



# Prusa 3-D Printer Position Error: Conceptualization and Testbed Design

Azure S. Rubel\*, Jaden Johnson\*, Nathan Westerman\*, Satya R.T. Peddada†, & Albert E. Patterson†

\* Urbana High School, Urbana, IL † Department of Industrial and Enterprise Systems Engineering, University of Illinois at Urbana-Champaign, Urbana, IL

## Background & Motivation

One of the most common 3-D printing processes, especially among those processing polymeric materials, is the fused deposition modeling (FDM) process [1]. This process (Figure 1) builds geometry by selectively depositing material in layers, fusing each layer with the one below.

- A problems facing the wide adoption of this technology in manufacturing is the dimensional error on the parts [2]
- This is mainly caused by position error of the open-loop controller and belt compliance [3]
- This project designed a useful testbed for characterizing this error at different speeds and settings
- The current status of the work is a completed testbed design and experimental plan for monitoring the errors during printing

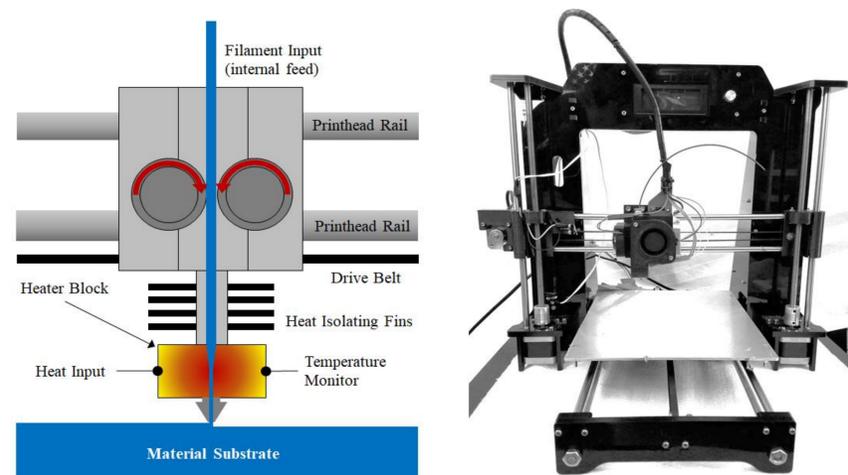


Figure 1. FDM process (a) deposition and (b) example hardware

## Methods/Workflow

- The problem was examined and a conceptual model of the printer position error behavior was made (Figure 2)
- A simple and effective test bed was designed, using the same type of motion in one axis as the printer (Figure 3)
- The testbed is set up to analyze motion using a GoPro camera and a reference point on the moving mass

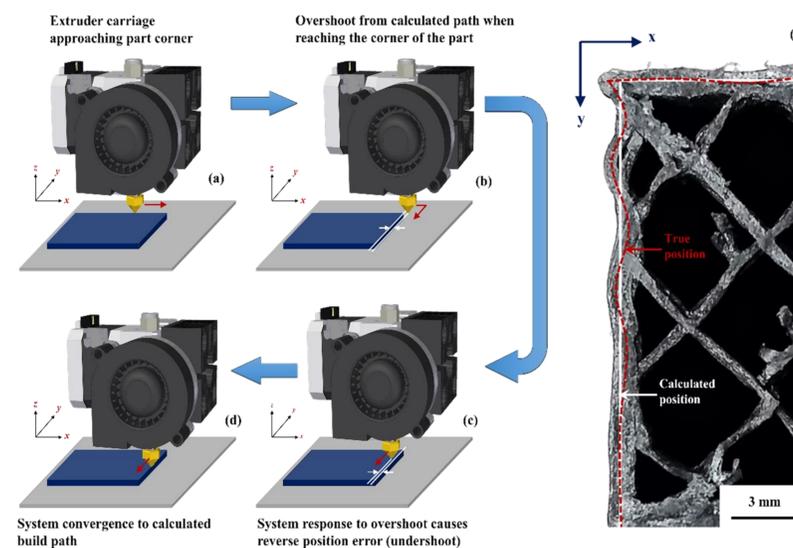


Figure 2. FDM (a-d) position error and (e) material example

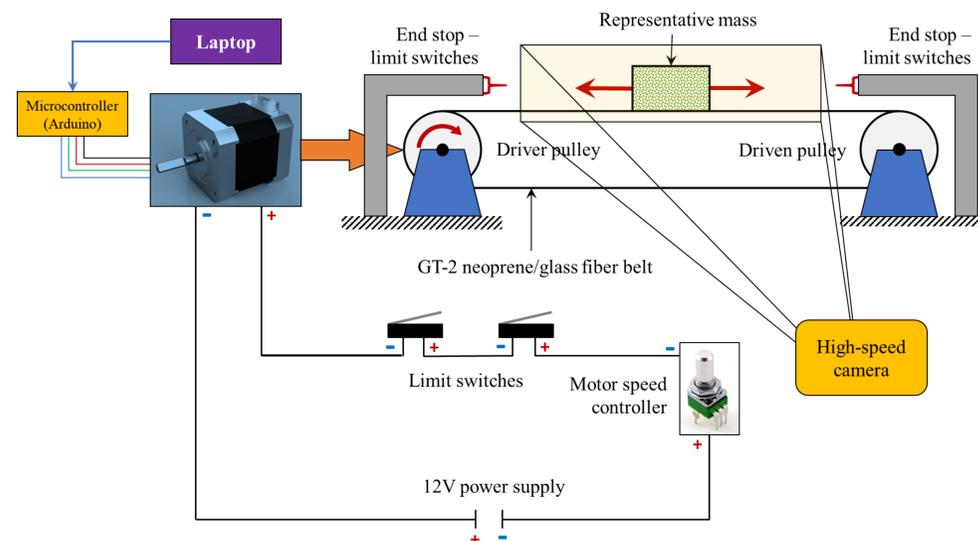


Figure 3. Mockup test bed design with computer vision system

## Results & Conclusions

- At the current time, the testbed design has been completed and materials for realizing it have been collected
- New insights into the nature and solution of the problem have been gained and will be enhanced further once the testbed is complete
- MATLAB® computer vision code will be used to find the true position of the mass and compare with theoretical results
- Future research efforts will focus on fabricating the testbed and running physical experiments

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## References

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