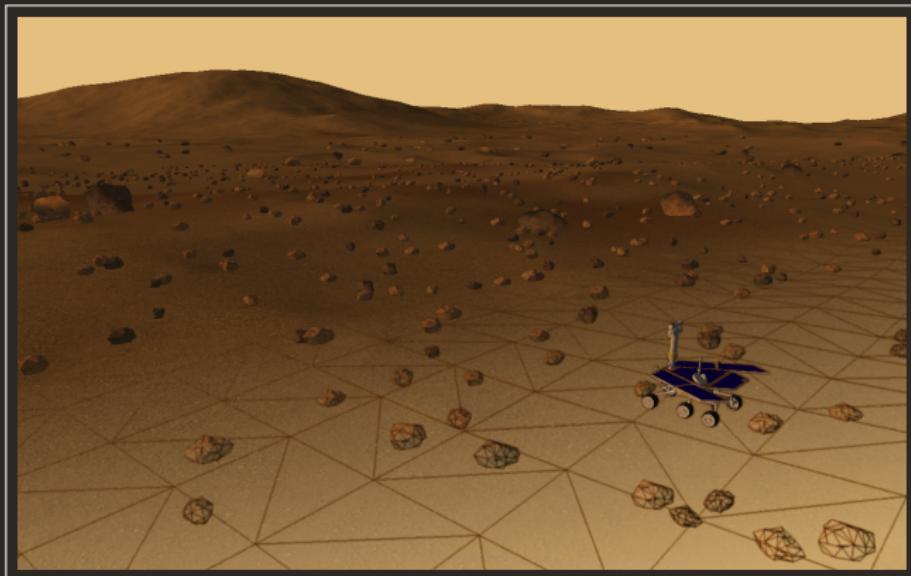


# Planet Surface Simulation with OGRE 3D



Stefan Kral

September 16, 2010

# Not Just for Games



# Outline

Terrain Rendering Techniques

3D Surface Simulation

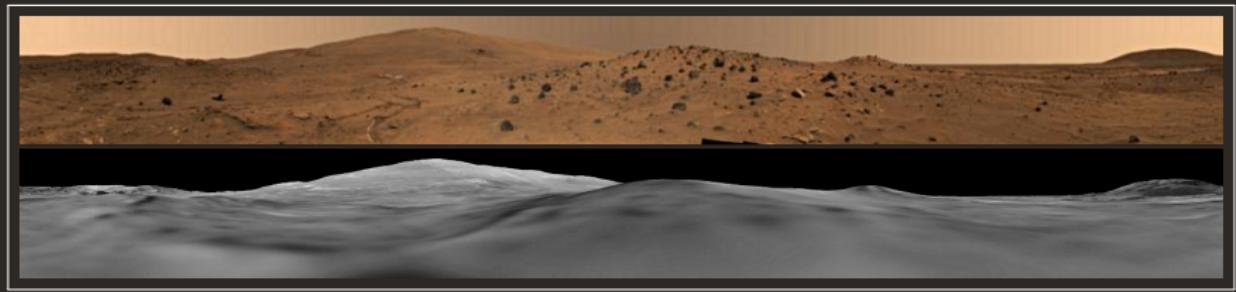
Exploit GPU Data Processing

Outlook to Further Possibilities

## About OGRE3D

- ▶ OGRE: Object-Oriented Graphics Rendering Engine
- ▶ Open source 3D graphics library written in C++ since 2000
- ▶ Rich API for platform independent scene-oriented development

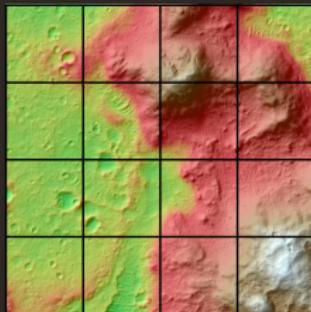
# Terrain Rendering



Comparison of

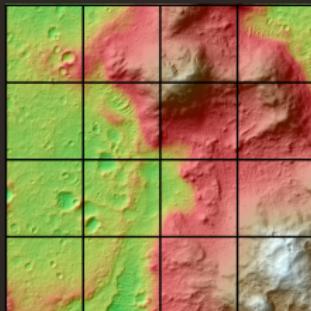
- ▶ panorama shot of Mars Exploration Rover Spirit
- ▶ rendered DTM from Mars Reconnaissance Orbiter

# Terrain Rendering Techniques

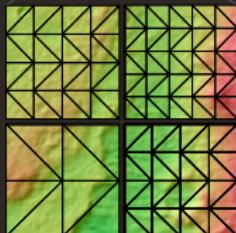


- ▶ Area can be tiled into multiple pages
- ▶ Paging allows dynamic terrain loading to avoid out of memory

