

High Accuracy Registration Technique (HART)

HART, developed by BAE Systems, is an innovative product suite for automatic image registration.

The process of mapping, targeting, and sensor fusion continues to explode in its requirements for accurately registered images. Many different sensors are available, but accuracy for exploitation is often lacking. HART fixes this problem automatically, by registering inaccurate images to accurate ones. This immediately facilitates accurate mapping, targeting, and sensor fusion.

The HART Method

HART uses a combination of edge based image understanding and photogrammetry to automatically extract and match conjugate features between different overlapping images. Once common features have been identified a unique weighted least squares bundle adjustment package improves sensor geo-location information to support exploitation. The output adjusted sensor models are required to support targeting, mapping, or other fusion based applications such as change detection.

Multi-Sensor, Multi-Modal

Images may be registered, which vary in modality (such as SAR to EO), time of year, resolution, and obliquity. Images may also vary in sensor-type such as satellite, aerial, pushbroom, frame, whiskbroom, etc.

Batch Processing

The HART process can be run in batch mode to automatically register and update sensor model parameters and error parameters.

DPPDB

HART can automatically register images to reference imagery such as NGA's Digital Point Positioning Data Base (DPPDB). DPPDB source selection and error propagation is included.

Outputs

HART produces several outputs allowing downstream processing to continue.

- Updated sensor model support and error data
- Updated NITF images with RPC sensor models
- Self health check diagnostics (In testing)
- SOCET SET® compatible RPC support files

FEATURES

Multi-Sensor/Cross Sensor Fusion

Completely autonomous

Supports NTM, tactical, and commercial Sensors

Multi-threaded

Sensor Model error propagation

Photogrammetric bundle adjustment

Support for terrain assisted image matching

Developer's API

RPC fitting and file conversions

Image Reduced Resolution Data Set (RRDS) generation

Ground accuracy estimation for tie points

Matching precision typically 1-2 pixels

Replacement Sensor Model generation in work

New tactical sensor's in testing

Supports use of DTED 0,1,2, etc. for elevation estimation

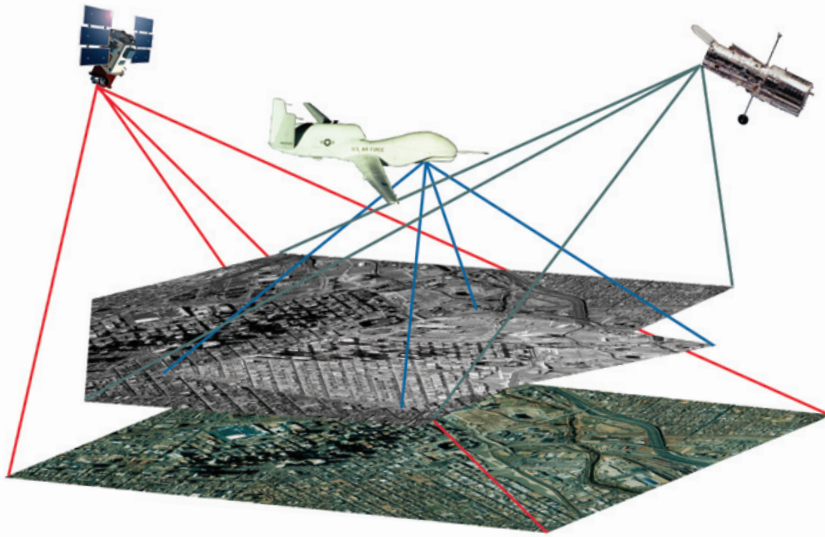


HART SUPPORTS AUTOMATIC REGISTRATION WITH A VARIETY OF SENSORS

Sensors currently available

Sensor Model Type	Import	Notes/Comments
NTM (multiple types)	Capability supported	NITF, TFRD 4.3
Predator EO/IR	Special custom import required	In testing
ASARS-2	Capability supported	
Globalhawk SAR spotlight mode	Capability supported	
DPPDB	Capability supported	Special control point and accuracy generation
Quickbird PAN	SOCET SET used on import	In testing
Commercial Frame	SOCET SET used on import	In testing

N-Way, Multisensor, Image-to-Image Registration



HART User's Kit

The HART user kit consists of several executables such as:

- HART Core registration
- Source Selection to identify suitable reference imagery
- Image ingestion

HART Developer's Kit

HART has a developer's API of C++ library functions allowing user's to customize and wrap HART functions into specific automated processing functions.

Performance

HART's speed is highly variable depending on image size, search uncertainty, number of images, and other factors. Run times of 1 to 10 minutes per image are common. Typical match point precisions are in the 1-2 pixel range.

Hardware/Software

HART v2.6.1 is currently supported on SUN Solaris 2.6, 2.7, 2.8 and is currently in beta for Solaris 2.9. Other operating systems may be available depending on the business case.

Technology Readiness Level (TRL) 8

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