MARSCAPE

MARS COMMUNICATED THROUGH AN AUGMENTED, PHYSICAL ENVIRONMENT

UK SPACE AGENCY

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

MarsCAPE is a project funded by the UK Space Agency's Space For All Community Funding Scheme 2016. It utilises physical models of the Martian surface focused on ExoMars mission sites, laser cut using the latest Digital Elevation data, upon which information about the environment is digitally projected. Its key objective is to provide the public with a novel perspective on the dynamic nature of the Martian surface, unobtainable from 2D or 3D data in isolation, and compare the geological processes that have created it with those on Earth.

THE PROBLEM...

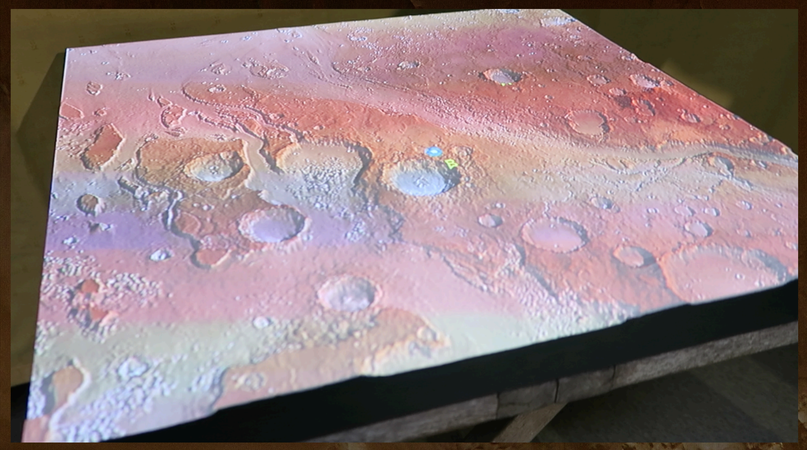
In the past decade through the proliferation of digital technologies, citizen science has grown in popularity and is now used as a data analysis tool across a range of disciplines. Due to the abundance of instruments currently collecting data, planetary science has become a prime candidate for, and adaptor of, citizen science platforms (Sprinks et al., 2015). Current projects (planetfour.org, moonzoo.org etc.) take a Virtual Citizen Science (VCS) approach (Reed et al., 2012), gathering scientific analysis from remotely sensed imagery that's presented to the public through a website interface. However, in presenting the data 'on screen' in a 2D form, issues regarding interpretation and context arise – for instance, depending on the angle of the Sun when the picture was taken, images of craters taken from overhead (i.e. from orbit) may appear to be a mountain.

The crater or doming illusion is an optical phenomenon that causes impact craters in some images to appear as hills or mountains. It is caused through being accustomed to light coming from overhead. In orbital images the sun can come from different directions, meaning that in some cases the interior of a crater can look like being above the surrounding terrain.

Reed J., Rodriquez W., Rickoff A., (2012). A Framework for Defining and Describing Key Design Features of Virtual Citizen Science Projects, *Proceedings of the 2012 iConference*, pp. 623-625

Sprinks J., Houghton R., Bamford S., Morley J. G., Wardlaw J., (2015). Is that a Crater? Designing Citizen Science Platforms for the Volunteer and to Improve Results, *European Planetary Science Congress 2015*, EPSC2015-694, Vol. 10

PARM (PROJECTION AUGMENTED RELIEF MODEL)



The MarsCAPE models are created using Computer Numerical control (CNC) milling from HRSC and HiRISE digital terrain data. The setup includes a mobile rig to hold the projector so that the display can be easily transported to different types of event.

Projection Augmented Relief Models (PARM) are displays designed to tell stories through maps and imagery projected down onto three dimensional landscape models.

The power of physical relief models lies in their ability to convey subtle changes in slope and elevation more easily than monitor-based visualisation techniques. They allow close scrutiny but also offer the viewer overviews of whole landscapes. This spatial 'frame of reference' helps to place features into their landscape context. The addition of high definition animated digital projection adds richness of content to such displays opening up new possibilities for education and spatial decision support.

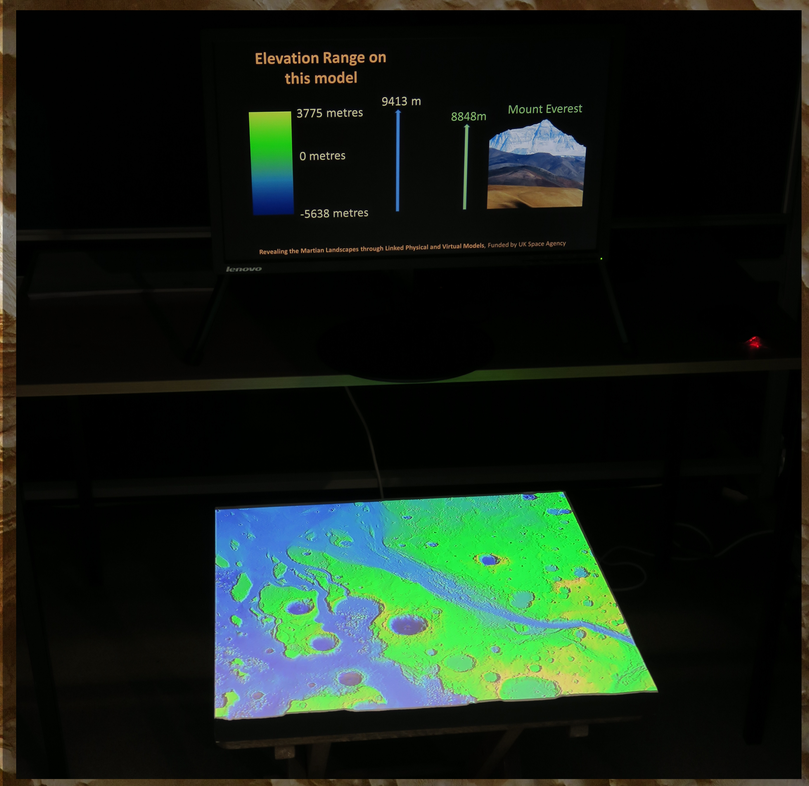
METHODOLOGY

In order to address issues regarding context and interpretation, MarsCAPE is an engaging and informative display that communicates key aspects of the Martian landscape to the public, including the nature and scale of landscape forms, using a unique combination of physical landscape models and synchronised 3D perspective views. Using PARM technology, it combines the proven power of physical relief models for providing overviews of landscape and discerning more subtle spatial forms and relationships, with first person game-like perspectives on the ground.

It also includes the capability of projecting data 'overlays' onto the physical model of surface, such as imagery, geological mapping, or comparison examples from Earth to provide context.

MARSCAPE AIMS

The aims of the MarsCAPE project are not only to solve the issues regarding context and interpretation when studying the Martian surface, but also to educate the observer in regards to the geophysical processes that occur on Mars and how they relate to those that are happening on Earth. Through using a physical display presented in a public space citizen science can be moved from an individual process conducted in isolation to a public and shared experience, where scientific analysis and understanding can be discussed. Ultimately it is hoped that this can result in a more enriching experience for citizen scientists, who give up their time and effort for free and on whose participation the success of a citizen science project relies on.



Additional monitors can be used to display information about each stage of the projection. For example, context regarding the height differences of the model can be explained through comparison with known Earth geology, such as Mount Everest.

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