Processing LiDAR Data To Predict Natural Hazards

Stennis Space Center, Mississippi

ELF-Base and ELF-Hazards (wherein "ELF" signifies "Extract LiDAR Features" and "LiDAR" signifies "light detection and ranging") are developmental software modules for processing remote-sensing LiDAR data to identify past natural hazards (principally, landslides) and predict future ones. ELF-Base processes raw LiDAR data, including LiDAR intensity data that are often ignored in other software, to create digital terrain models (DTMs) and digital feature models (DFMs) with sub-meter accuracy.

ELF-Hazards fuses raw LiDAR data, data from multispectral and hyperspectral optical images, and DTMs and DFMs generated by ELF-Base to generate hazard risk maps. Advanced algorithms in these software modules include line-enhancement and edge-detection algorithms, surface-characterization algorithms, and algorithms that implement innovative data-fusion techniques. The line-extraction and edge-detection algorithms enable users to locate such features as faults and landslide headwall scarps.

Also implemented in this software are improved methodologies for identification and mapping of past landslide events by use of (1) accurate, ELF-derived surface characterizations and (2) three LiDAR/optical-data-fusion techniques: post-classification data fusion, maximum-likelihood estimation modeling, and hierarchical within-class discrimination. This software is expected to enable faster, more accurate forecasting of natural hazards than has previously been possible.

This program was written by Ian Fairweather and Robert Crabtree of HyPerspectives Inc. and Stacey Hager of Yellowstone Ecological Research Center for Stennis Space Center.

Inquiries concerning rights for its commercial use should be addressed to:

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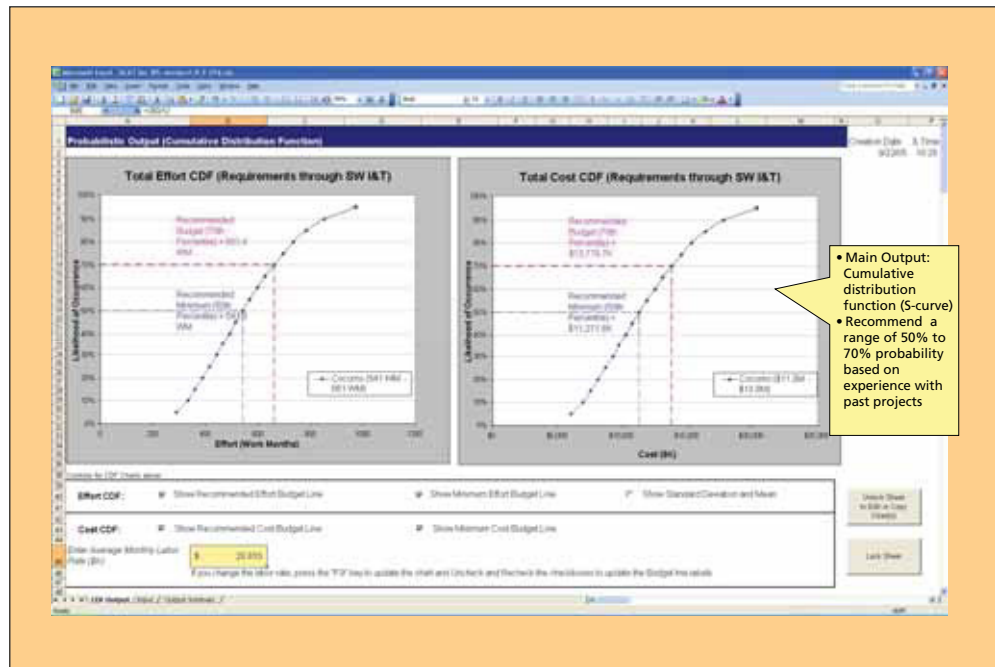*Phone No.: (406) 556-9880*

Refer to SSC-00279, volume and number of this NASA Tech Briefs *issue, and the page number.*

Estimating Software-Development Costs With Greater Accuracy

NASA's Jet Propulsion Laboratory, Pasadena, California

COCOMOST is a computer program for use in estimating software development costs. The goal in the development of COCOMOST was to increase estimation accuracy in three ways: (1) develop a set of sensitivity software tools that return not only estimates of costs but also the estimation error; (2) using the sensitivity software tools, precisely define the quantities of data needed to adequately tune cost estimation models; and (3) build a repository of software-cost-estimation information that NASA managers can retrieve to improve the estimates of costs of developing software for their project (see figure).

COCOMOST implements a methodology, called "2cee," in which a unique combination of well-known pre-existing data-mining and software-development-effort-estimation techniques are used to increase the accuracy of estimates. COCOMOST utilizes multiple models to analyze historical data pertaining to software-development projects and performs an exhaustive data-mining search over the space of model parameters to improve the performances of effort-estimation models. Thus, it is possible to both calibrate and generate estimates at the same time. COCOMOST is written in the C language for execution in the UNIX operating system.

This program was written by Tim Menzies and Dan Baker of West Virginia University and Jairus Hihn and Karen Lum 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 Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44858.

Example Model Output