Tiled WMS/KML Server V2

NASA's Jet Propulsion Laboratory, Pasadena, California

This software is a higher-performance implementation of tiled WMS, with integral support for KML and time-varying data. This software is compliant with the Open Geospatial WMS standard, and supports KML natively as a WMS return type, including support for the time attribute. Regionated KML wrappers are generated that match the existing tiled WMS dataset. Ping and JPG formats are supported, and the software is implemented as an Apache 2.0 module that supports a threading execution model that is capable of supporting very high request rates.

The module intercepts and responds to WMS requests that match certain patterns and returns the existing tiles. If a KML format that matches an existing pyramid and tile dataset is requested, regionated KML is generated and returned to the requesting application. In addition, KML requests that do not match the existing tile datasets generate a KML response that includes the corresponding JPG WMS request, effectively adding KML support to a backing WMS server.

This work was done by Lucian Plesea of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-47308.

CometQuest: A Rosetta Adventure

NASA's Jet Propulsion Laboratory, Pasadena, California

CometQuest is an educational Apple iPhone game outlining the Rosetta mission to comet Churyumov-Gerasimenko. Its goal is to provide an enjoyable means to learn about the Rosetta mission through action gameplay where the player takes the role of Rosetta's mission operator and tries to capture and record as much science data as possible. It offers a multiple-choice quiz-type learning experience in which the player is asked to answer questions about the Rosetta mission and comets in general. The answers to all the questions are included in the app's "Learn more" section.

CometQuest would become one of few NASA educational games available on the iPhone and iPad platforms, including the first educational NASA game optimized for iPad. The app is a specialized outreach tool for the Rosetta mission, enabling NASA to disseminate information and appreciation of its value to the public in a medium otherwise unavailable.

This work was done by Nancy J. Leon, Diane K. Fisher, Alexander Novati, Artur B. Chmielewski, Austin J. Fitzpatrick, and Andrea Angrum of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48582.

Dig Hazard Assessment Using a Stereo Pair of Cameras

A lander can autonomously determine the areas within its robotic arm's workspace that have the least risk for digging hazards.

NASA's Jet Propulsion Laboratory, Pasadena, California

This software evaluates the terrain within reach of a lander's robotic arm for dig hazards using a stereo pair of cameras that are part of the lander's sensor system. A relative level of risk is calculated for a set of dig sectors. There are two versions of this software; one is designed to run onboard a lander as part of the flight software, and the other runs on a PC under Linux as a ground tool that produces the same results generated on the lander, given stereo images acquired by the lander and downlinked to Earth.

Onboard dig hazard assessment is accomplished by executing a workspace panorama command sequence. This sequence acquires a set of stereo pairs of images of the terrain the arm can reach, generates a set of candidate dig sectors, and assesses the dig hazard of each candidate dig sector.

The 3D perimeter points of candidate dig sectors are generated using configurable parameters. A 3D reconstruction of the terrain in front of the lander is generated using a set of stereo images acquired from the mast cameras. The 3D reconstruction is used to evaluate the dig "goodness" of each candidate dig sector based on a set of eight metrics. The eight metrics are:

1. The maximum change in elevation in each sector,
2. The elevation standard deviation in each sector,
3. The forward tilt of each sector with respect to the payload frame,
4. The side tilt of each sector with respect to the payload frame,
5. The maximum size of missing data regions in each sector,
6. The percentage of a sector that has missing data,
7. The roughness of each sector, and
8. Monochrome intensity standard deviation of each sector.

Each of the eight metrics forms a goodness image layer where the goodness value of each sector ranges from 0 to 1. Goodness values of 0 and 1 correspond to high and low risk, respectively. For each dig sector, the eight goodness values are merged by selecting the lowest one. Including the merged goodness image layer, there are nine goodness image layers for each stereo pair of mast images.

There are three modes of operation for the ground tool version of the software: