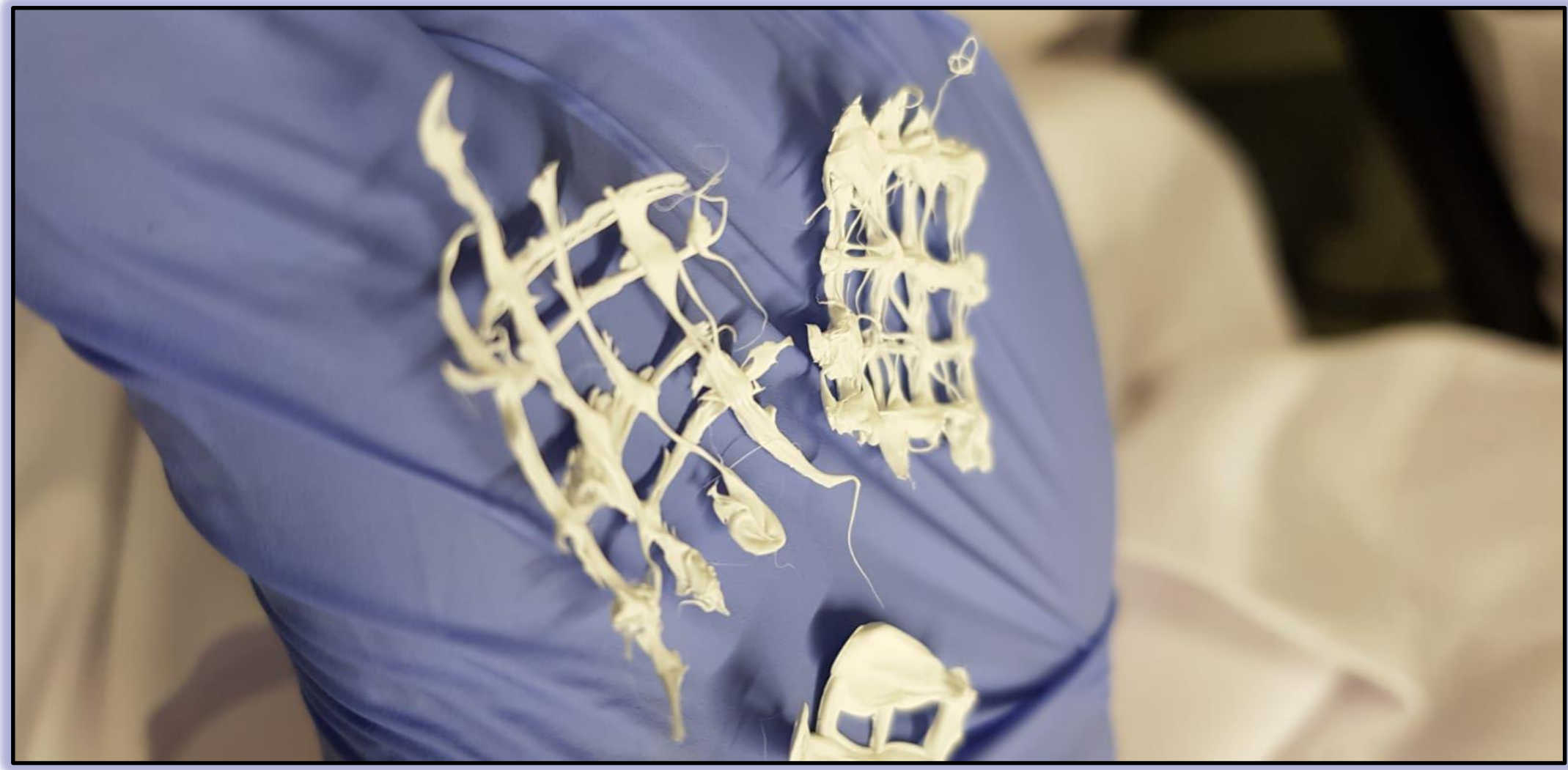


DESIGN OF METAMATERIALS: CONVERTING G-CODES FILE TO X-SEL FILES FOR 3D PRINTING

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Abstract

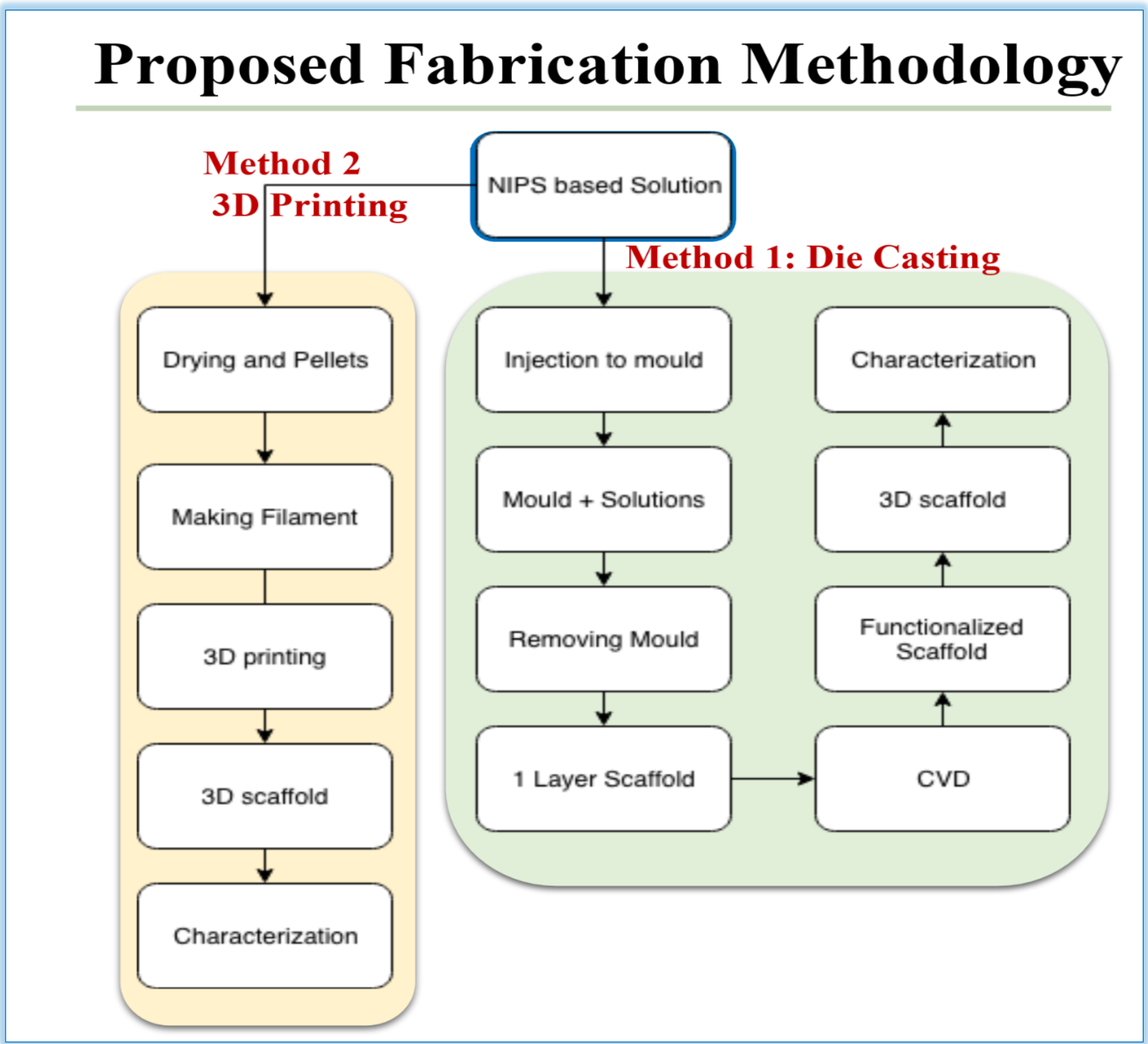


Fabrication of scaffold is one of the important key for bone tissue engineering which is regarded as the most effective way to repairing bone defects¹. It can be printed structures that can support biological tissues which called scaffold. 3D printing which is Tabletop Robot TT, helps to fabricate the artificial bone scaffold. However, there are some issues with integrating the robot to a deposition head which needs commands in the form of a G-File to deposit 3D material using continous paths. This Project aim is to convert these g-code files to X-SEL software and get a concrete data for printing. It can be designed and stimulated artifical bone scaffold with these X-SEL files and codes.

Objectives

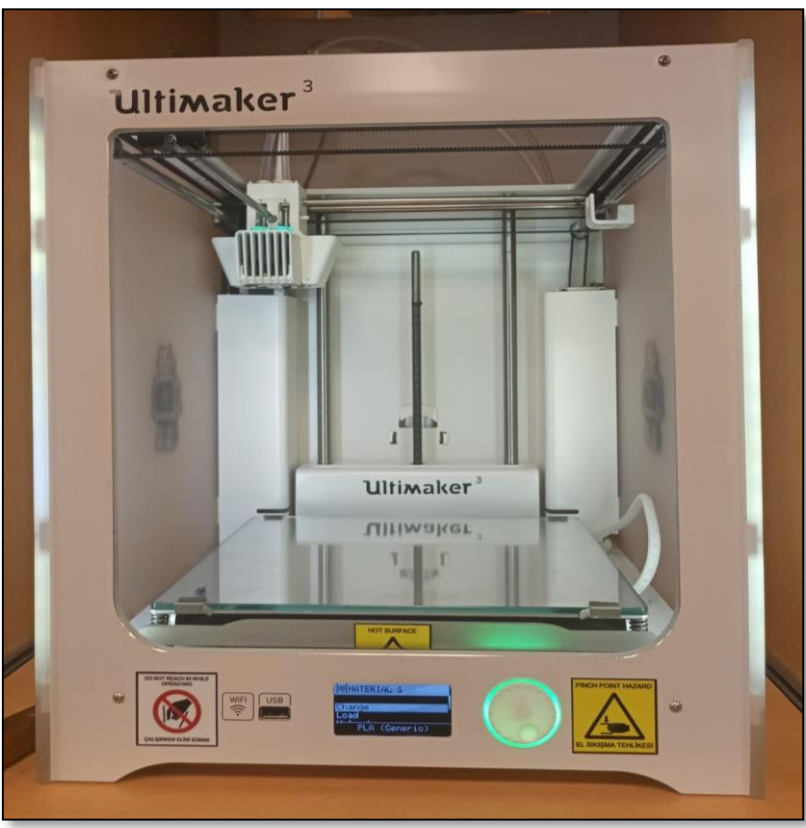
- To translate G-code files to a language that is compatible with the robot's X-SEL software.
- To convert g-codes to X-SEL and printing these X-SEL files with IAI brand 3D printer.
- To design and simulate artificial bone scaffold for effective healing

Proposed Fabrication Methodology



3D Printing^{2,3}

- * Creation of physical objects from a three-dimensional
- * Materials: polymers, metals, ceramics, concrete
 - typically by laying these materials on top of each other.



Types of 3D Printers

- FDM
- SLS
- SGC
- SFF
- SLA

FDM

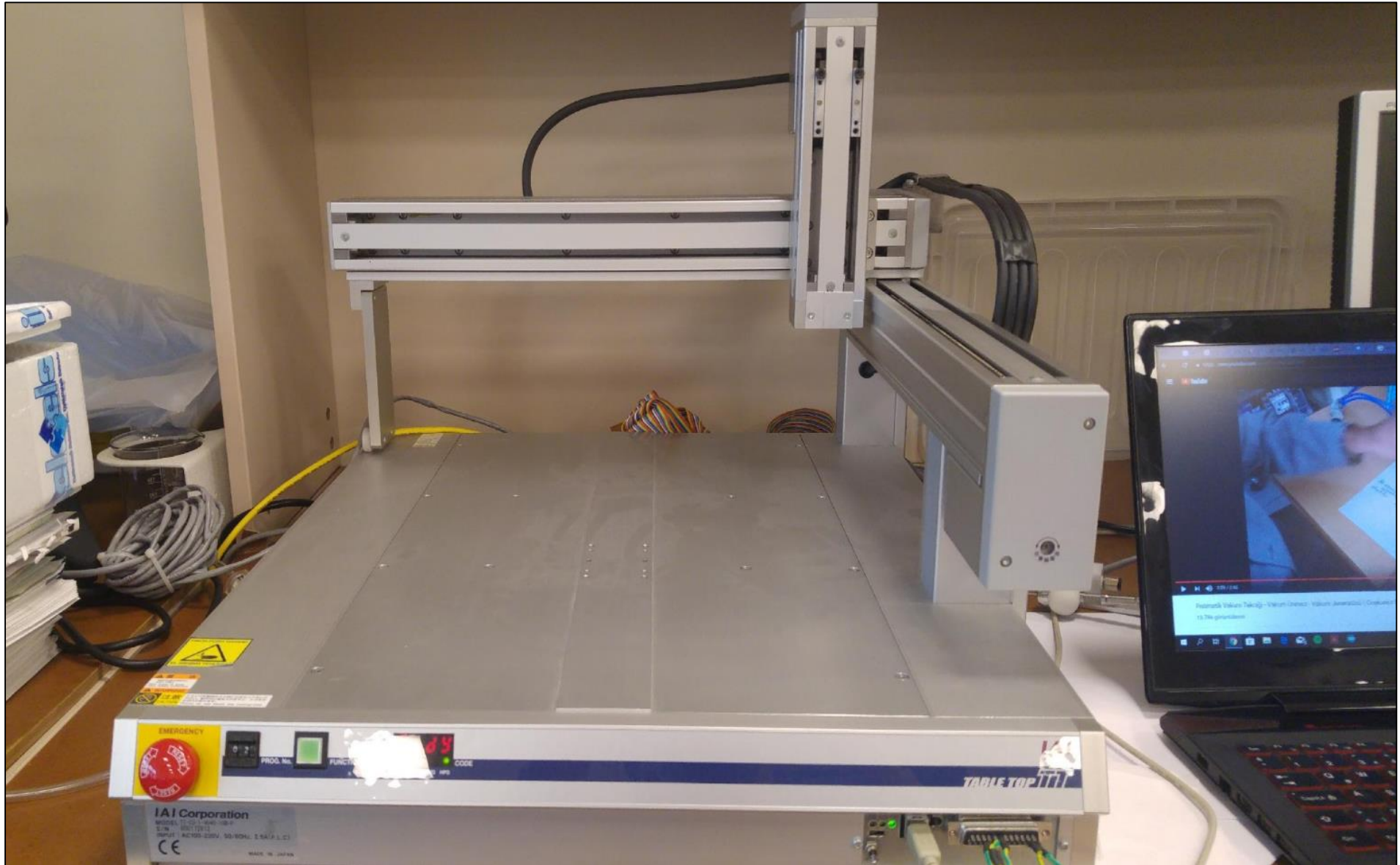
Advantages:

- Cheap
- Best resolution and Highly Accurate

Limitations:

