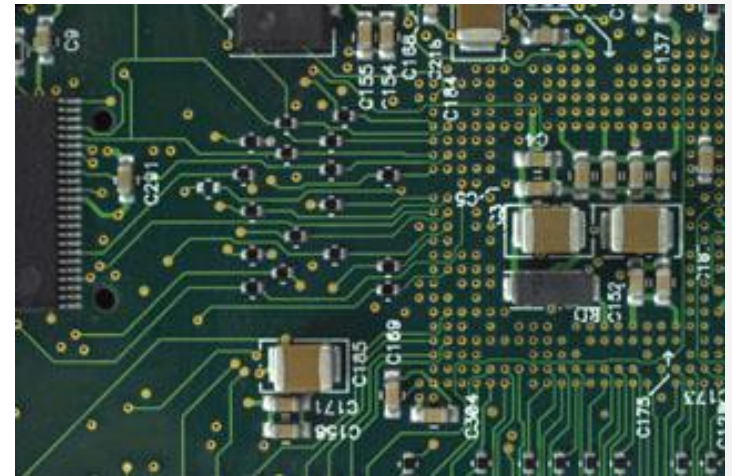
GRAB Lab

Embedded Circuits

Printed Circuit Board (PCB) Design

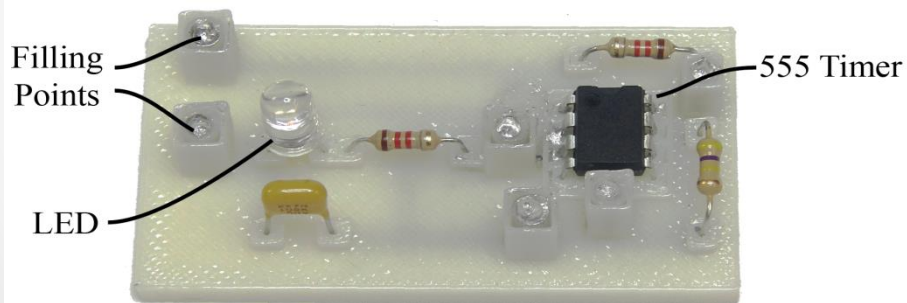
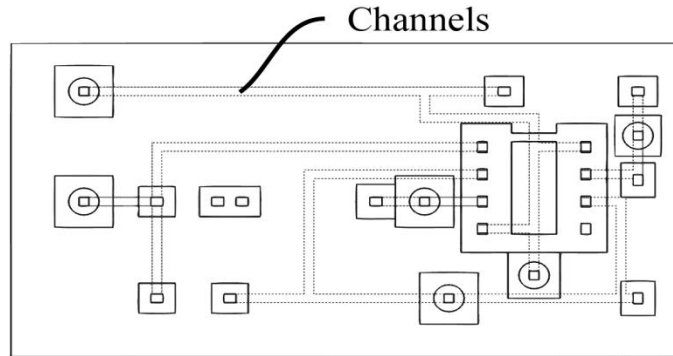


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<http://www.imaginant.com/images/HR-1100cCircuitBoard.jpg>

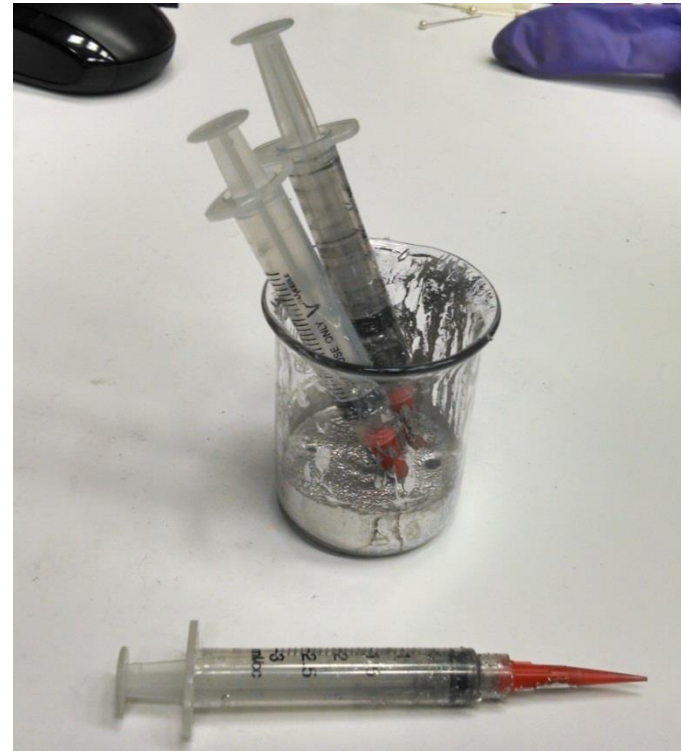
Prior Work



Brandon Araki, 2014, An Injection-Based Method of Embedding Electronics in 3D Printed Parts

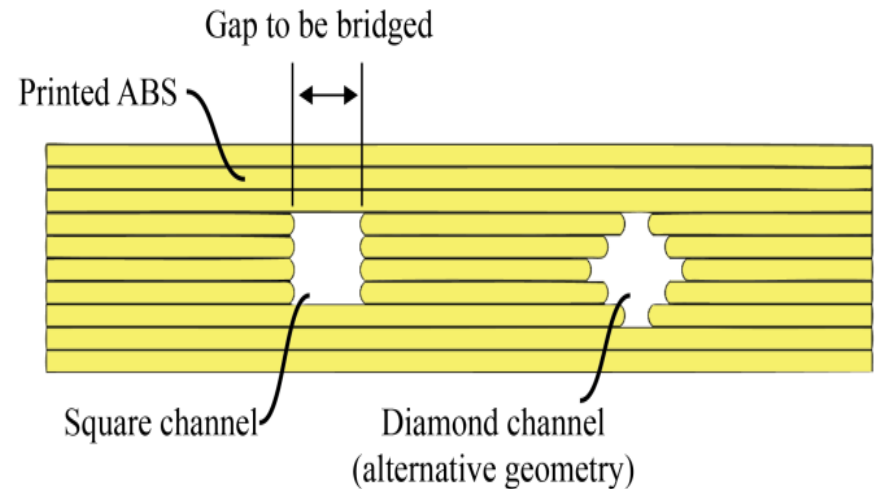
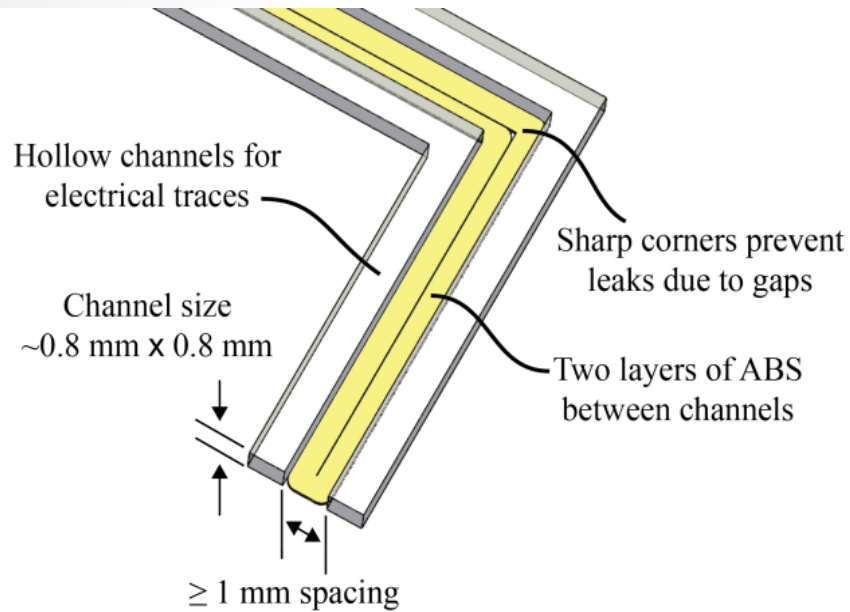
Cerrolow 136