# Terrain Rendering Techniques

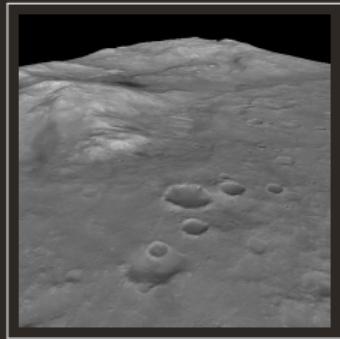


- ▶ Area can be tiled into multiple pages
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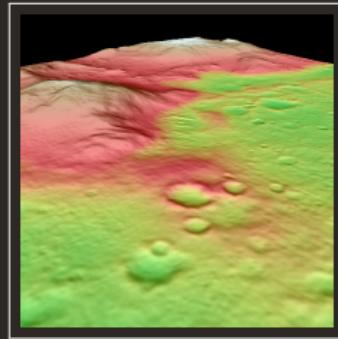


- ▶ Pages are subdivided into batches
- ▶ Number of triangulated vertices could be varied regarding to computing power

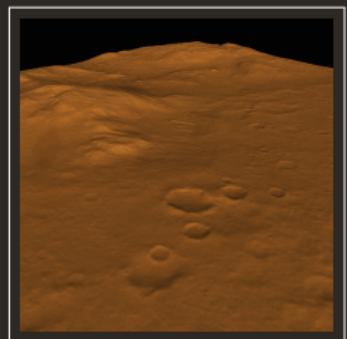
## Terrain Textures



MRO Orthoimage

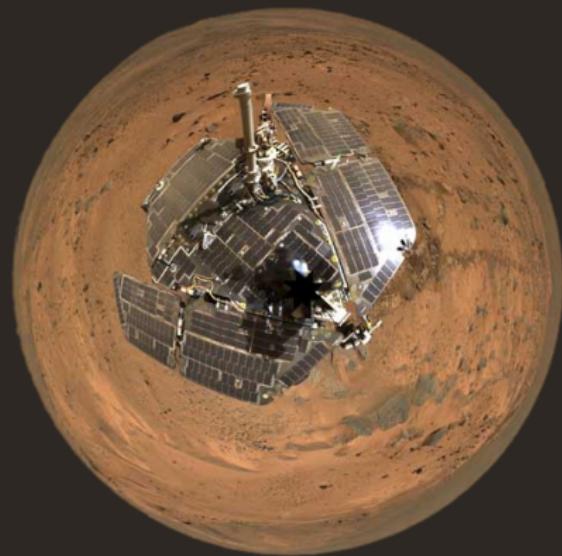


Color Altimetry

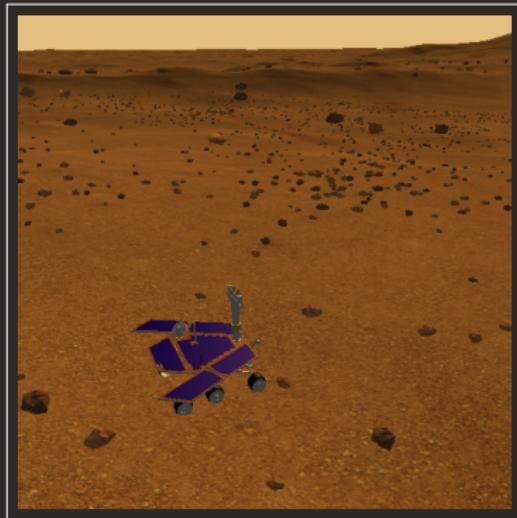


Custom Texture

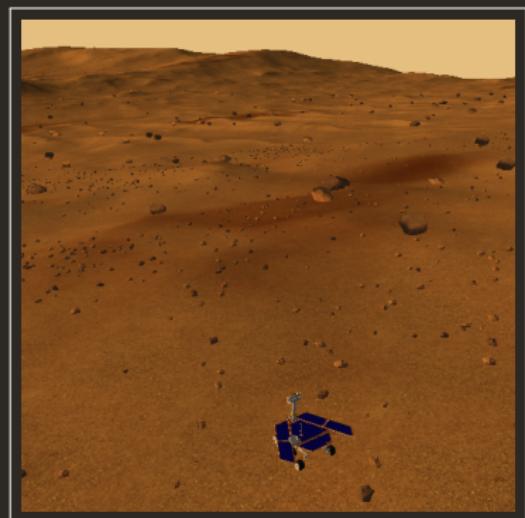
# 3D Surface Simulation



# Parameter Modelling for Navigation Tasks



Roughness



Ground Condition

# Parameter Modelling for Navigation Tasks



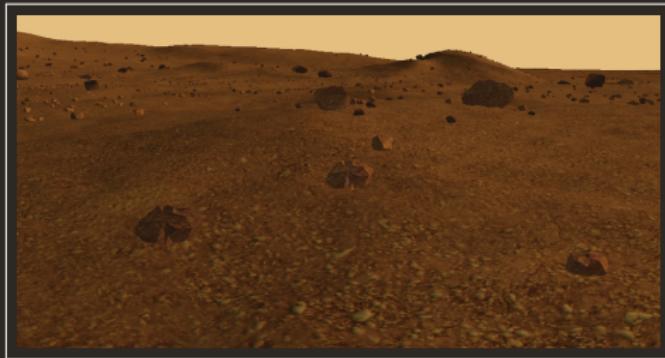
Slope



Obstacles

# Exploit GPU Data Processing

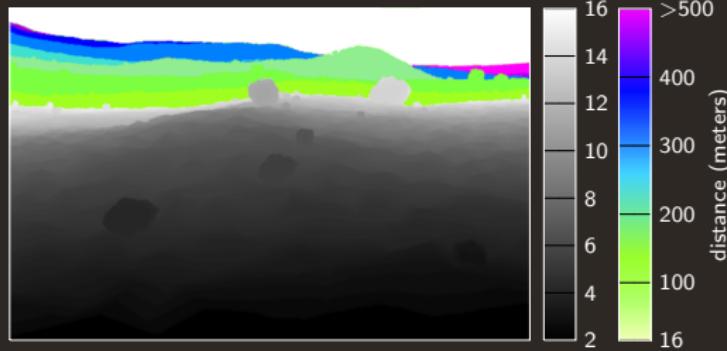