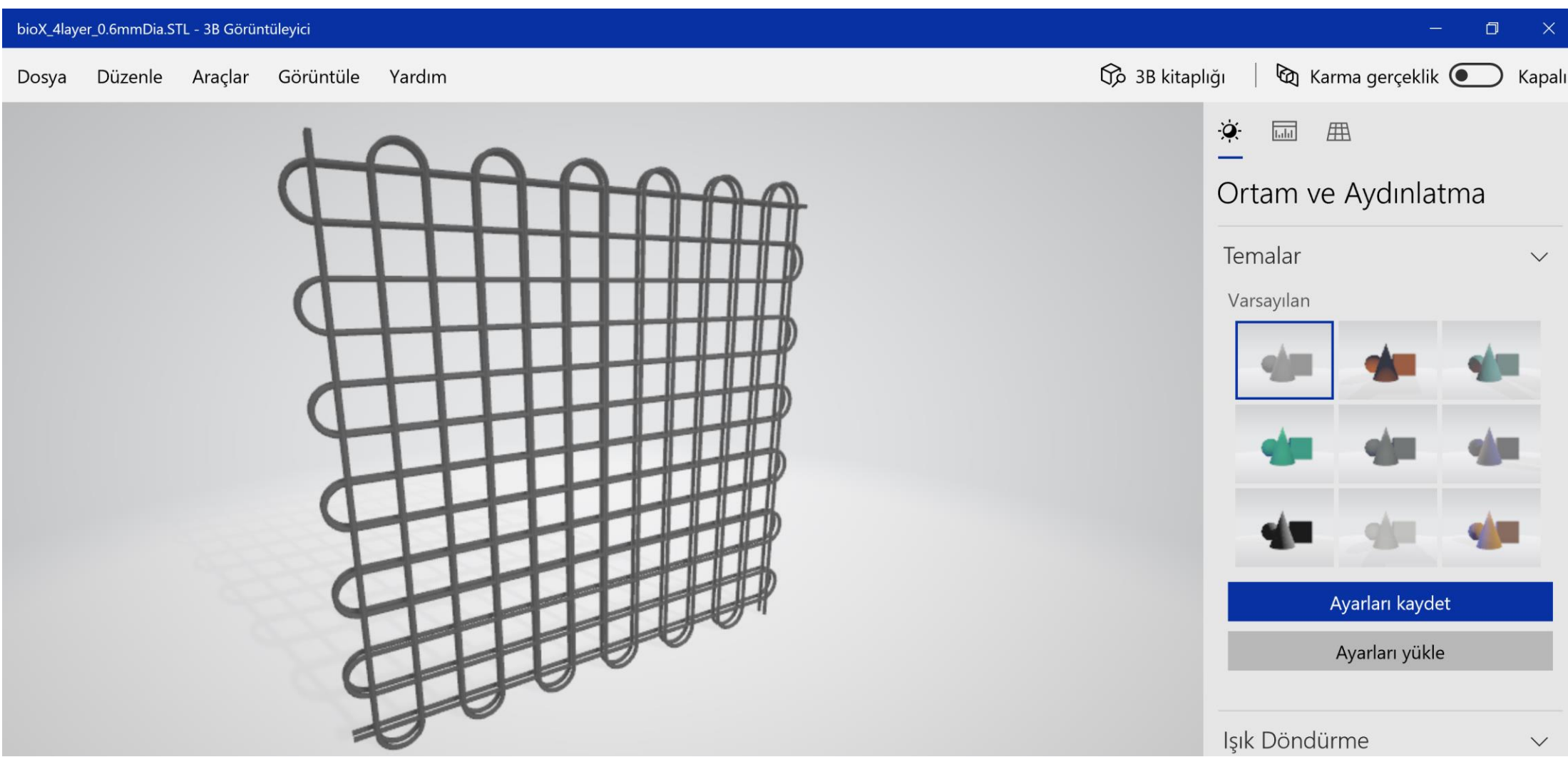
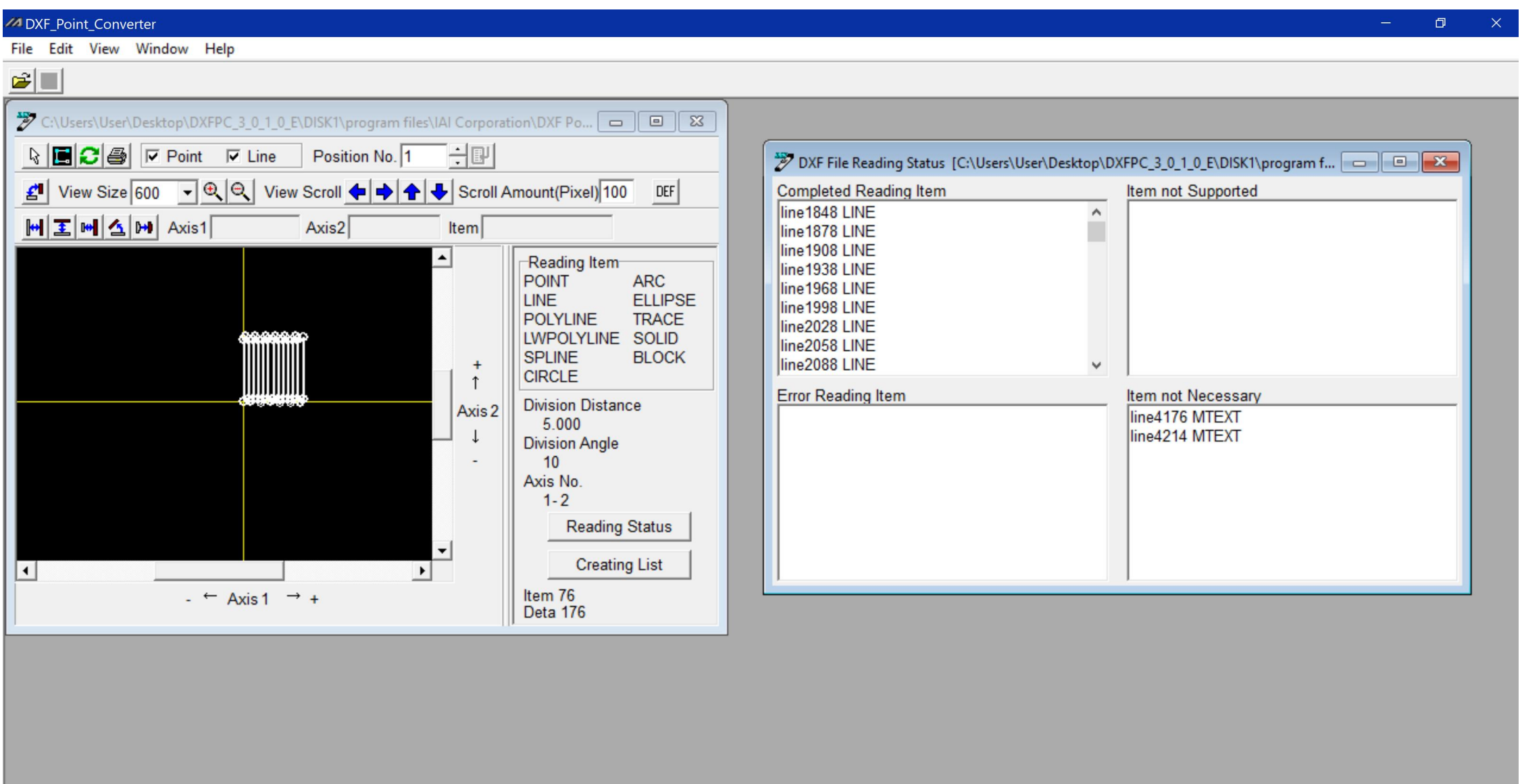
- Limited Testing

