mapped landmarks generated per image allow for automatic detection and elimination of bad matches. Atti-
tude and position can be generated from each image; this image-based atti-
tude measurement can be used by the onboard navigation filter to improve the attitude estimate, which will im-
prove the position estimates.

The algorithm uses normalized cor-
relation of grayscale images, producing
precise, sub-pixel images. The algo-
rithm has been broken into two sub-al-
gorithms: (1) FFT Map Matching (see figure), which matches a single large template by correlation in the fre-
quency domain, and (2) Mapped Land-
mark Refinement, which matches many small templates by correlation in the spatial domain. Each relies on feature
selection, the homography transform, and 3D image correlation. The algo-
rithm is implemented in C++ and is
rated at Technology Readiness Level
(TRL) 4.

This work was done by Andrew Johnson, Adnan Ansar, and Larry Matthews of Caltech for NASA's Jet Propulsion Laboratory. Fur-
ther information is contained in a TSP (see page 1).

The software used in this innovation is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44463.

WMAP C&DH Software

Goddard Space Flight Center, Greenbelt, Maryland

The command-and-data-handling
(C&DH) software of the Wilkinson Mi-
crowave Anisotropy Probe (WMAP)
spacecraft functions as the sole inter-
face between (1) the spacecraft and its
instrument subsystem and (2) ground
operations equipment. This software in-
cludes a command-decoding-and-distrib-
tution system, a telemetry/data-hand-
dling system, and a data-storage-and-playback system. This software performs onboard processing of attitude sensor data and generates
commands for attitude-control actuators in a closed-loop fashion. It also processes stored commands and moni-
tors health and safety functions for the
craft and its instrument subsys-
tems. The basic functionality of this soft-
ware is the same of that of the older
C&DH software of the Rossi X-Ray Tim-
ing Explorer (RXTE) spacecraft, the
main difference being the addition of the attitude-control functionality. Pre-
viously, the C&DH and attitude-control computations were performed by differ-
ent processors because a single RXTE
processor did not have enough process-
ing power. The WMAP spacecraft in-
cludes a more-powerful processor capa-
bale of performing both computations.

This program was written by Alan Cud-
more, Tim Leath, Art Ferrer, Todd Miller,
Mark Walters, Bruce Savalkin, and Ji-Wei
Wu of Goddard Space Flight Center; Steve
Siegel of Goddard Space Flight Center; Steve
Siegmund of Litton/PRC. Further information is contained in a TSP (see page 1).
GSC-14964-1

Web-Based Environment for Maintaining Legacy Software

Lyndon B. Johnson Space Center, Houston, Texas

“Advanced Tool Integration Envi-
ronment” ("ATIE") is the name of both a software system and a Web-based envi-
ronment created by the system for main-
taining an archive of legacy software and expertise involved in developing the legacy software. ATIE can also be used in
modifying legacy software and develop-
ing new software. The information that
can be encapsulated in ATIE includes experts’ documentation, input and output data of tests cases, source code, and
compilation scripts. All of this informa-
tion is available within a common envi-
ronment and retained in a database for
case of access and recovery by use of
powerful search engines. ATIE also ac-
commodates the embedment of sup-
porting software that users require for
their work, and even enables access to
supporting commercial-off-the-shelf
(COTS) software within the flow of the
experts’ work.

The flow of work can be captured by
saving the sequence of computer pro-
grams that the expert uses. A user gains
access to ATIE via a Web browser. A modern Web-based graphical user inter-
face promotes efficiency in the retrieval,
execution, and modification of legacy
code. Thus, ATIE saves time and money in the support of new and pre-existing
programs.

This program was written by Michael
Tigges of Johnson Space Center; Nelson
Thompson, Mark Orr, and Richard Fox of
Dynacs, Inc.; and Rich Rohan of Lockheed
Martin Corp. Further information is con-
tained in a TSP (see page 1). MSC-23810-1

Information Metacatalog for a Grid

Ames Research Center, Moffett Field, California

SWIM is a Software Information
Metacatalog that gathers detailed in-
formation about the software compo-
nents and packages installed on a grid
resource. Information is currently
gathered for Executable and Linking
modules for extracting software informa-
tion from a system, an XML schema
defining the format of data that can be
added by users, and a POUR XML
configuration file that describes how
these elements are used to generate pe-