

Plumbus creation through the use of 3D scanning, FDM printing and laser-cutting

BSc-5

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1 Introduction

The goal of the project was to create a 3D printed plumbus – a fictional household item from the Rick and Morty universe – by 3D scanning at least 5 common, physical objects. The scanned files needed to be fabricated using a Fused Deposition Modeling (FDM) printer along with a base for the object by the method of laser-cutting.

A plumbus has 5 distinct parts for which 5 real world items have been selected:

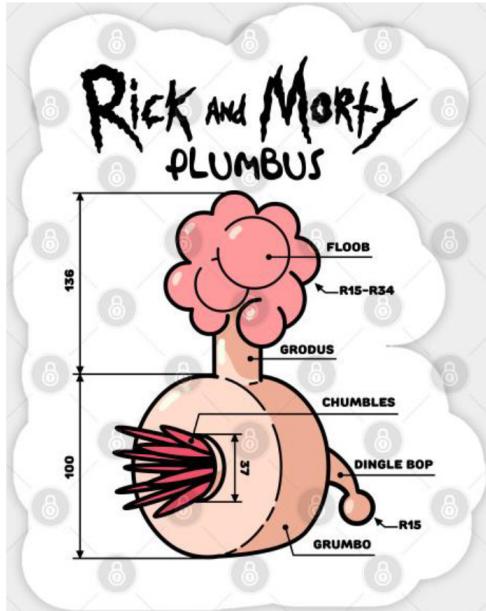


Figure 1: Labeled image of a plumbus with rough dimensions.

- Floob → microfiber cloth ball
- Grodus → toiletpaper roll core
- Chumbles → brush bristles
- Dingle bop → microfiber cloth cone
- Grumbo → toiletpaper roll

Objects were chosen from common cleaning supplies to reflect some of the uses of the plumbus.

2 Scanning

The first step in creating the plumbus was to acquire the geometries of the selected objects.

First, the objects had to be prepared to fit the exact needs of the project. For some, such as the paper tube, it meant creating additional, more detail-rich texture while for others it meant modifying their shape and adding a mounting option to allow scanning on all sides. Most of these modifications were made with the use of rubber bands.

The first method of 3D scanning was to attempt photogrammetry with mobile devices. The main issue encountered was the impossibly long upload and processing times of the apps¹

¹Apps attempted were Polycam, Modelar and CamToPlan.

that we tried. Blaming the server-based processing, the use of *Mushroom* was attempted for stitching individual images into a 3D scene, but it also abandoned due to its extreme hardware and storage requirements.

Finally, a decision has been made to use specialized scanning hardware. The scanner used was the *EINSTAR VEGA hand scanner*, provided by our professor. With its display and on-device processing, it proved to be fairly user-friendly, but several issues also presented themselves.



Figure 2: The UI of the EINSTAR VEGA gave valuable information such as the optimal distance to the scanned object as well as areas that still need more definition.

Issue	Solution
Scans would not initiate/not recognize an object's presence.	Starting scans from the pedestal used (chair) and only after initialization moving up to the desired object.
When scanning the hanging ball, the chair leg obstructed the view to the object.	Switching to a detailed scan reduced the working distance.
Some objects, mainly those of paper, lost tracking easily.	Adding dots on the exteriors seemed to facilitate tracking by adding distinct features for texture based tracking.

Table 1: List of issues faced with the actions taken to tackle the problem.