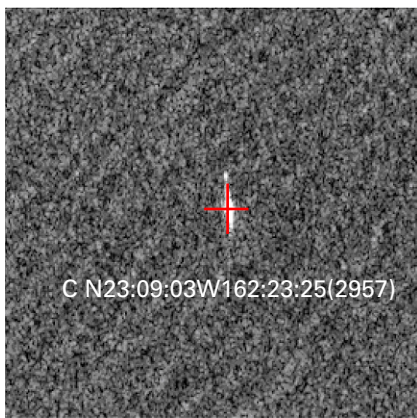


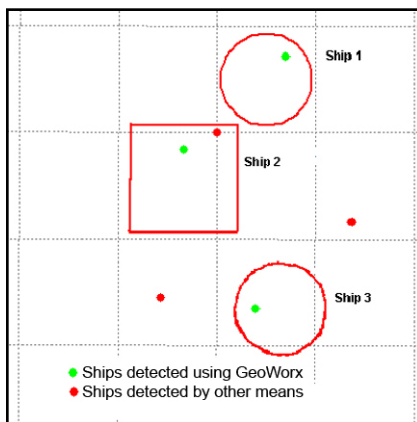
GeoWorx™

Image Processing Solutions

Ship Detection Module



Automated Ship Detection



Comparison of Detections



GeoWorx™ is a suite of image processing software applications that focuses on high-throughput production of orthorectified images from multiple commercial satellite sources. GeoWorx is a licensed commercial-off-the-shelf product and it has been integrated as the main image processing engine in a number of commercial and Government image processing systems in the United States and abroad. GeoWorx allows you to take full advantage of the high computing power of the Unix-based Solaris operating system on SPARC or x86 platforms.

Ship Detection

The GeoWorx Ship Detection Module builds upon the standard GeoWorx software applications to provide automated ship detection from commercial radar satellites. The end product is a list of detections, including latitude, longitude, potential heading, a coarse estimate of size, and strength-of-return used to differentiate between positive and false detections. The detections can also be displayed in the GeoWorx suite with detections highlighted for operator review.

Ship Detection Demonstration

In one field demonstration, results from the ship detection algorithm (green dots in the figure on the left) were compared to known ship location accuracy polygons (red circles and squares) and current Radio Frequency (RF) ship detection methods (red dots). The superior location accuracy of the GeoWorx ship detection algorithms was shown by locating all three known ships within their required area of operation. The alternative RF-detection method mis-located all three ships (the red dot within the square is actually ship 1). The alternative RF method can only detect ships that are broadcasting some type of signal. The GeoWorx Ship Detection Module is able to detect ships whether or not the ships are actively transmitting signals.

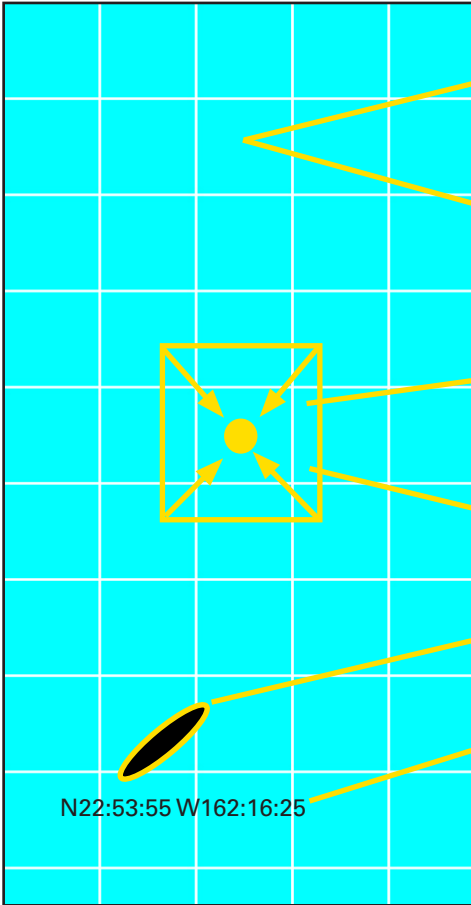
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Ship Detection Algorithm



- Mask out land
- Calculate local estimates of background ocean for image block ignoring small, bright responses
- Index a look-up table to find a threshold that achieves a given false alarm rate
- Bi-linear interpolation of statistics to threshold from the center of the image block
- Flag pixels above the threshold as ship detection
- Combine flagged pixels into a single target
- Use satellite ephemeris to approximate ship location
- Generate report
- Operator review of ship detections

Processed image scn3_6Dec06.img
 Pixel size is 12.500 meters
 Background size is 3750 meters
 Maximum target size is 375 meters
 Angle measured in degrees clockwise from north
 Distance in meters
 Scene angle is -99.7749

Item	Row	Col	Lat (DMS)	Lon (DMS)	Angle	Length	Width	Strength	Rating
1	7460	6376	N22:53:55	W162:16:25	91.921	125.5	74.9	4545	1
2	5592	5040	N23:08:03	W162:23.25	165.446	356.1	79.5	2957	1
3	4017	6267	N23:16:57	W162:12:23	83.147	94.6	26.2	486	1
4	5605	5041	N23:07:58	W162:23:25	142.285	69.1	28.8	442	4

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