

Worcester Polytechnic Institute's full-scale mascot replica for the 6th International Symposium on Academic Makerspaces

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Introduction

The purpose of this project was to fabricate a replica model of a statue currently at Worcester Polytechnic Institute's campus to be used at future commencement ceremonies. LiDAR scanning was used to create a copy of the statue on campus, with FDM (Fused Deposition Modeling) 3D printing technology being used to fabricate the model. The seventy-five different FDM printed parts were assembled via friction welding using a Dremel, and post-processed via filler primer and sanding. The final assembly was color matched and spray painted to parallel the statue on campus and mounted on plywood to stabilize during transportation and use on stage.



Fig.1 Final Full Sized Model

To create the model for the replica, a Structure iPad 3D Scanner was used. Four scans of the original statue (2 at Noon, 2 at dusk) were made and imported into Blender. The scanned file was cleaned and exported as a .obj file. Once the 3D model was created and cleaned, 3D Builder was used to split the full-scale model into manageable pieces for FDM 3D printing. A layered approach was used, where the full statue was split into 10-13 vertical slices. Once each individual slice was created, these were split into smaller components that fit the build plates of the Ultimaker 3 and Lulzbot TAZ 6 printers. Once all individual components were created, they were put into the 3DPrinterOS slicing software to prepare for printing the physical models. All the printed components focused on keeping the print material at a minimum except for the legs and horns to improve structural stability.



Fig.2 Assembled model before painting

To assemble all the printed pieces, friction welding was used to secure each individual component while also filling in any gaps. A Dremel with 2.85mm PLA filament was used to attach each neighboring piece together, while also smoothing out the edges so they met flush. Each individual component associated with a level of the entire model was assembled, and then each individual layer was assembled to create the final model.



Fig.3 Final model printing

To match the replica exactly to the statue on campus, multiple models of the goats were printed, and spray painted with various colors of spray paint. The best match to the actual statue was used for the final spray paint color. Multiple coats of spray paint filler were used prior to this final spray paint color to provide an even base coat, while removing obvious layer lines that result from FDM 3D printing.

<i>Table 1 Project Statistics</i>	
Total Parts	75
Total Time	30 print days in 1 week
Total Printers	3 Ultimaker 3 + 3 Lulzbot TAZ 6
Total Material	13.5 Kgs PLA + TPU (2.85mm)
Assembly Time	3 weeks