- 57.8 °C melting point
- Minor net volume change



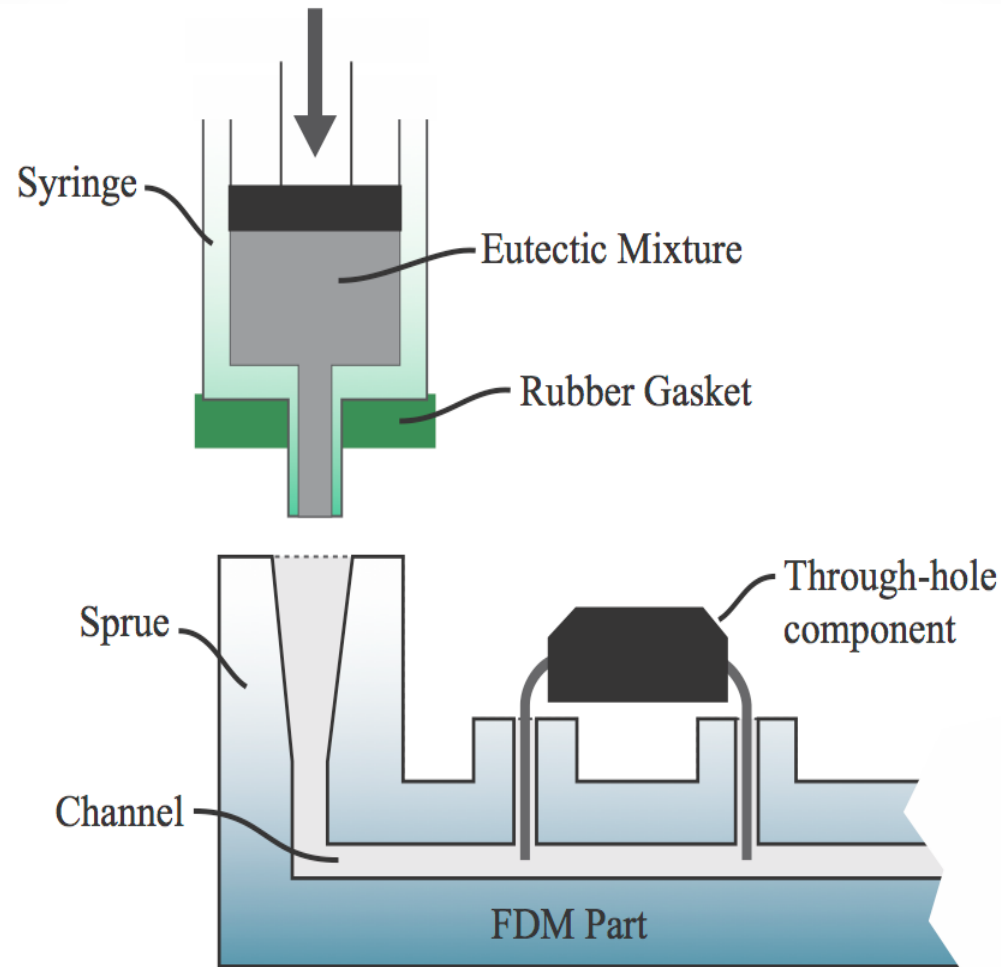
Creation of Channels

FDM Printer: Stratasys Fortus 250mc



Brandon Araki, 2014, An Injection-Based Method of Embedding Electronics in 3D Printed Parts

Injection-Based Method

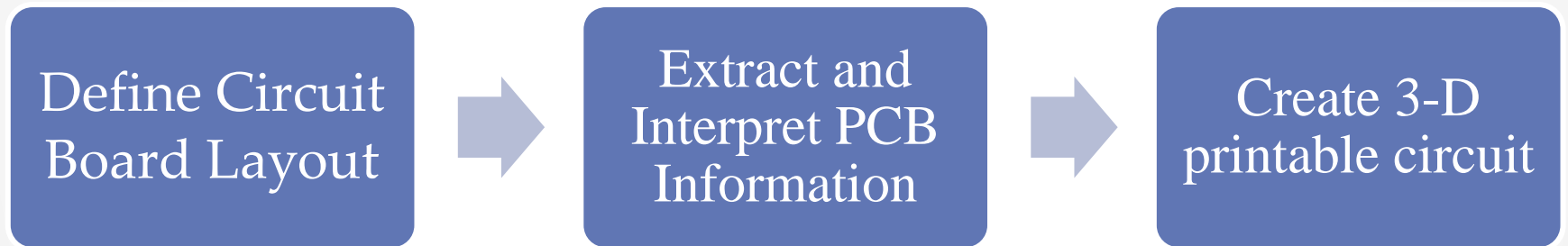


Brandon Araki, 2014, An Injection-Based Method of Embedding Electronics in 3D Printed Parts

