Celestial Mapping System for Lunar Surface Mapping and Analytics

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ASTRACT: Celestial Mapping System (CMS) is a software platform to generate virtual 3D globe for celestial bodies within our solar system. Various layers are built on top of the virtual globe to provide visualization of high resolution imagery, enable precise measurements, build analytical capabilities and broad range of functionalities to assist planetary scientists and mission planners. CMS is built using OpenJDK 11 and will run on a wide variety of platforms such as Linux, Windows, OSX, etc. It has a thick client with less overhead to access hardware resources. This allows features such as terrain profiling and distance calculations to be performed on the client and on the fly.

The present focus of CMS is on developing lunar mapping tool kits to provide features such as - 3D first person view with zoom and navigational capabilities, realistic terrain visualization based on LRO data, measurement tools, Apollo landing site annotations, stereoscopic view, elevation profiles, line of sight analysis and many more. The application is developed to provide situational and domain awareness on Lunar surface, planning capabilities for equipment placements and traverse path optimization. As data becomes available, CMS has the capabilities to integrate data sets that change dynamically in real-time, which will be useful for monitoring satellites and remotely-sensed data on Lunar surface.

CMS utilizes NASA WorldWind Java library and OpenGL to achieve high-performance rendering of data and measurements, and also adheres to OGC standards. CMS supports importing synthetic features in a variety of 3D, 2D, vector and raster formats. Nomenclature is pulled from USGS Moon IAU2000 database, and lunar parameters are based of the standardized IAU2000 Moon ellipsoid. GDAL (Geospatial Data Abstraction Library) was used to modify and test the accuracy of datasets before integrating into the application. Our high-resolution global elevation model was compared with the LRO LOLA DEM elevation values and tested to ensure accuracy.

Celestial Mapping System has several potential use cases for NASA including subsurface lava tubes visualization and analysis, soil analysis, resource visualization and representation on 3D globe.