Automated Calibration for 3D Extrusion Bioprinting Using Pressure Sensing and Image Analysis

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Biomotion Technologies

Automated bioprinting for reproducible tissue models.

biomotion
Engineered for Consistency.

Reproducibility Gap

- **20% weight variation of final product**
- **High Material & Time Waste**
- **Challenging Regulatory Approval**

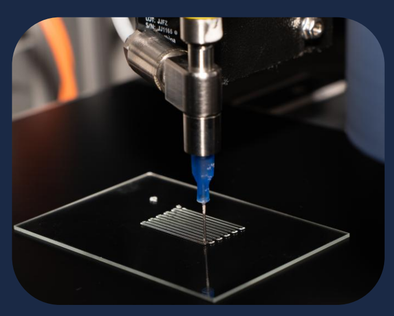
Bioprinter Setup

ExplorerOne



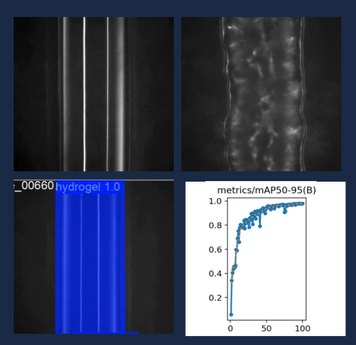
Piston-driven extruder 10 µm stepping resolution

Pressure sensor



22G needle with pressure sensor (0-5 kPa)

Camera set-up + segmentation



- **On-device segmentation @ 15 fps**
- **Resolution:** 725 × 524 px → **~1.82 µm/pixel**
- **Accuracy:** mAP50–95 > 95%

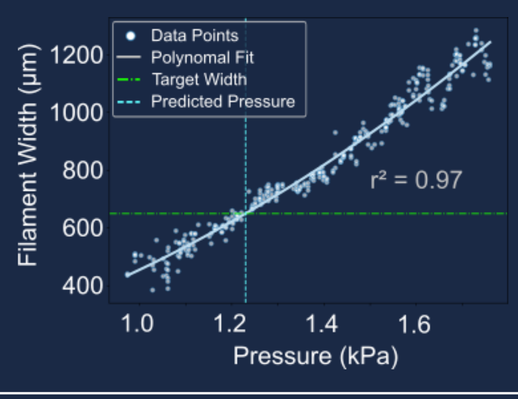
Automated recording of line width and image segmentation

