Multi-Axis Stereolithography Controller with Graphical User Interface

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**Background and Motivation**

- In the manufacturing industry, there is a growing need to build around inserts using current rapid prototyping technology such as 3-D Systems SLA equipment.
- A major problem using current hardware is that of laser shadowing.
- Laser shadowing prevents the resin around the insert from being fully cured thus leaving a less than adequate part.
Objectives

- Design and build a mechanical system that will eliminate the problem of laser shadowing
- Implement a controller with a graphical user interface that will allow the user to use the mechanical system to build around inserts
Hardware

- X-Y-Z Motion Table
- 4 Galvanometers
- Focusable Laser
- 2 UNIDEX 500 Control Boards
Software

- UNIDEX 500 MMI (Man-Machine Interface)
- Visual Basic for user interface
Control Methods

- While a total of seven axes will be controlled, there is only a need for at most four axes to be controlled simultaneously.
- Each of the axes of the motion table is controlled independently due to the fact that there is no significant coupling between their motion.
- PID controller for each axis of the motion table.
- Galvanometers are open-loop and the angle of rotation is based on magnitude of voltage input.
Results

- The design of the mechanical system for eliminating laser shadowing has been realized.
- Circuitry for powering the galvanometers has been constructed.
- Mounts for attaching the galvanometers to the motion table have been designed.
Current and Future Work

- Building the galvanometer mounts using the SLA-250 machine
- Assembling the frame for the laser mount
- Graphical user interface and control algorithms for building around certain families of inserts
Conclusions

❖ The mechanical system being constructed will change the path of the laser spot from what is currently being used in available technology allowing resin to be cured near and around the insert, thus eliminating laser shadowing