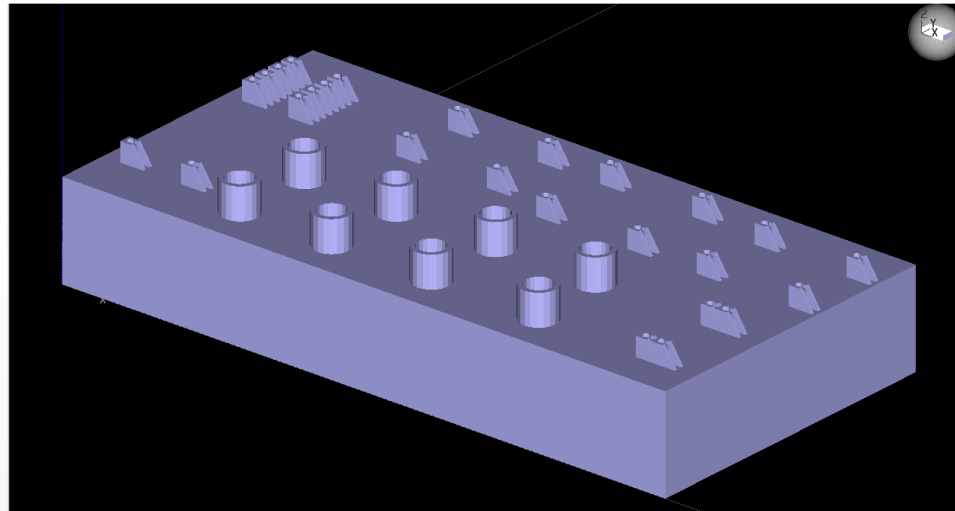
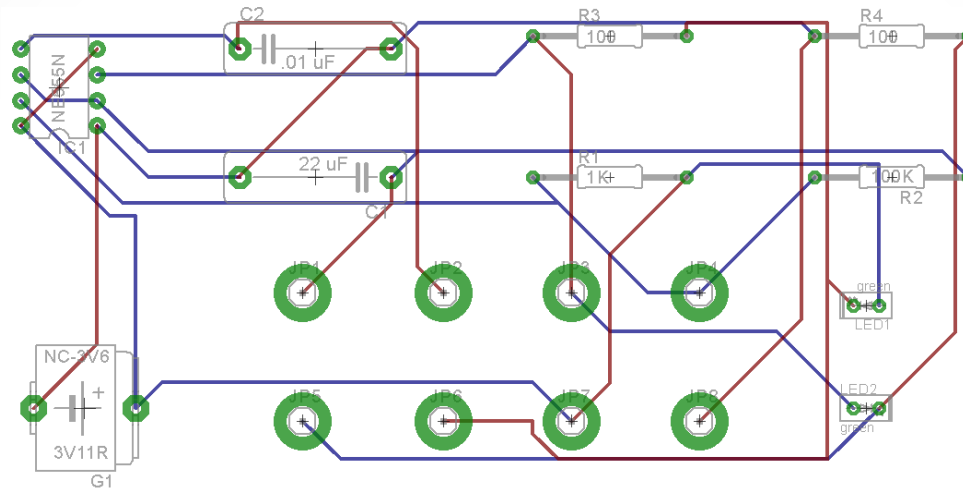
Questions

- Can we automate the manual process of 3-D printable circuit design?
- Can we design a method that solves the metal spillage problem?

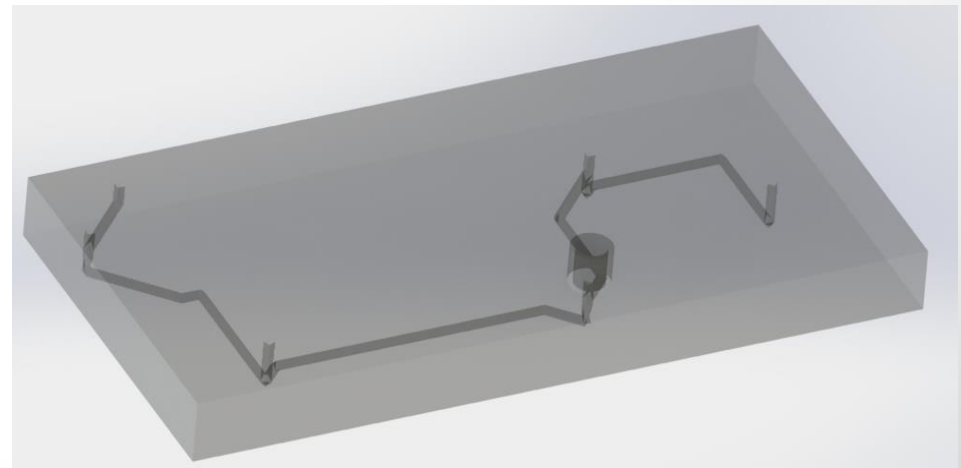
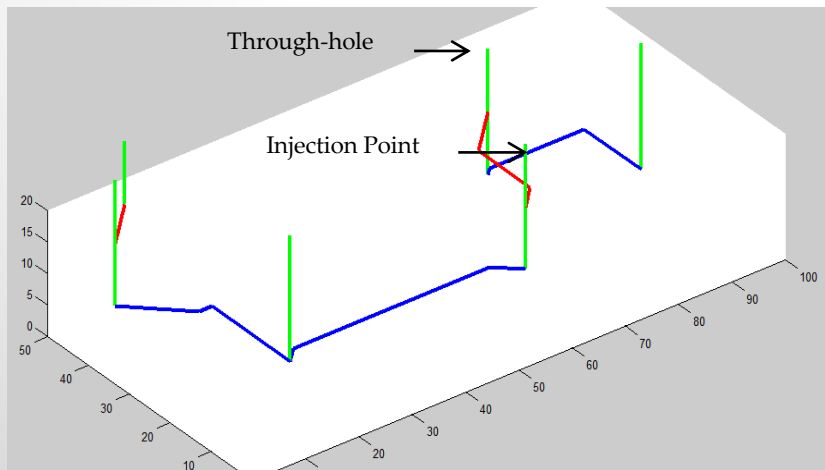
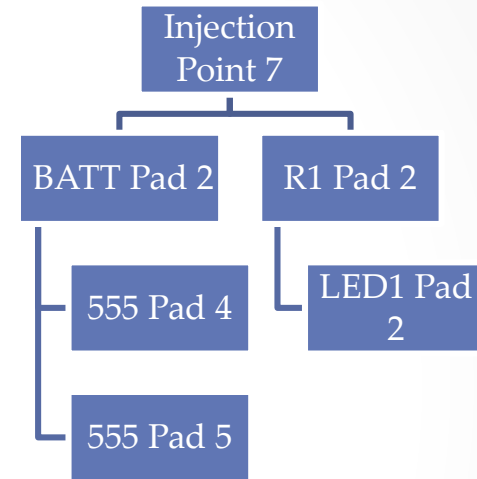
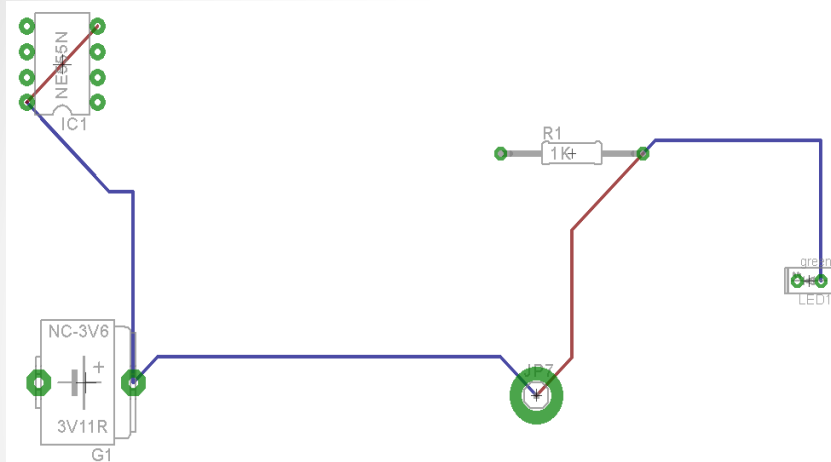
Proposed Method