## Depth Map Generation



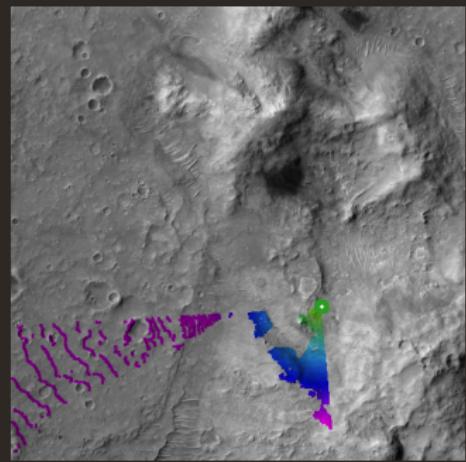
- ▶ GPU optimized for matrix operations (transformations)
- ▶ Get depth map for free

# Exploit GPU Data Processing

## Depth Map Generation



Depth Map



Visibility Map

## Summary

With OGRE we have

- ▶ a powerful library for rendering surface models
- ▶ adjustments between exactness and performance
- ▶ a promising approach to create an application for scientific visualization as well as an engineering tool

## Outlook to Further Possibilities

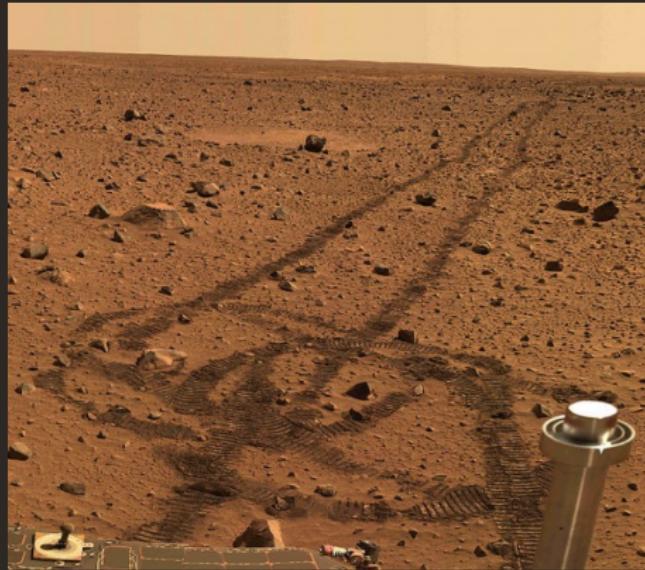
- ▶ Make use of more OGRE capabilities:  
multiple render targets, scene nodes, user interface
- ▶ Combine with GIS database  
(SpatiaLite)
- ▶ Model physical quantities and simulate kinematics  
(Player/Gazebo)

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Thank you

[stefan.kral@dlr.de](mailto:stefan.kral@dlr.de)