

## Goforth Scientific releases new software to improve registration of Multispectral UAS Imagery

Press Release  
August 14, 2011

Leesburg, VA – **Goforth Scientific, Inc (GSI)** has developed new software that automatically registers bands in multispectral imagery collected from a UAS (Unmanned Aircraft System). GSI provided software to researchers at the New Mexico State University working on The Jornada project a new way to improve registration in multispectral imagery that is fully automated and processes 5-times faster than previous methods that outputs a uniformly registered multispectral image. This significantly improves spectral analyses and accuracy for land vegetation classification mapping from multispectral images. Researchers were impressed with the alignment results that provided a significant improvement from the manual tie-point registration and polynomial method used previously.

The Jornada project uses imagery from UAS platforms as one source of data for land cover assessment. The UAS has become an important new robotic technology in the past decade for both surveillance and civil applications that provides timely and unique overhead images of the Earth for mapping and GIS applications. The multispectral camera used on the UAS for The Jornada research is a Mini MCA built by Tetracam [http://www.tetracam.com/mca\\_mini.html](http://www.tetracam.com/mca_mini.html). The multispectral imagery has 6 bands with 10-bit dynamic range and 13 cm ground resolution.

The new GSI software assessed the original multispectral imagery from the camera to have significant mis-registration between bands and variable within each image up to 12 pixels (see example quiver plot). This mis-registration between multispectral image bands introduces errors in the spectral analysis used to determine land classification. In the past, the researchers were required to determine the registration correction manually using tie-points and estimate the correction using a polynomial function. Then, application of that correction took 8 sec per image band and would take more than 8 hours to process an entire UAS image collection campaign, which typically has 100-700 images with 6 multispectral bands per image.

This new registration software from GSI automatically derives the mis-registration and applies the correction 5 times faster yielding a significantly improved result since it is not limited to manual estimates. The corrected imagery is estimated to have approximately 0.5 pixel of mis-registration across all images and bands. By visual inspection, the output imagery contained no mis-registered regions (see example of image comparison).

This new GSI software works in batch mode to process an entire UAS collection campaign in less than 2 hours. The software automatically determines the mis-registration between multispectral bands and applies the correction in a batch mode using parallel processing by using all available CPU cores and takes approximately 1.6 seconds per image band.

To further refine the accuracy of the registration, the software derives a highly precise registration correction estimate by using the estimated mis-registration for all the images in the campaign and averaging the registration assessment across many images. The registration correction supports any variable amount of mis-registration across the image (see example quiver plot). In batch mode, the entire registration process of estimation and correction is fully automated.

Software versions are available for Windows XP and Windows 7, both 32-bit and 64-bit operating systems. The software can be used on multispectral images from other sensors and platforms.

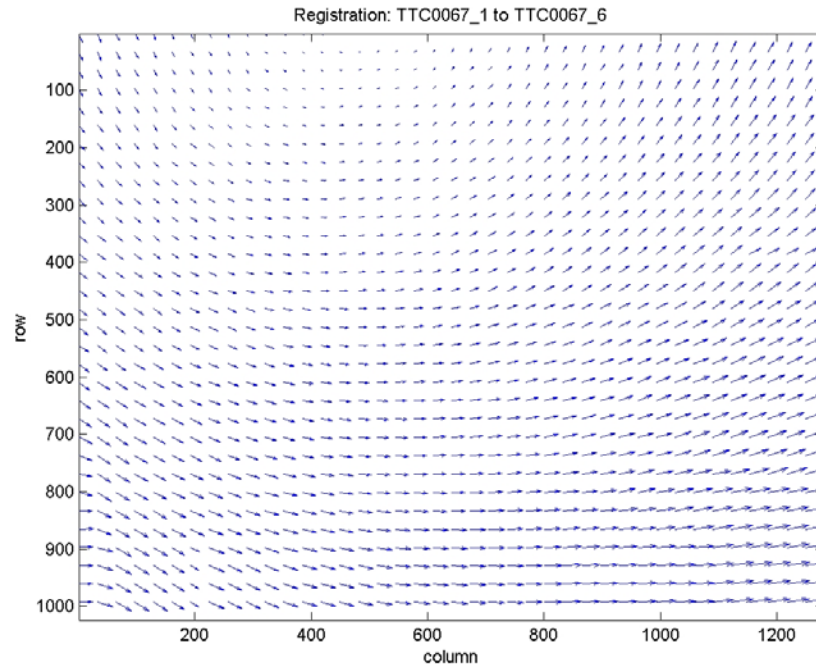
Dr. Mark Goforth is the developer of the new registration software from GSI, and is collaborating with researchers on The Jornada project to co-author a paper describing the entire UAS workflow from image acquisition, pre-processing, ortho-rectification, mosaicing and classification of vegetation using this imagery.

In 1980, the National Science Foundation (NSF) established a network of sites across the U.S. for long term study of ecological processes over long time periods and across large spaces. One of the original sites of this network of now 26 locations was in the Jornada Basin. The Jornada includes many partners in research and collaboration including: NSF, USDA, BLM, USGS, NOAA National Climate Data Center, and New Mexico State University (where offices are located).

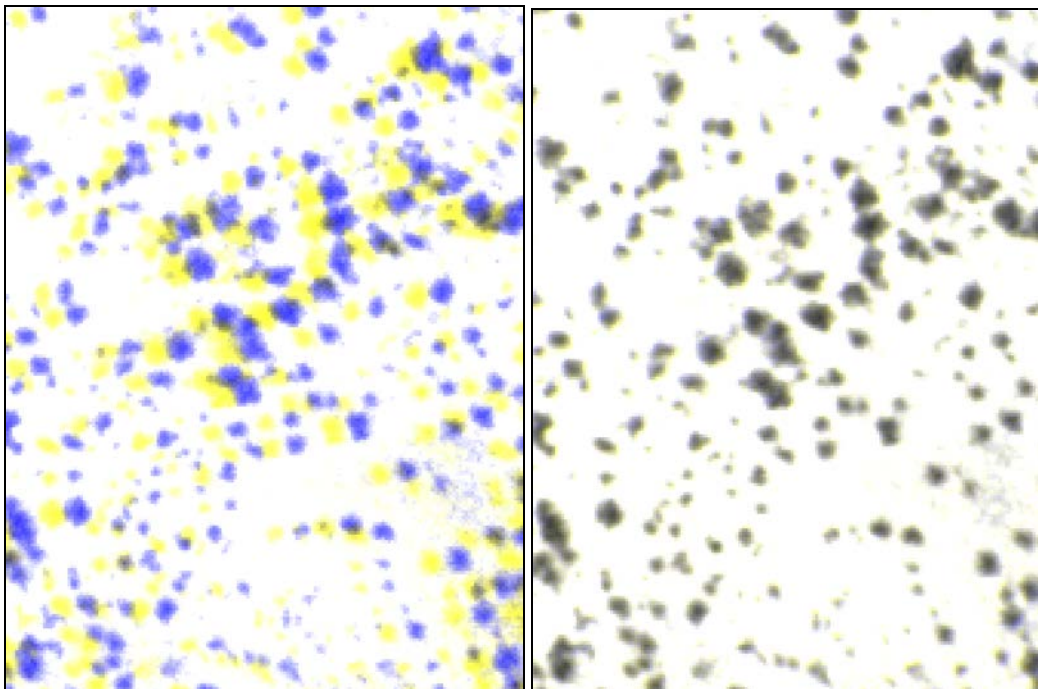
The Jornada has become an international leader in the development of land assessment and monitoring protocols. The Jornada has developed a quantitative monitoring protocol, Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems, that is being applied in the U.S. and at least four countries outside the U.S. The Jornada also co-authored the qualitative assessment protocol, Interpreting Indicators of Rangeland Health, which is being applied globally. For more information about The Jornada, visit it's website <http://jornada.nmsu.edu/>.

For more information about the new multispectral image registration software developed by GSI, visit <http://goforthsci.com/Jornada> or contact Dr. Mark Goforth at [info@goforthsci.com](mailto:info@goforthsci.com)

Goforth Scientific specializes in custom software for scientific applications and advanced algorithms for image processing and remote sensing, GIS analyses, and website development.



*This quiver plot shows the assessment of the mis-registration of the original input image band 1 compared with band 6. The mis-registration varies in direction and amount across the image from 0.4 to 9.6 pixels. The new GSI software automatically generates these plots.*



*These images show the alignment results before (left) and after (right) GSI software has registered the images. After GSI software corrections are applied, there are no visual indications of mis-registration. The images show an overlay of bands 1 (yellow) and 6 (blue). This image is a subset of the lower-left corner of the original image, where of mis-registration is the largest: ~8 pixels in the original image and ~0.5 pixels after registration correction.*