



**Micro but Mighty**



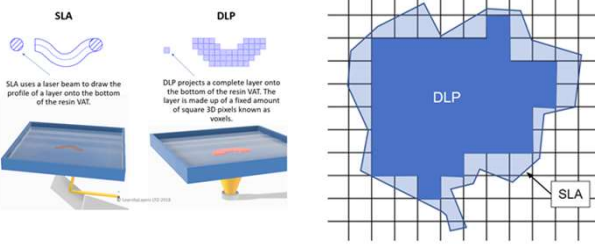
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## Vision Statement

To provide a cutting-edge, microscale 3D printing technology that seamlessly incorporates all the advantages of a hybrid operation between DLP and SLA printing.

## Problem Definition

- Combine SLA and DLP to create a fast, high resolution resin 3D printer
- Moving bed and resin vat
- Have microscale movement in every axis
- Utilize cameras to create a calibration system



## Engineering Requirements

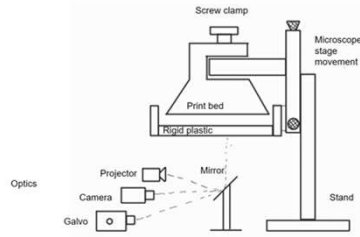
1. Be able to print in both SLA and DLP seamlessly
2. Movable print bed and vat during printing
3. Printing at 100 μm resolution or finer
4. Stitching accuracy at 25 μm resolution or finer
5. Stitching at least a 2x2 area to demonstrate scaling capabilities
6. Create calibration routine for SLA and DLP alignment

## Value Proposition

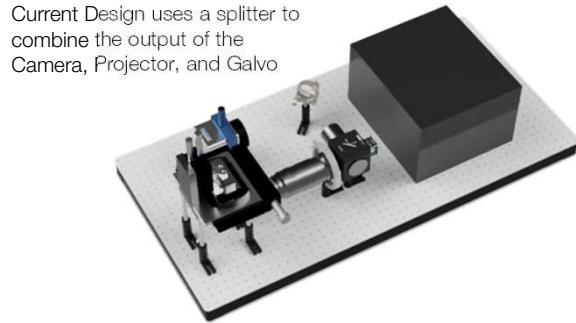
Because this hybrid operation will be able to create both fast and high resolution prints, it can be utilized in a variety of applications such as the following:

- Micro-scale Research
- Medical - medical devices, dental, etc.
- Microelectronics
- Optics - Lens Mounts, Tools, Holders
- Automotive - Sensors and In-Cabin Elements
- Aerospace & Defense - Pressure Sensors, Air flow devices, & Accelerometers

## Mechanical Design

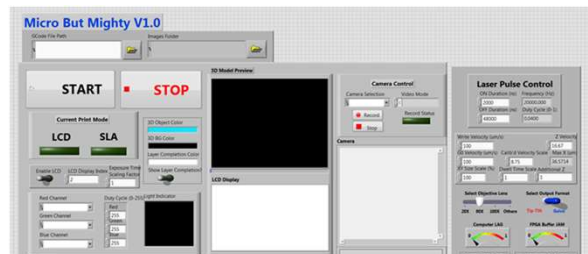
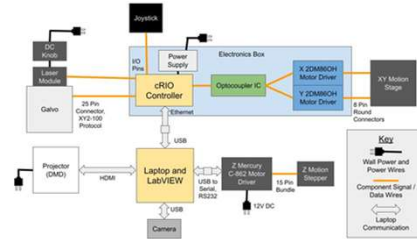


Original Design included Projector, Camera, and Galvo next to each other

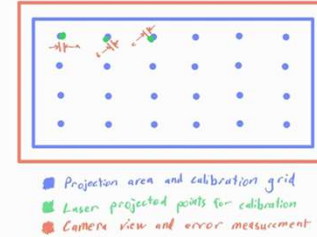


Current Design uses a splitter to combine the output of the Camera, Projector, and Galvo

## Controls and Electronics



## Testing & Validation



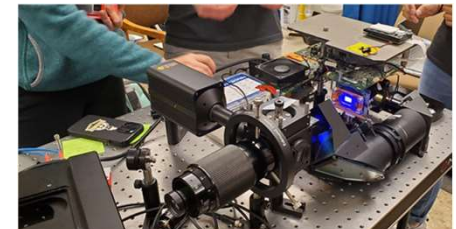
Current validation plan is to project a grid of dots using the DLP camera. Then the SLA laser aligns its beam onto where the dot is. We then use a camera and a LABVIEW code to create a mesh that offsets any discrepancies between the SLA and the DLP.

Resolution Calculator:

- Able to calculate print size based on resolution of projector and distance

Print size	Max X	Max Y	Current	Stage X length	Stage Y length	Resolution	Resolution	Resolution	Resolution
25.375	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
50.750	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000
76.125	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
101.500	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000
126.875	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000
152.250	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000
177.625	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000
203.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000
228.375	90.000	90.000	90.000	90.000	90.000	90.000	90.000	90.000	90.000
253.750	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
279.125	110.000	110.000	110.000	110.000	110.000	110.000	110.000	110.000	110.000
304.500	120.000	120.000	120.000	120.000	120.000	120.000	120.000	120.000	120.000
329.875	130.000	130.000	130.000	130.000	130.000	130.000	130.000	130.000	130.000
355.250	140.000	140.000	140.000	140.000	140.000	140.000	140.000	140.000	140.000
380.625	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000
406.000	160.000	160.000	160.000	160.000	160.000	160.000	160.000	160.000	160.000
431.375	170.000	170.000	170.000	170.000	170.000	170.000	170.000	170.000	170.000
456.750	180.000	180.000	180.000	180.000	180.000	180.000	180.000	180.000	180.000
482.125	190.000	190.000	190.000	190.000	190.000	190.000	190.000	190.000	190.000
507.500	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000	200.000
532.875	210.000	210.000	210.000	210.000	210.000	210.000	210.000	210.000	210.000
558.250	220.000	220.000	220.000	220.000	220.000	220.000	220.000	220.000	220.000
583.625	230.000	230.000	230.000	230.000	230.000	230.000	230.000	230.000	230.000
609.000	240.000	240.000	240.000	240.000	240.000	240.000	240.000	240.000	240.000
634.375	250.000	250.000	250.000	250.000	250.000	250.000	250.000	250.000	250.000
659.750	260.000	260.000	260.000	260.000	260.000	260.000	260.000	260.000	260.000
685.125	270.000	270.000	270.000	270.000	270.000	270.000	270.000	270.000	270.000
710.500	280.000	280.000	280.000	280.000	280.000	280.000	280.000	280.000	280.000
735.875	290.000	290.000	290.000	290.000	290.000	290.000	290.000	290.000	290.000
761.250	300.000	300.000	300.000	300.000	300.000	300.000	300.000	300.000	300.000

## Further Improvements



- Further improve the accuracy of the validation plan
- More tests for effectiveness of SLA and DLP to decrease print time
- Increase resolution of printer to function better within Microscale
- Make design more compact to decrease foot area needed to run

## Acknowledgments and References

- **Professor Liang Pan - Help on all aspects of the project**
- LearnByLayers. (2023). *SLA v DLP 3D Printing*. [Infographic]. LearnByLayers.com. <https://www.learnbylayers.com/product/sla-v-dlp-and-resin-materials/>
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