Goal of Proposed Method

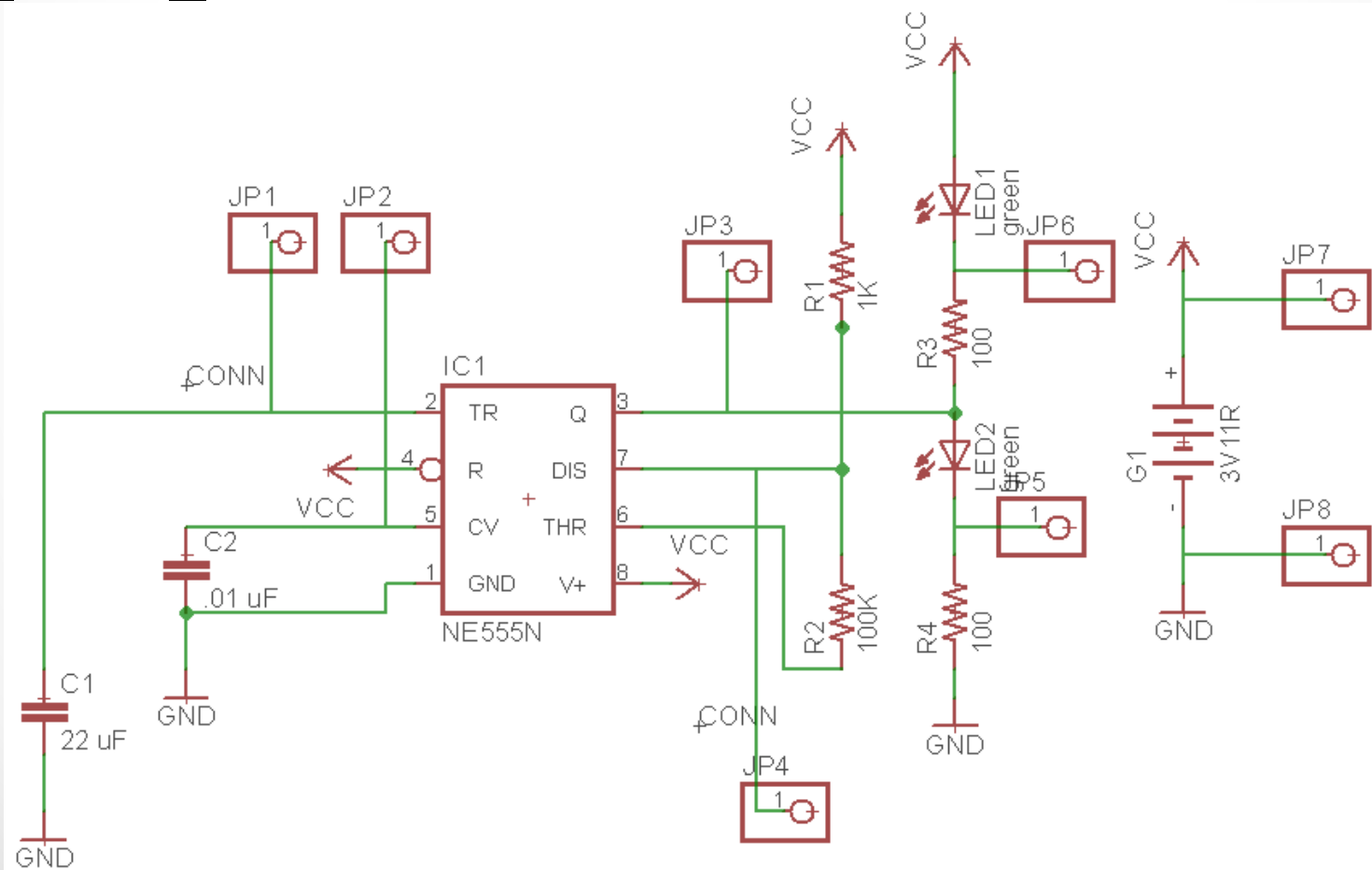


Tree Structure

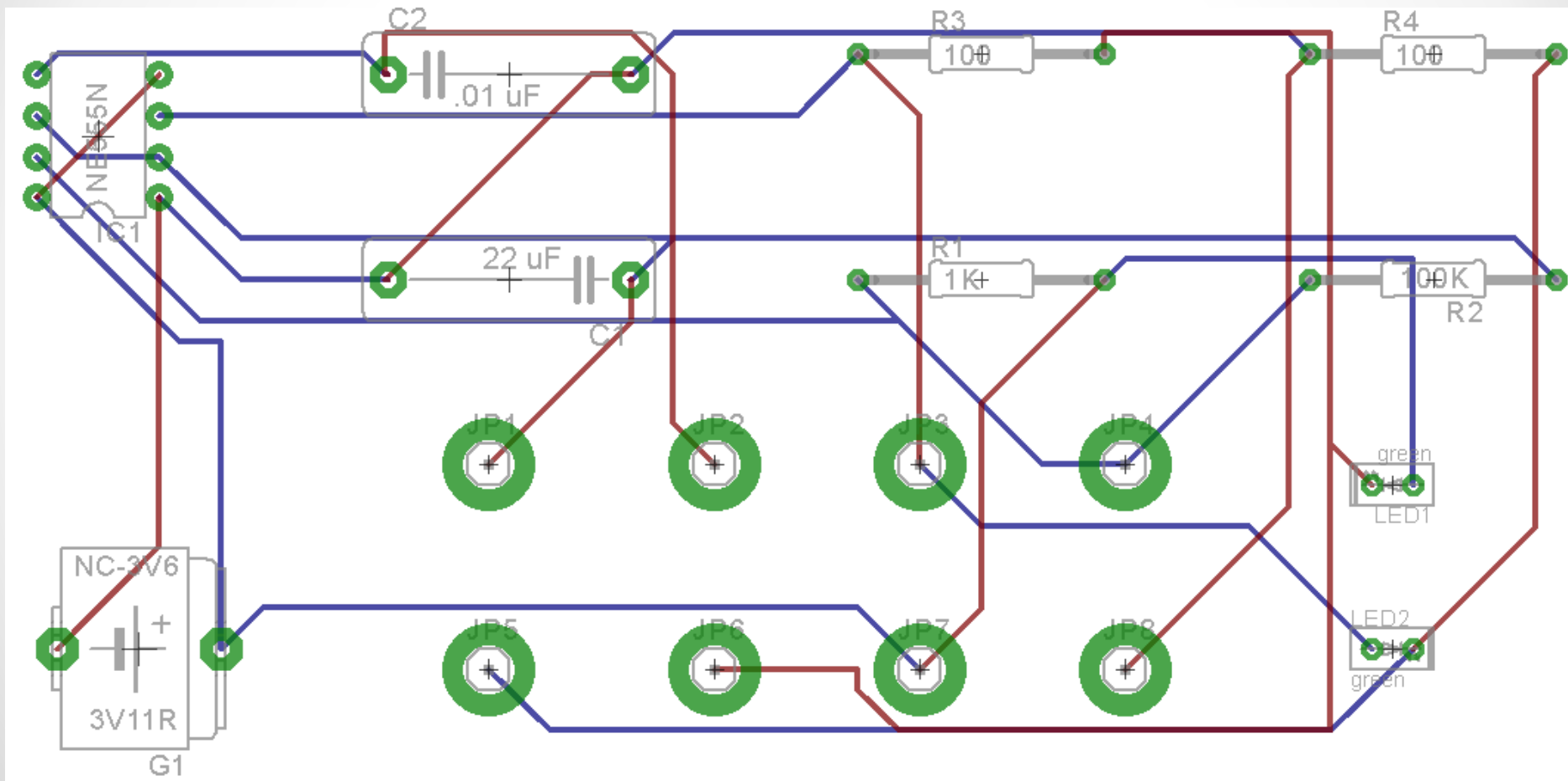


EAGLE PCB

- Easily Applicable Graphical Layout Editor for Printed Circuit Boards

