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## Automated Vectorization of Decision-Based Algorithms

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Virtually all existing vectorization algorithms are designed to only analyze the numeric properties of an algorithm and distribute those elements across multiple processors. This advances the state of the practice because it is the only known system, at the time of this reporting, that takes high-level statements and analyzes them for their decision properties and converts them to a form that allows them to automatically be executed in parallel.

The software takes a high-level source program that describes a complex decision-based condition and rewrites it as a disjunctive set of component Boolean relations that can then be executed in parallel. This is important because parallel architectures are becoming more commonplace in conventional systems and they have always been present in NASA flight systems. This technology allows one to take existing condition-based

code and automatically vectorize it so it naturally decomposes across parallel architectures.

*This program was written by Mark James 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-42524.*

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## Grayscale Optical Correlator Workbench

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Grayscale Optical Correlator Workbench (GOCWB) is a computer program for use in automatic target recognition (ATR). GOCWB performs ATR with an accurate simulation of a hardware grayscale optical correlator (GOC). This simulation is performed to test filters that are created in GOCWB. Thus, GOCWB can be used as a stand-alone ATR software tool or in combination with GOC hardware for building (target training), testing, and optimization of filters. The software is divided into three main parts, denoted filter, testing, and

training. The training part is used for assembling training images as input to a filter. The filter part is used for combining training images into a filter and optimizing that filter. The testing part is used for testing new filters and for general simulation of GOC output. The current version of GOCWB relies on the mathematical software tools from MATLAB binaries for performing matrix operations and fast Fourier transforms. Optimization of filters is based on an algorithm, known as OT-MACH, in which variables specified by the user are para-

meterized and the best filter is selected on the basis of an average result for correct identification of targets in multiple test images.

*This program was written by Jay Hanan, Hanying Zhou, and Tien-Hsin Chao of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).*

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## "One-Stop Shopping" for Ocean Remote-Sensing and Model Data

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OurOcean Portal 2.0 (<http://ocean.jpl.nasa.gov>) is a software system designed to enable users to easily gain access to ocean observation data, both remote-sensing and *in-situ*, configure and run an Ocean Model with observation data assimilated on a remote computer, and visualize both the observation data and the model outputs. At present, the observation data and models focus on the California coastal regions and Prince William Sound in Alaska. This system can be used to perform both real-time and retrospective analyses of remote-sensing data and model outputs. OurOcean Portal 2.0 incorporates state-of-the-art information technologies (IT) such as MySQL database, Java Web Server (Apache/Tomcat), Live Access Server (LAS), interactive graphics with Java Applet at the Client site and MatLab/GMT at the server site, and distributed comput-

ing. OurOcean currently serves over 20 real-time or historical ocean data products. The data are served in pre-generated plots or their native data format. For some of the datasets, users can choose different plotting parameters and produce customized graphics. OurOcean also serves 3D Ocean Model outputs generated by ROMS (Regional Ocean Model System) using LAS. The Live Access Server (LAS) software, developed by the Pacific Marine Environmental Laboratory (PMEL) of the National Oceanic and Atmospheric Administration (NOAA), is a configurable Web-server program designed to provide flexible access to geo-referenced scientific data. The model output can be views as plots in horizontal slices, depth profiles or time sequences, or can be downloaded as raw data in different data formats, such as NetCDF, ASCII, Binary, etc. The interactive

visualization is provided by graphic software, Ferret, also developed by PMEL. In addition, OurOcean allows users with minimal computing resources to configure and run an Ocean Model with data assimilation on a remote computer. Users may select the forcing input, the data to be assimilated, the simulation period, and the output variables and submit the model to run on a backend parallel computer. When the run is complete, the output will be added to the LAS server for user to retrieve and examine the results.

*This program was written by P. Peggy Li, Quoc Vu, and Yi Chao of Caltech, and Zhijin Li and Jei-Kook Choi of Raytheon for NASA's Jet Propulsion Laboratory.*

*This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-41761.*