

A Low-Cost Reflectance Transformation Imaging Dome

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Reflectance Transformation Imaging

Reflectance Transformation Imaging (RTI) has applications in a number of heritage imaging fields, including numismatics, sigillography, and archaeology, but the barriers for starting work with it can be somewhat high. Manual workflows with flashes are slow and cumbersome. Commercial domes cost from €10.000–30.000, and universities and departments are understandably reluctant to loan them out for classroom or student use. While instructions for homemade domes have been around since at least 2016, most have been quite complex, requiring large amounts of soldering and the fabrication of custom circuit boards.

The SimpleRTIDome Project

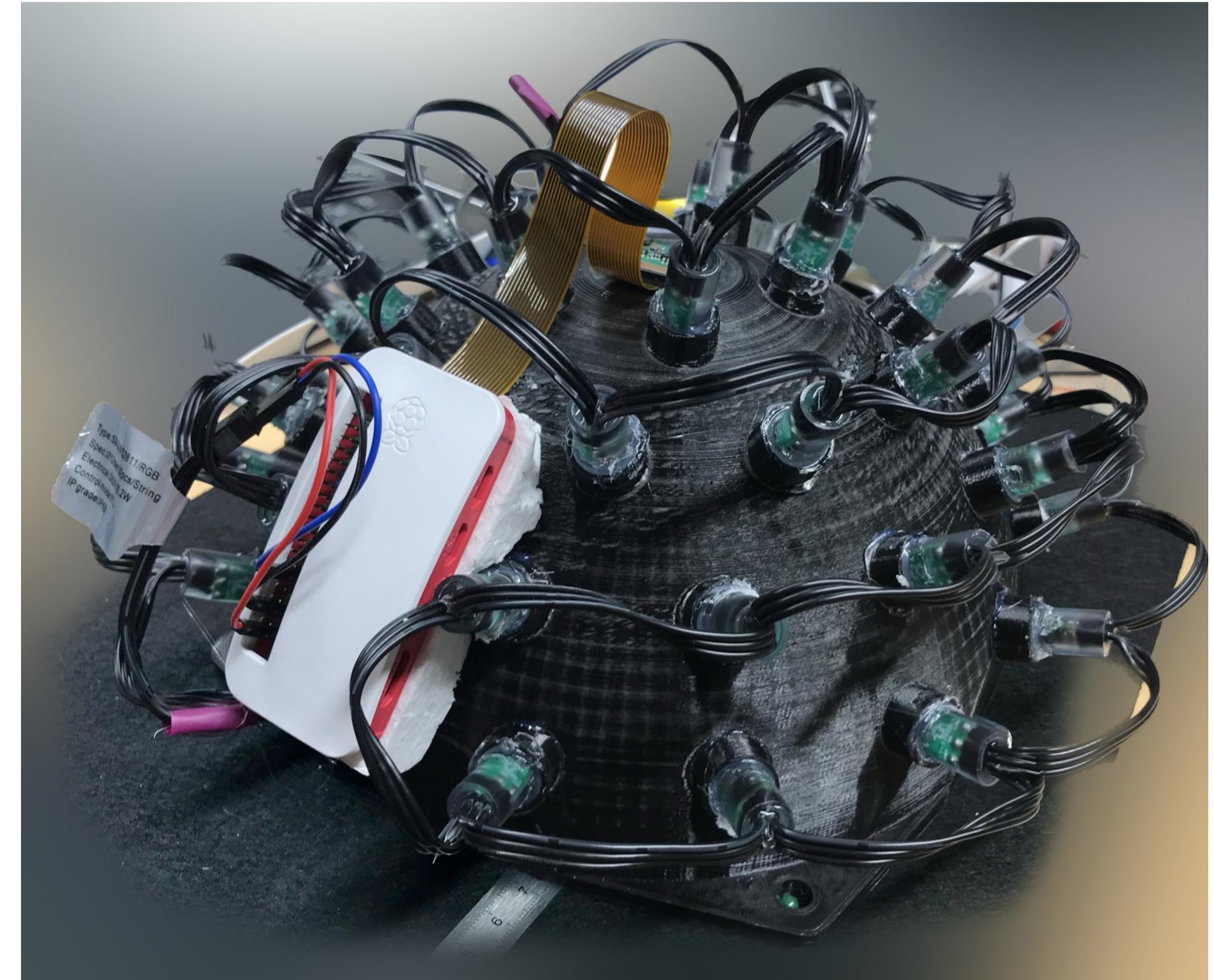
Taking advantage of the consumerization of single-board-computers and 3D printing in the last few years to design a dome that is suitable and accessible for classroom and student use. It was designed to be:

- Low Cost (less than €200* of materials)
- Requires only common crafting tools for assembly
- Requires no special electronics skills (e.g. soldering)
- Easy and automated workflow

(* Includes 3D printing materials, but not time/printer)

Limitations

Designed to be “checked out” like a book, the V2 dome is only suitable for small objects, with maximum dimensions of 7x7x1.5cm. Though the automation elements of the controller work equally well for both the Raspberry Pi Camera Module 3 and higher-quality DSLR camera systems, the current RGB string lights are not suitable for colour-critical research purposes due to their low CRI. As a temporary measure, while awaiting more appropriate lights to be shipped from manufacturers in China, this has been considered an acceptable compromise.

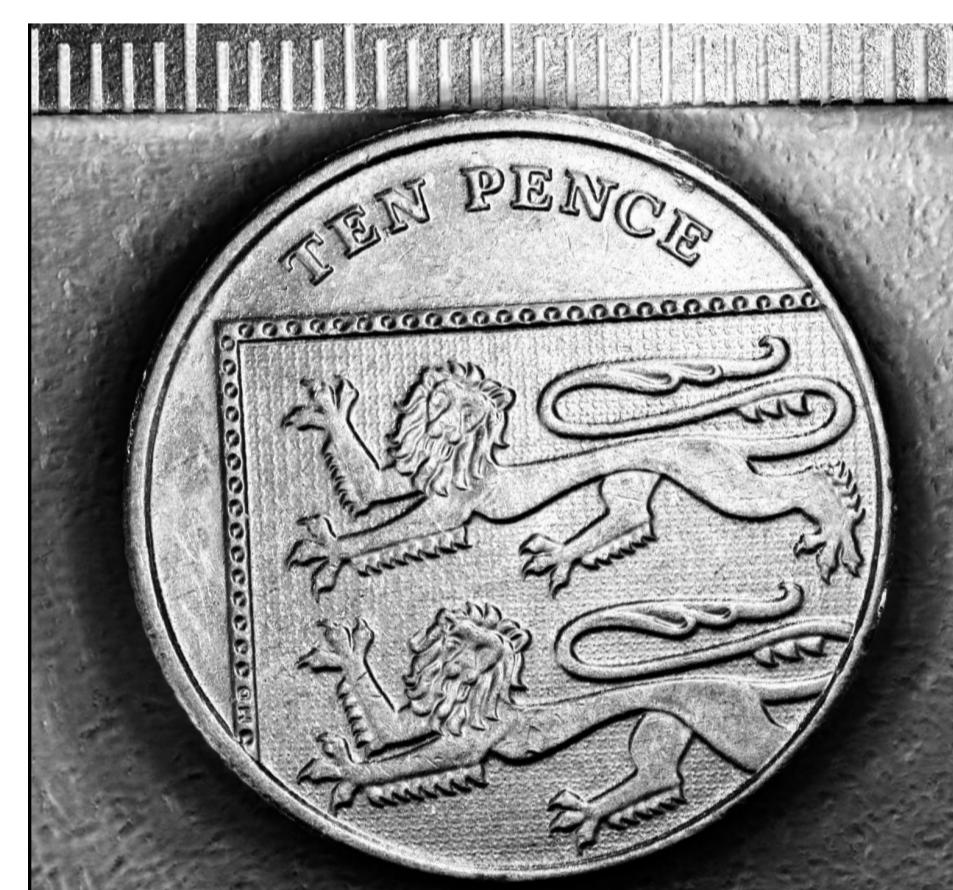
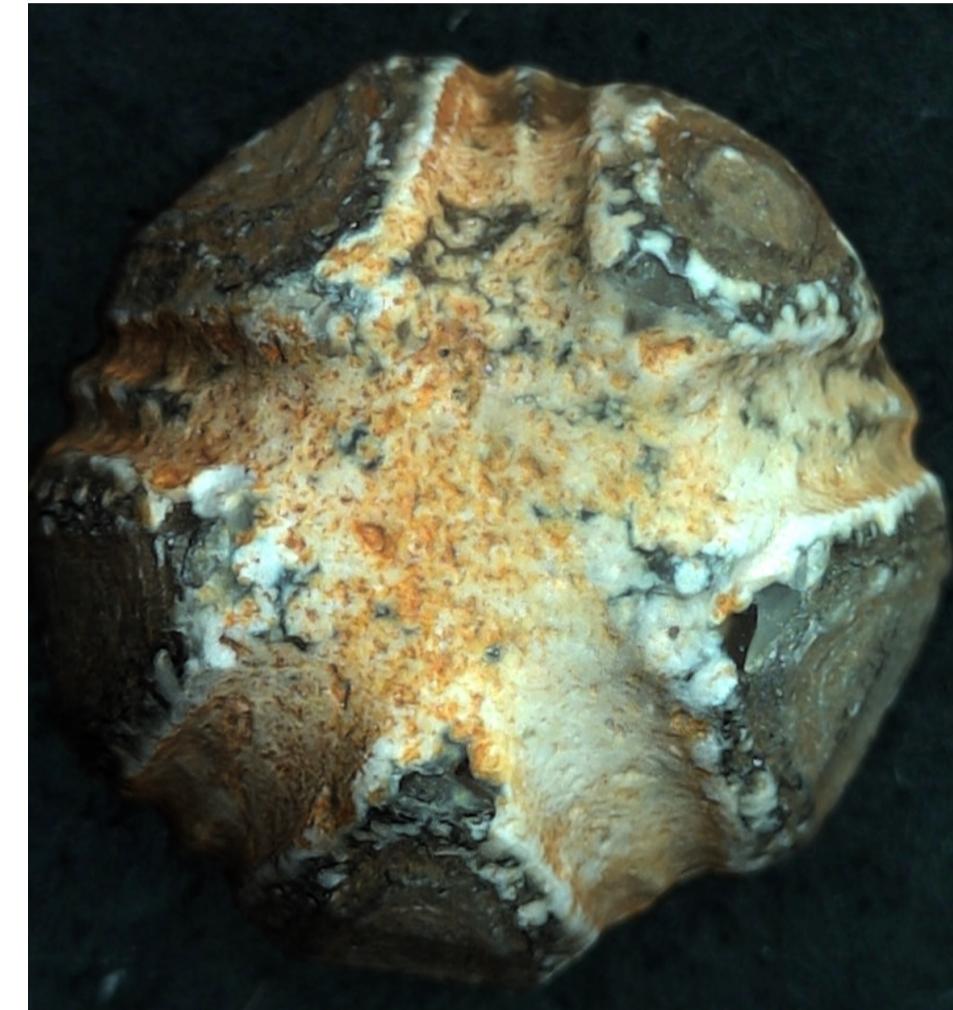
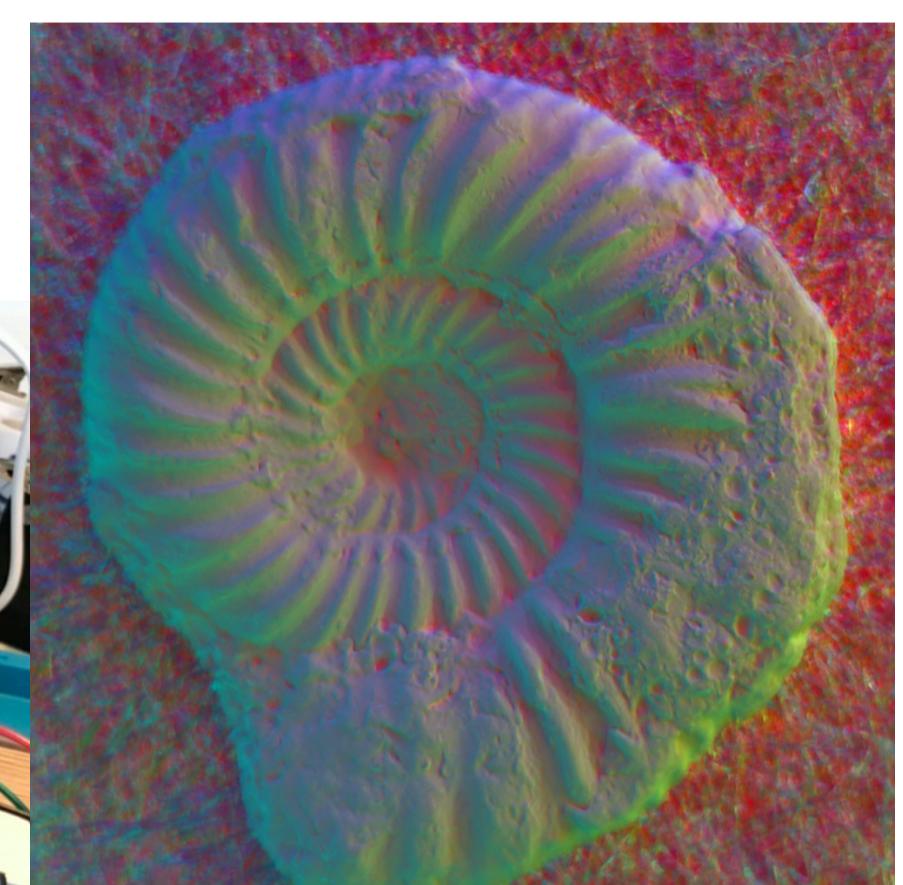
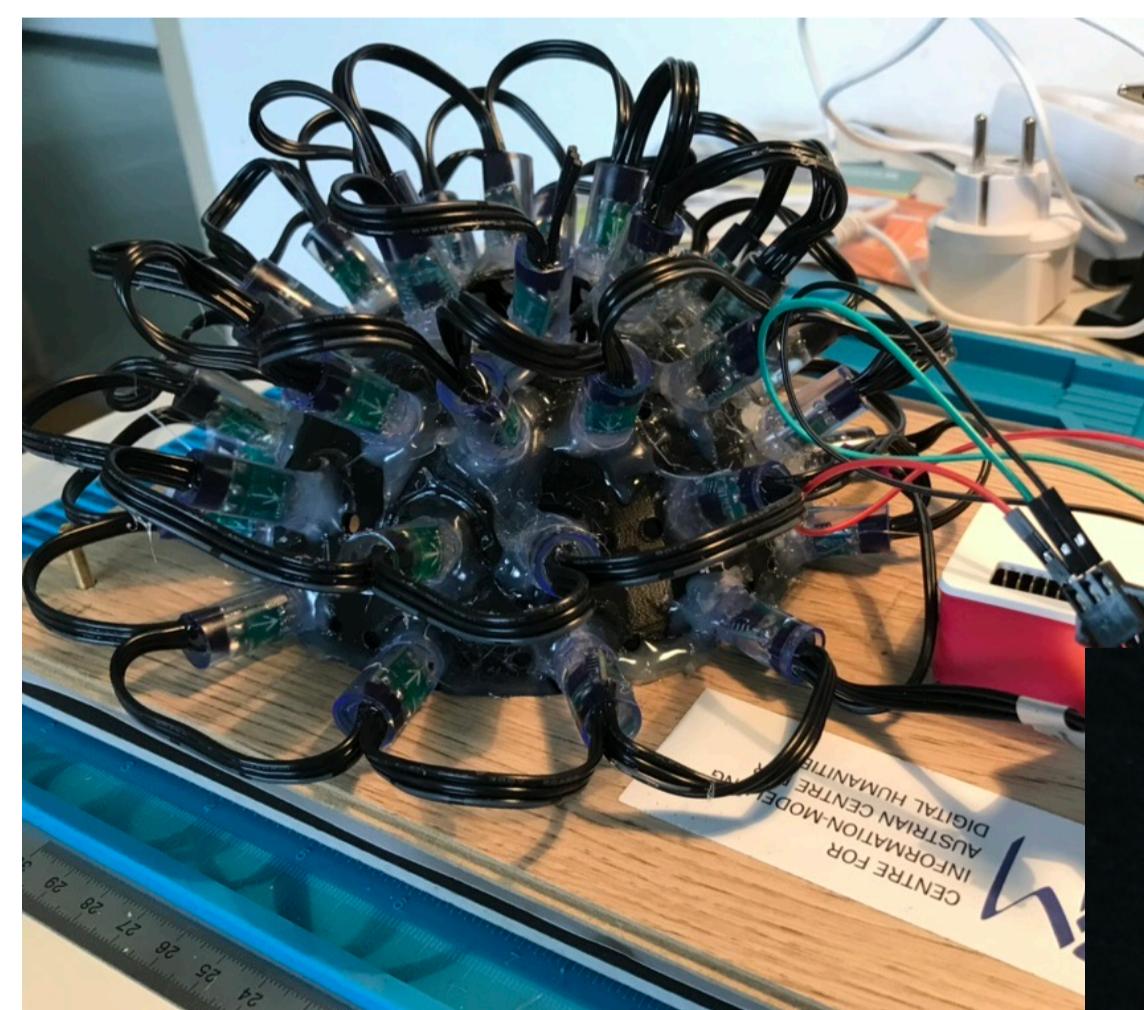


Above: V2 prototype

Right: fossil normals

Below: V1 prototype

Bottom: 3D printing models



Top: relit natural light image from dynamic RTI image

Above: UK 10p coin relit for high contrast

Below: Ethiopian 1Birr coin in diffuse light and relit speculars, showing difference in contrast



Find the Project on GitHub

<https://github.com/larkvi/SimpleRTIDome/>



Material List:

Raspberry Pi Camera Zero WH/2WH	€20
Raspberry Pi Camera Module 3 (76•)	€30
+ accessories	€40
Addressable RGB String Lights	€25
PETG Filament	€17
Miscellaneous Parts	< €20
	€150

Tools List:

knife, file, sandpaper, hot glue gun ~ €30

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