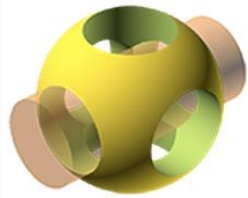


EAGLE PCB



Computer Aided Design

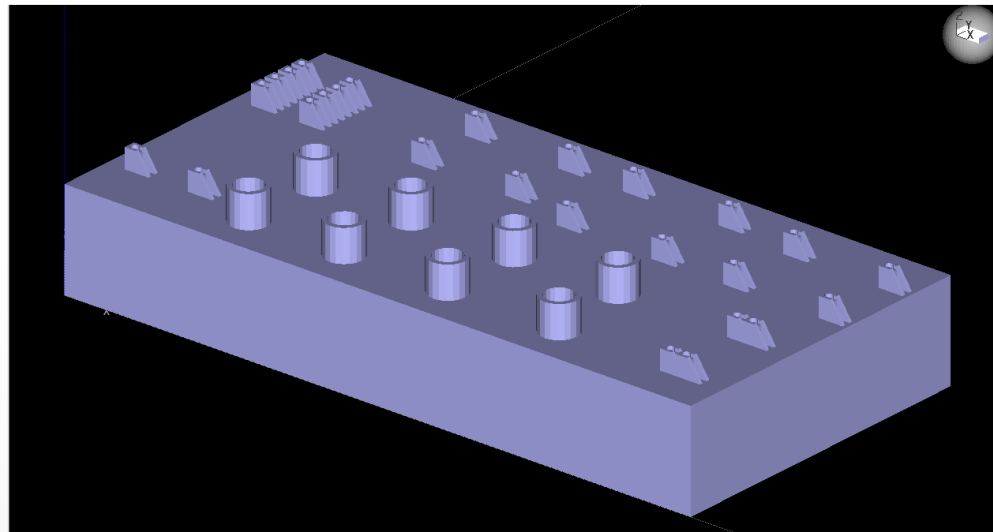
- Computer Aided Design (CAD) software applications used to create 3-D models