IAI Corporation TT-A3-I-4040-10B- P 3-Axis Robot Table Top TT Series Actuator



Conclusions

There are some g-code files and these files are converted to X-SEL files but how to convert these files was unknown. That is why a reseach was maden and mailed with authorized people. Than it was learned that there is a converter for this purpose which is DXF Point Converter. With this converter, the drawing of SolidWorks's x-axis and y-axis can be pointed and learned for X-SEL. Thus, one step closer to the aim of fabrication of bone scaffold.



No.	Axis1	Axis2	Axis3	Yes	Acc	Del
1	-0.300	0.000				
2	0.300	0.000				
3	2.200	1.250				
4	2.800	1.250				
5	3.750	0.300				
6	3.750	-0.300				
7	4.700	1.250				
8	5.300	1.250				
9	7.200	1.250				
10	7.800	1.250				
11	8.750	0.300				
12	8.750	-0.300				
13	10.000	1.250				
14	10.300	1.250				
15	12.200	1.250				
16	12.800	1.250				
17	13.750	0.300				
18	13.750	-0.300				
19	14.700	1.250				
20	15.300	1.250				
21	17.200	1.250				
22	17.800	1.250				
23	18.750	0.300				
24	18.750	-0.300				
25	19.700	1.250				
26	20.300	1.250				

References

- [1]Chen, & Zhichao. (1970, January 01). Fabrication and research of 3D complex scaffolds for bone tissue engineering based on extrusion–deposition technique. Retrieved from <https://dspace.lboro.ac.uk/2134/27522>
- [2] Redwood, B., Schöffner, F., Garret, B., & Fadell, T. (2018). *The 3D printing handbook: Technologies, design and applications*. Amsterdam: 3D Hubs.
- [3] Introduction to X-SEL PC Software Tutorial. (2014, January 07). Retrieved from <https://www.intelligentactuator.com/x-sel-pc-interface-software-tutorial/>