

A PROPOSED GEOTECHNICAL GIS FOR LUNAR EXPLORATION. Leon Croukamp¹, ¹Council for Geoscience, South Africa, leonc@geoscience.org.za.

Introduction: Future Lunar exploration depends to a large extent on the knowledge of the geological properties but even more so on the geotechnical properties of the soil and underlying bedrock. The role of the geologist during rover and manned missions is critical. Both from control on earth as well as for decision making during actual field excursions.

GIS as a tool:

Using GIS as a decision making tool is nothing new and numerous examples exist where it had been applied successfully, especially in the terrain of utility monitoring for Metropolitan Councils, client distribution maps and even defense strategies or emergency service providers for shortest and quickest routes to fires and accident scenes.

At the Council for Geoscience (CGS) a geotechnical GIS [1] had been designed and implemented to support the ever increasing demand for housing in semi-urban areas. During this, it became apparent that GIS is not just a tool for creating maps but can actively support decision making at different levels of authority.

The proposed geotechnical GIS for Lunar exploration will incorporate the following proposed datasets but is not limited to those.

Envisaged Data layers required for Lunar exploration.

- Slope angle
- Slope aspect
- Surface roughness
- Geology
- Geotechnical properties
- Boulder size
- Etc

Using these data layers in combination and posing different questions could help in the finding of resources whilst also contributing to the best (most cost-effective) path of travel to choose. In effect a maneuverability map will be the end result. Input from on-board monitoring equipment such as stereo cameras and others would be crucial to make on the spot decisions either automatically or by relaying information back to earth to mission control.

Special areas of interest that need investigation.

As there is a strong possibility of finding water-ice or conditions conducive to the formation of water-ice on some areas in permanent shadow it would be important during the design of the GIS to allow for friction coefficients such as slippery areas, mushy areas, etc in permanent shadowed areas. This factor, combined with slope angle could play a significant role during the investigation of the South Pole Aitken Basin, an area of interest and probably first area for future investigation.

Some questions that may need answering.

- What have been done so far ?
- What methods did not work ?
- What do we know ?
- What do we need to know ?
- What don't we know ?
- What can be determined/measured from earth ?
- What needs to be determined on the moon or near-surface ?
- Is earth-based methodologies appropriate at all ?
- Is earth-based planning approaches relevant ?

Proposal:

It is proposed that a Geotechnical based GIS be developed for use during exploration of the Lunar surface to be utilized both during unmanned missions and manned missions to the moon.

As some of the data required will only become apparent during actual field excursions, a methodology to update decision making should be developed and implemented in the final version of the GIS.

References:

[1] Croukamp L. (1996): Unpublished MSc thesis *A Geotechnical GIS for use by Engineering Geologists*, Univ. Of Pretoria.