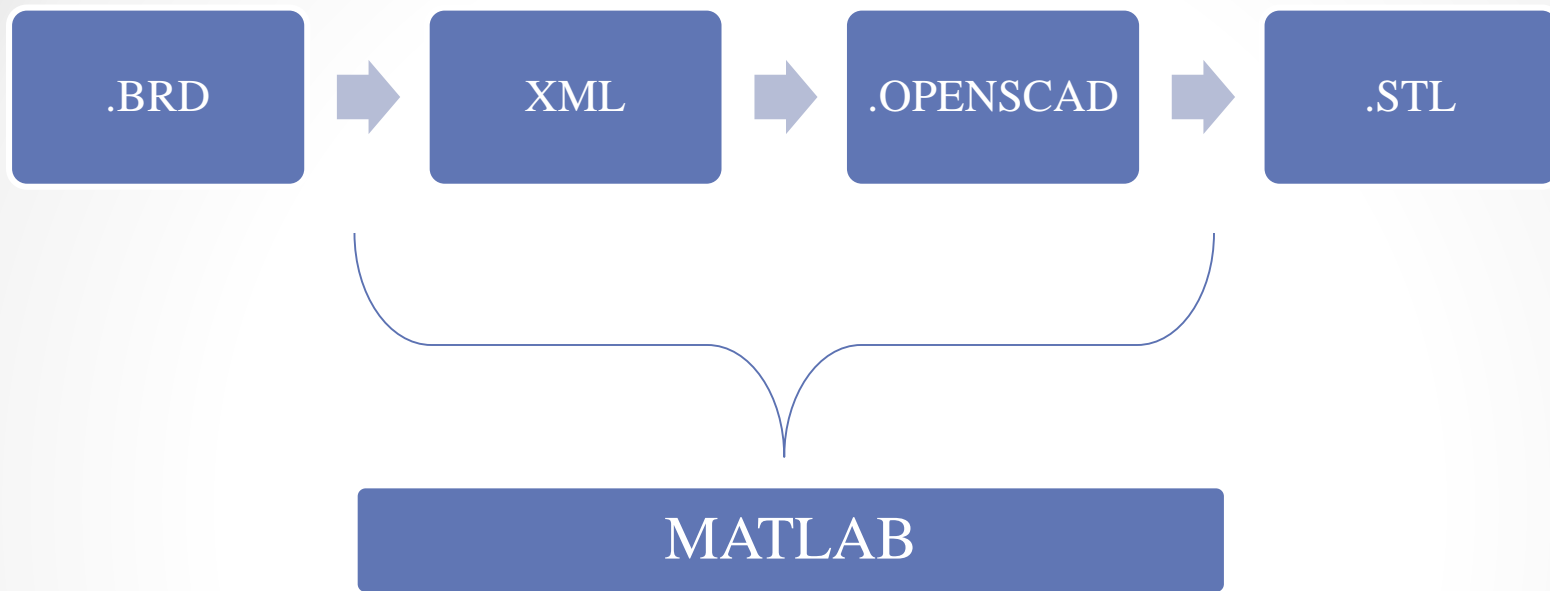


OpenSCAD

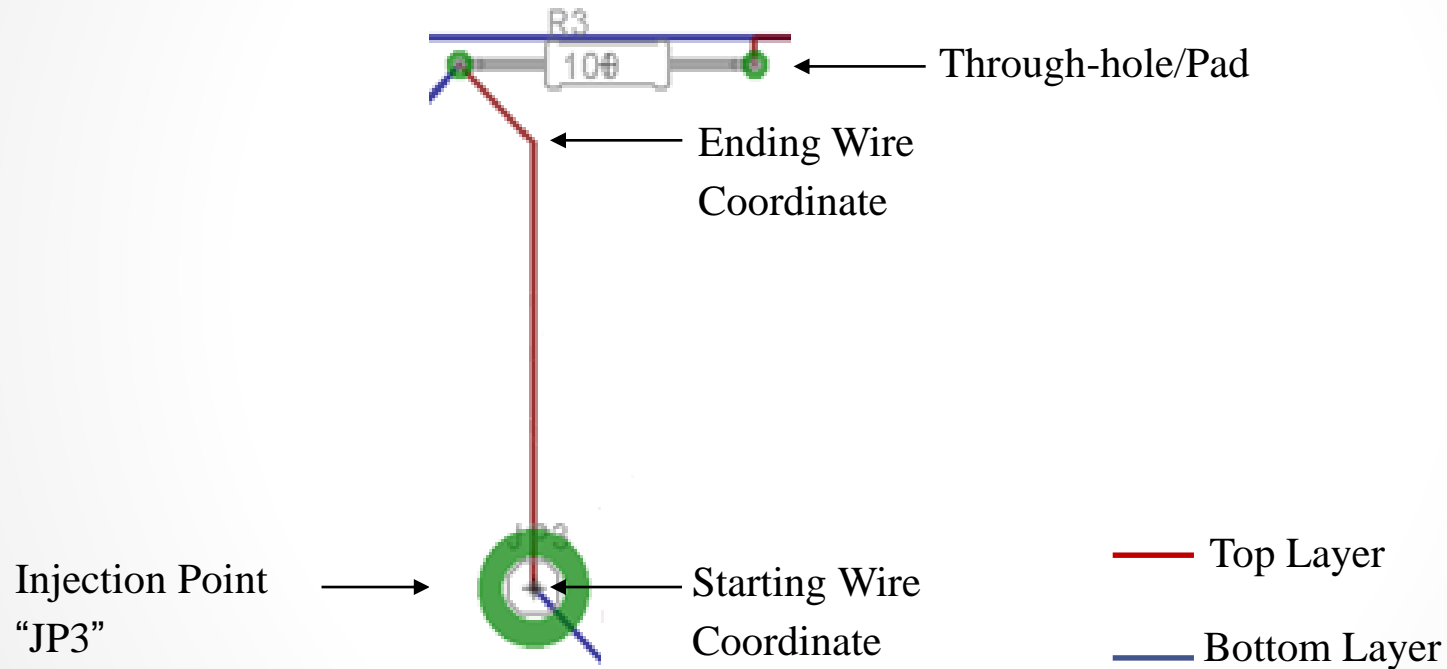
Advantages:

