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Full Moon Feeling

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Abstract

The Moon is, together with the Sun, the very first astronomical object that we experience in our life. As this is an exclusively visual experience, people with visual impairments need to follow a different path to experience it too. Here we will show the process of designing and testing a tactile 3D Moon sphere whose goal is to reproduce on a tactile support the experience of observing the Moon visually.

We have used imaging data obtained by NASA's mission Clementine, along with free image processing and 3D rendering software. This method is also useful to produce other artifacts that can be employed in the communication of astronomy to all kinds of public.

The tactile Moon project for the blind has been funded partially by the 2011 Europlanet Outreach Funding Scheme.

1. Introduction

Since the beginning of history, the Moon has played a central role in human life and culture: agriculture, calendars, poems, pictures, science... But our experience of the Moon is mostly visual, so blind people cannot share it. Therefore, in this project we set to reach for the Moon in order to let blind people enjoy and know it too.

This project was inspired by a former one that we developed for the IYA 2009, a planetarium show for the blind [1].

2. A 3D Spherical Moon

There are already a few resources about the Moon that have been designed for the blind, like "The little Moon Phase Book", by Noreen Grice [2], NASA's "Getting a Feel for Lunar Craters" [3], or models developed at the University of Puerto Rico [4]. They all have one characteristic in common: they are flat representations of parts of the Moon.

We set up therefore to create a 3D spherical model of the Moon, with the goal of conveying the visual impression that we have when looking at the Moon. We did not look for a mere topographical representation.

We wanted to build the Moon in an easy to share format to make the model available worldwide. Therefore, we chose an electronic, 3D printing format: "stl".

3. Developing the 3D model

We started from NASA's Clementine full visual map of the Moon. Too much detail leads to confusion when you are only touching and not seeing, therefore some deleting and blurring of the image was necessary. Only main accidents in terms of visibility were to be represented, even if they were not relevant topologically, like crater rays. We kept only large craters, large maria, large mountain ranges and conspicuous crater rays.

We used GIMP as image processing software to increase contrast, blur and delete structures in the original Clementine image. Each important feature is labeled with a Braille letter on top of a smooth rectangle to help distinguishing it from the lunar surface. An accompanying document in Braille lets the user know what does each letter stand for. For example, "a" is next to the Copernicus crater, "b" is next to the Kepler crater, and so on.

Flat caps mark the poles, and the northern one has a cross to help with the ball orientation.

The resulting processed image file is then converted into an ascii file and fed into a 3D rendering software, MeshLab [5]. The final 3D file was checked online at netfabb.com [6].

4. The 3D tactile Moon

We printed a prototype of the Moon in a 3D printer in polyamide. Then, a silicone mould from the prototype allowed for the making of 20 cheaper copies in resin.

These copies were shipped around the world to educators and outreach agents who do or were planning

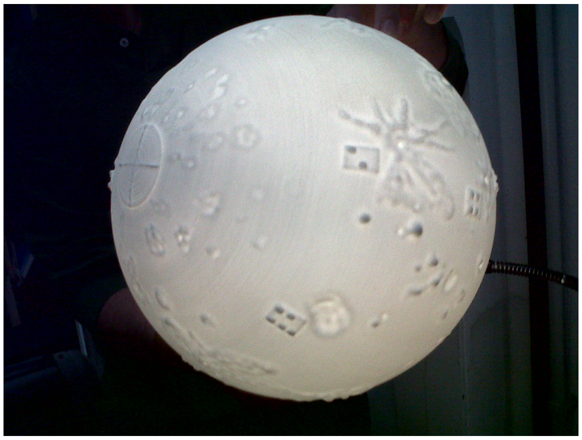

Figure 1: The first design of the tactile Moon for the blind. Crates are marked with Braille letters, and the northern polar cap has a cross engraved to help with the orientation of the ball. The surface has been largely simplified for the sake of clarity

to do astronomical activities with blind people. They were tested and a number of improvements were suggested.

These improvements have been incorporated into the final Moon design, that we have made freely available through our website, and those of the Galileo Teachers training Project and Universe Awareness. We also plan to include the model on the Google SketchUp repository [7].

5. The future of the 3D tactile Moon project

A project to create an educational kit with the tactile Moon, the northern sky half-sphere and an activity booklet is underway with the partnership of Universe Awareness.

A planetarium show is being developed by the Espinho Planetarium in Portugal that uses the tactile Moon as a central element of the show.

6. Summary and Conclusions

We have developed a novel tool to help blind people to learn about the Moon and experience it as people with full vision do. The model is freely available and downloadable from several websites.

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Lina Canas (Espinho Planetarium) is developing the planetarium show around the tactile Moon, and Pedro Russo (UNAWE) is coordinating the astronomical educational kit with the Moon and the sky hemisphere.

We also thank the Meshlab and Netfabb developers for making their software open source.

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References

[1] Ortiz-Gil, A., Gomez Collado, M., Martinez Nuñez, S., Blay, P., Guirado, J.C., Gallego Calvente, A.T., Lanzara, M. : Communicating Astronomy to Special Needs Audiences, Communicating Astronomy with the Public (CAP) Journal, Vol. 11, pp. 12-15, 2011.

[2] Grice, N.: The Little Moon Phase Book, Ozone, 2005.

[3] Hurd, D.: Getting a Feel for Lunar Craters, NASA, 2011.

[4] Isidro, G.M.: Private communication, 2011.

[5] Meshlab: http://meshlab.sourceforge.net/, 2011

[6] Netfabb: http://www.netfabb.com/, 2012

[7] Google SketchUp:http://sketchup.google.com/intl/en/index.htm 2012