Calibration Workflow

Patented technology: PCT/EP2025/076079

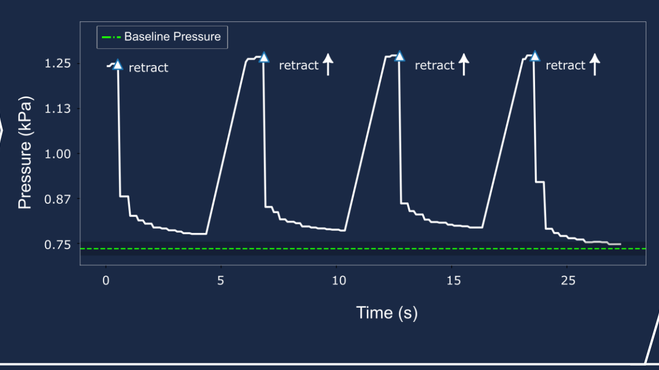
Step I

Correlate pressure with filament width



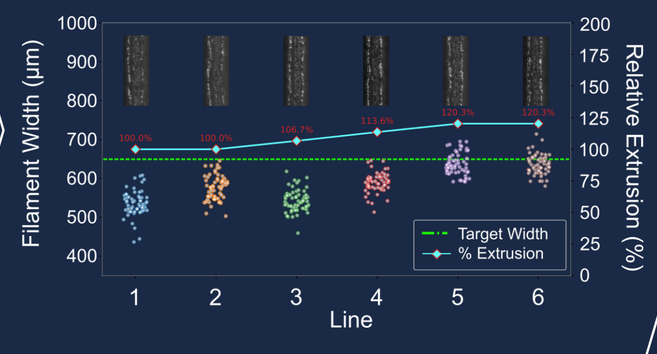
Step II

Tune retraction & unretraction to match pressure



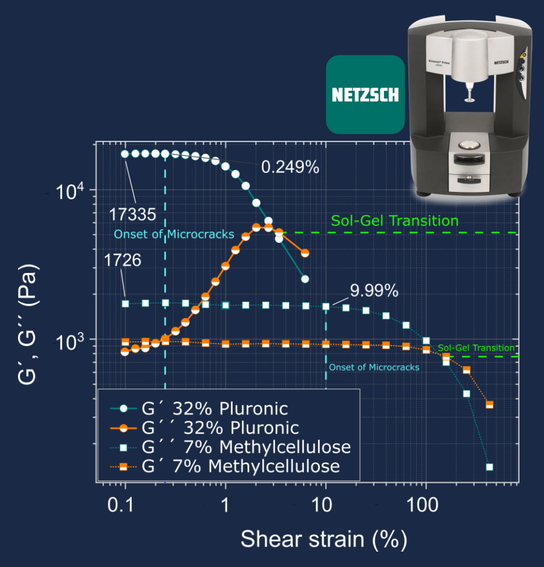
Step III

Fine-tune extrusion multiplier & retraction

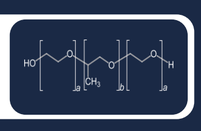


Print filaments with defined width

Validation Materials

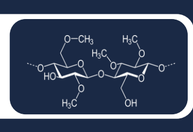


Pluronic F-127



- ~10x stiffer than MC

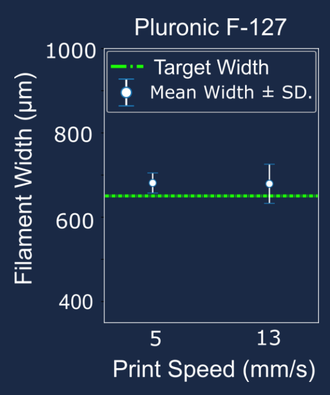
Methyl cellulose



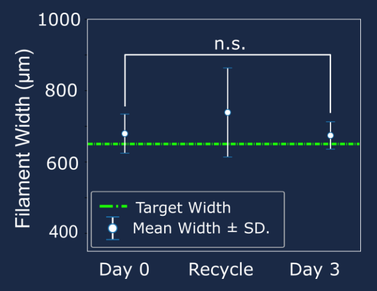
- ~40x higher resistance to deformation (LVE region)

Validation Tests

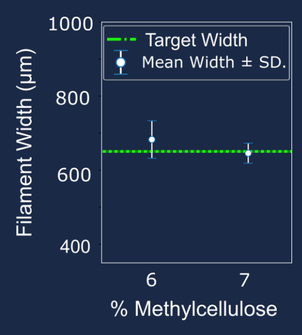
Print Speeds



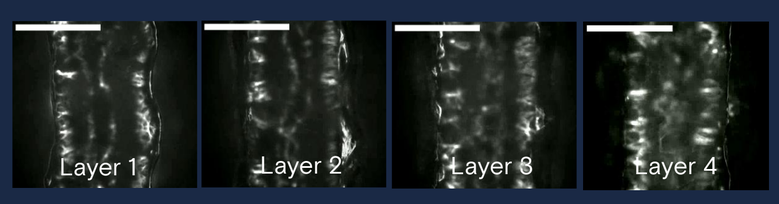
Time Independency

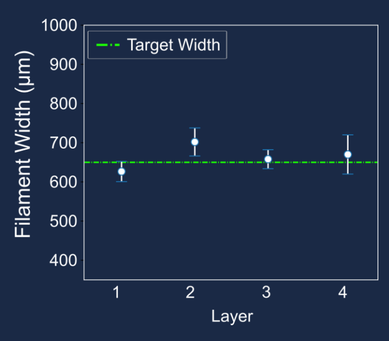


Batch Independency



3D Construct Validation







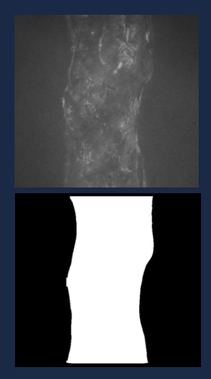
Commercial Material

Fibercoll Flex-A®

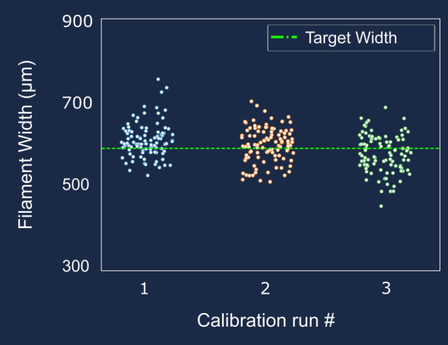
Collagen



Training + Segmentation



Consistent Calibration



Ready to scale beyond trial and error? Contact us.

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