- Programmable
- Export STL file format

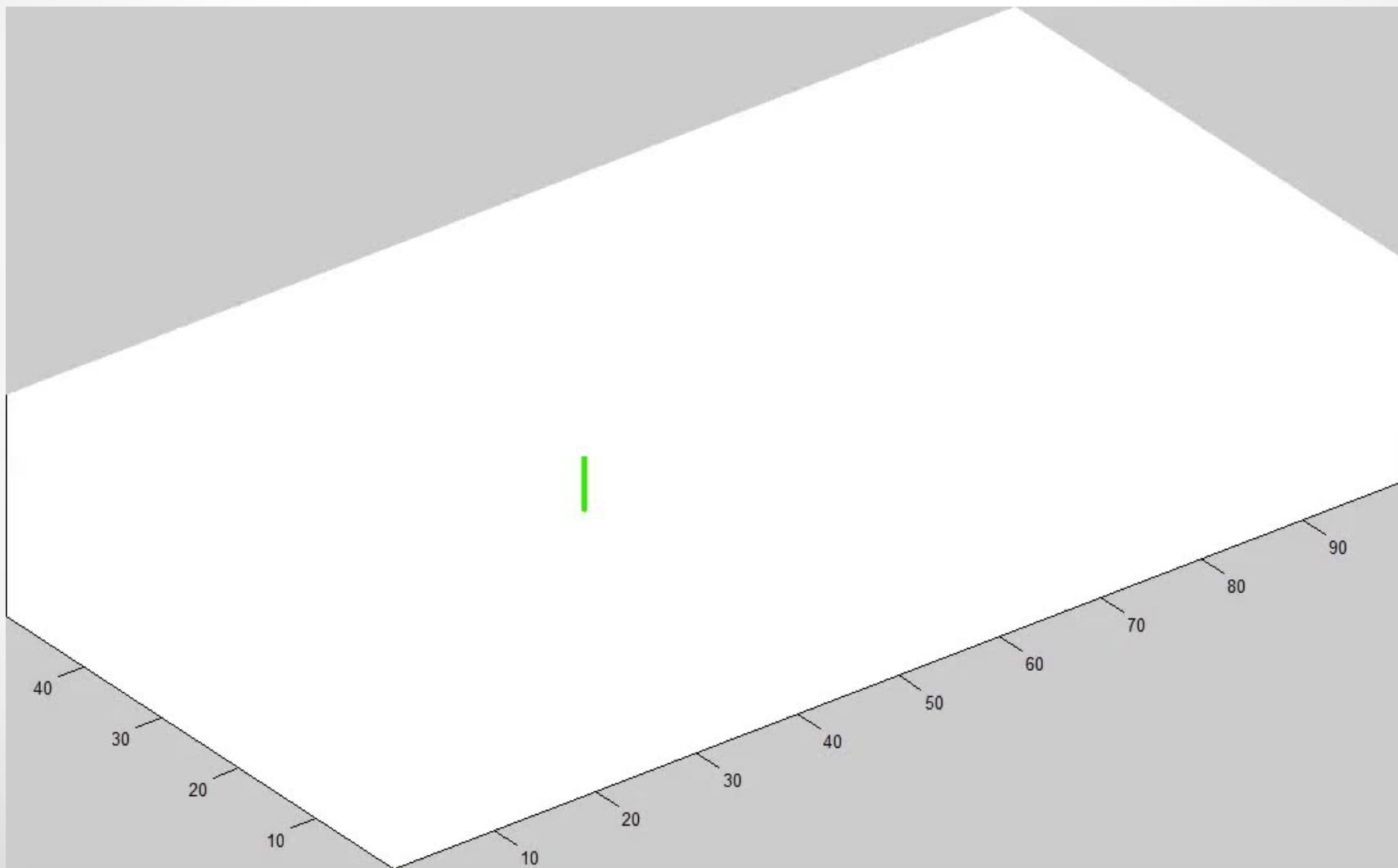




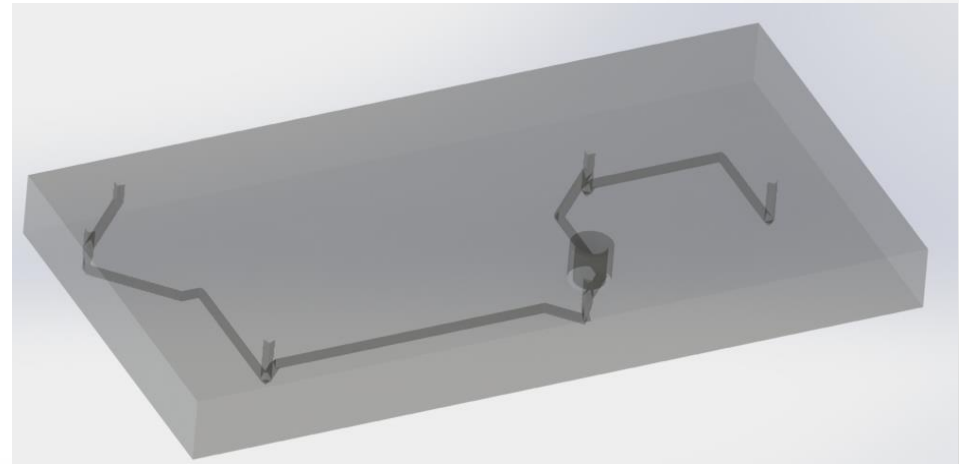
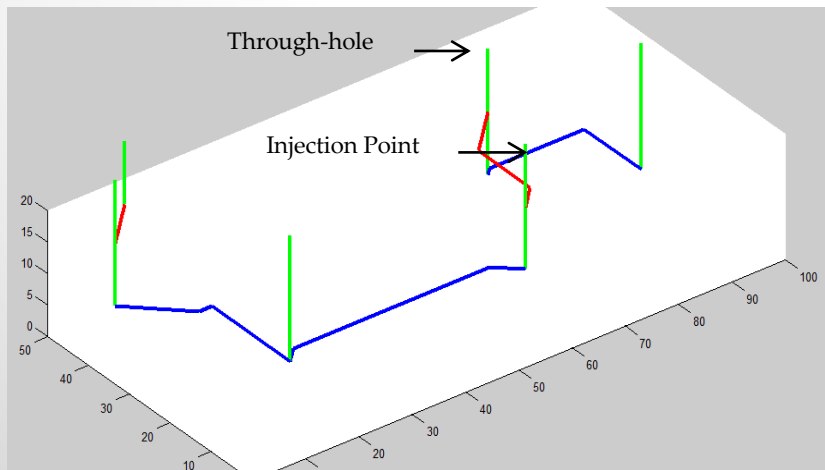
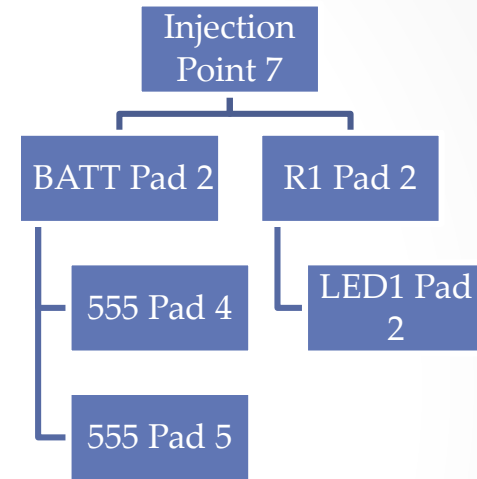
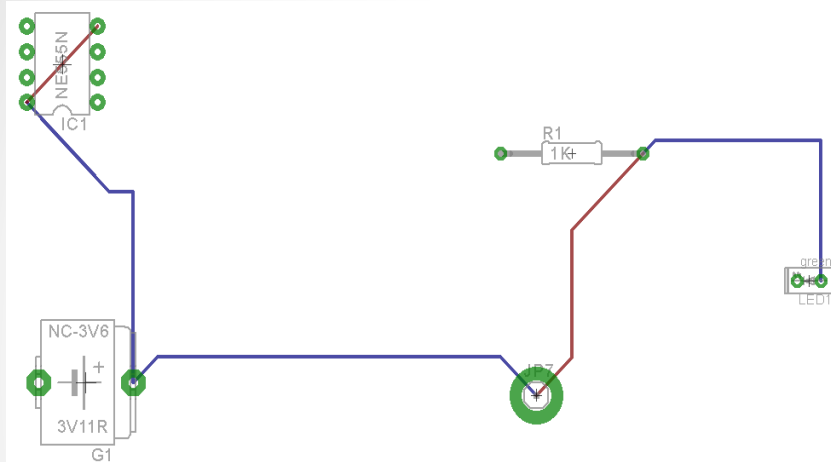
PCB Information



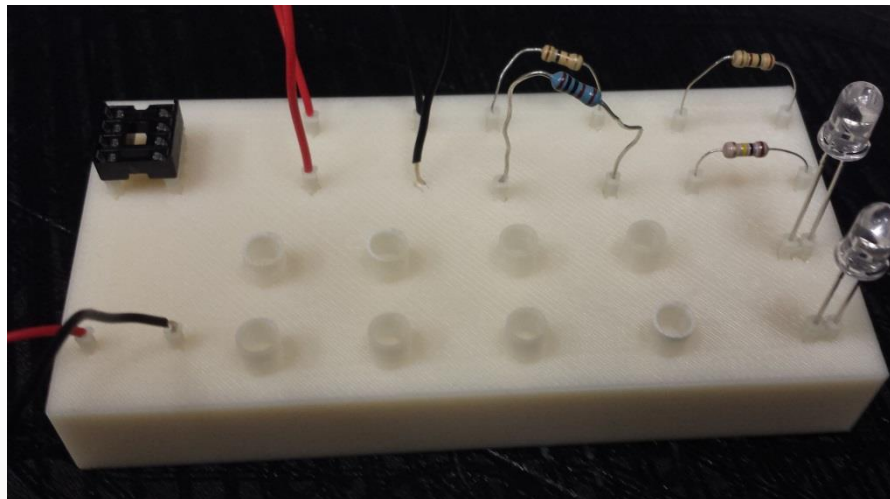
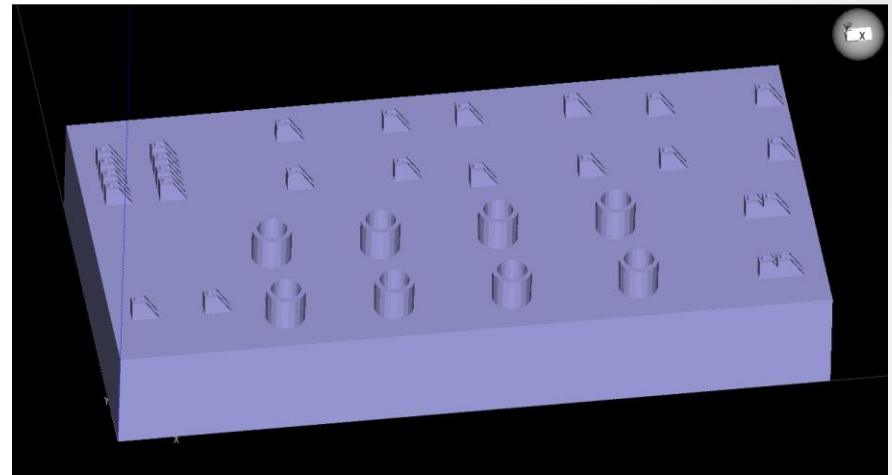
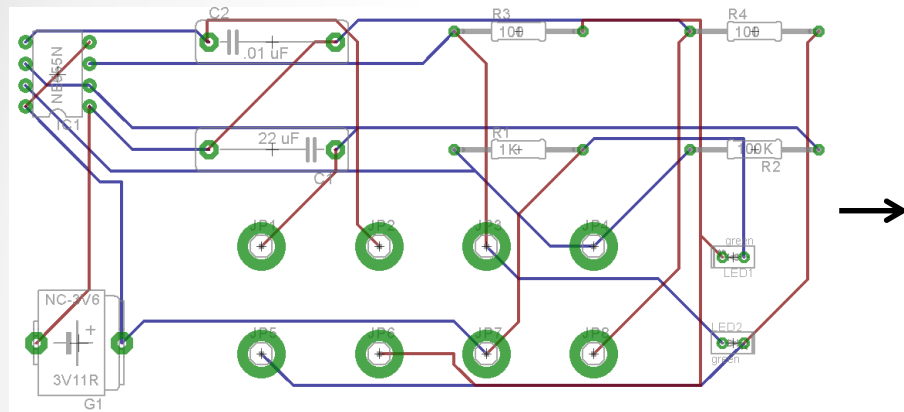
MATLAB



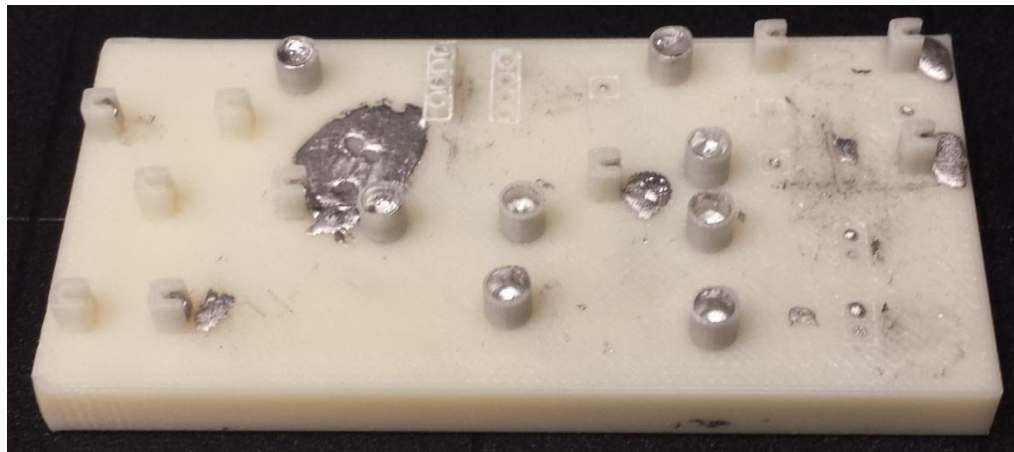
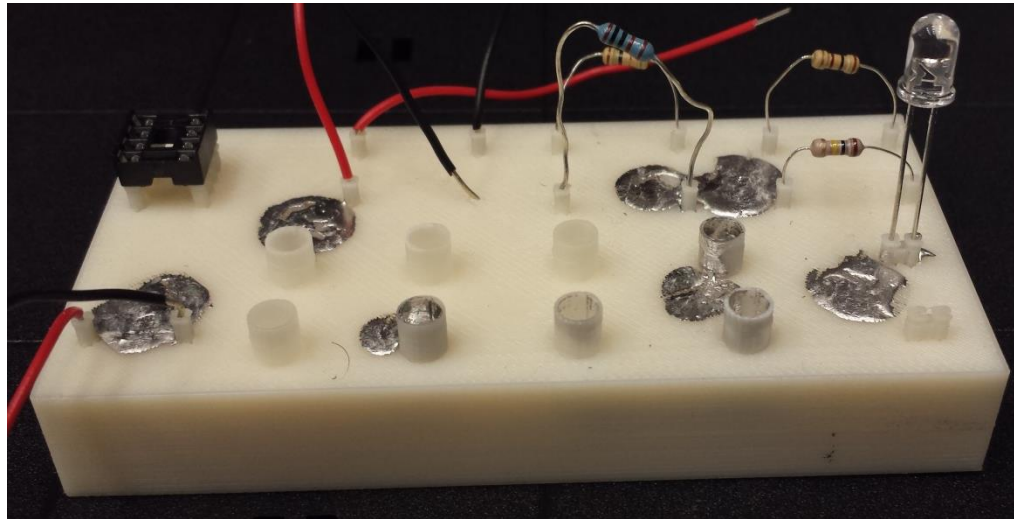
Tree Structure



Automation Successful



Injection Based Method



Future Work

- Expansion to 3+ layered circuits
- Trials with Different Types of Printers
- Automation of Injection Points
- Modification of Tree Structure Model

Acknowledgements

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