

Processing Technologies for Terrain Visualization

Detailed 3-D Picture Improves Execution of Military Operations

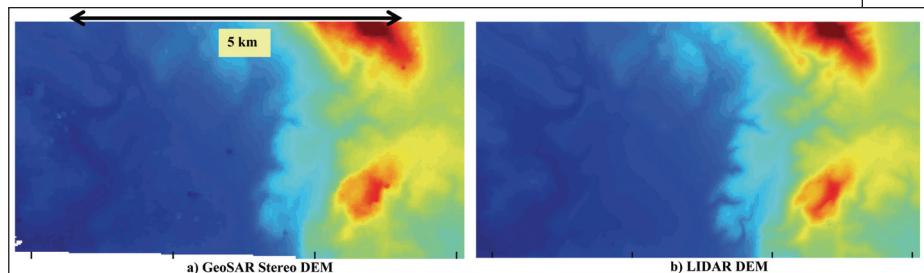


Technology and Innovation

When operating in difficult, unfamiliar terrain, Warfighters would have a tremendous advantage if they could clearly visualize the forest density, topography (especially under foliage), width and location of trails, roads, rivers, structures and fences, and other natural and man-made features. Synthetic Aperture Radar (SAR) is the preferred sensor for providing wide-area, all-weather, day/night, high resolution views of terrain and cultural features.

Under DARPA SBIR and STTR programs, Technology Service Corporation (TSC) has developed improved methods for processing ultra-high frequency (UHF) and microwave SAR data to provide topographic and surface cover maps that show these kinds of details with great accuracy. For example, Digital Terrain Elevation Data (DTED) is being generated with better than Level 2 accuracy (accepted standard from USGS map making) in dense foliage areas using TSC-developed stereo, interferometric and tomographic SAR imaging techniques.

One of TSC's products is a system that employs stereo processing to visualize terrain in three dimensions (3-D). This unique approach uses repeat-pass single-aperture SARs, which are typical of military systems. TSC also created signal processing techniques that produce 3-D tomographic images from circular flight trajectories flown around a target area. This innovative imaging capability was demonstrated using the EarthData



International (EDI) GeoSAR UHF system under DARPA SBIR funding. GeoSAR is a commercially available terrain mapping system that is owned and operated by EDI with TSC's support. With the help of TSC technologies developed under SBIR funding, GeoSAR is producing high resolution maps and radar imagery world-wide, including several regions previously considered inaccessible due to cloud cover and very rugged terrain.

DARPA has incorporated several of TSC's algorithms into its Wide-Area All-Terrain Change Indication and Tomography (WATCH-IT) workstation. WATCH-IT is being used by the US Army Communications-Electronics Research Development and Engineering Center (CERDEC). Other technologies that have been derived from TSC SBIR programs are also being used to support GeoSAR.

TSC's stereo DEMs, which compare favorably with the quality of LIDAR DEMs, can be rapidly generated over wide areas of severe, foliage-covered terrain

Joint Collaborations

Being a part of DARPA's WATCH-IT program involved collaborations with Alphatech (now BAE Systems), Essex (now Northrop Grumman), Vexcel (now Microsoft), Massachusetts Institute of Technology (MIT) Lincoln Laboratory, and the Naval Research Laboratory (NRL). These collaborations were a major

help to TSC in developing practical mapping technologies and gaining operational expertise.

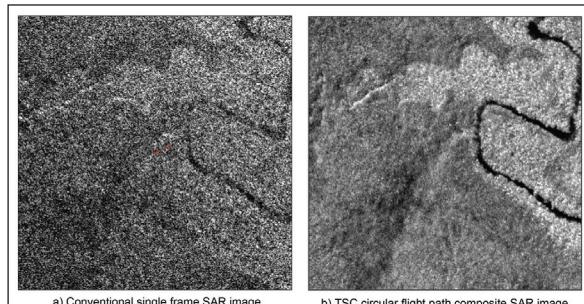
Lessons Learned

- Stay close to the end users so that prototypes and products provide benefits as soon as they are deployed. End user sponsorship is extremely important for SBIR-funded technology developments.
- Don't focus on just R&D during the SBIR program. The SBIR effort can help facilitate communications with military acquisition program managers, which is vital in the difficult process of transitioning technologies.
- Actively market the SBIR-funded technologies directly to the military, their suppliers and support contractors, all of whom have a role in the selection and advancement of system components.

Economic Impact

The WATCH-IT effort led directly to TSC obtaining funding from EDI to develop interferometric processing and digital terrain database generation techniques. They also received funds from DARPA to initiate circular flight path and tomographic imaging technologies. The image registration techniques developed under WATCH-IT led to TSC's obtaining Army contracts in the area of SAR change detection (in which accurate image registration is essential), as well as to contracts from the Air Force in the area of high-dimensional SAR signal processing.

TSC was also awarded a contract from EDI to develop a "System Engineering and Performance Plan for a Backprojection Field Deployable Computer System". This workstation, which will be used by EDI in the field for performing quality assurance and control by generating quick-look imagery products, is expected to reduce the net cost of flight operations and data acquisition. This deployable workstation will also greatly reduce the time between collection and first image output. TSC anticipates that this study could



Composite image has significantly better contrast to enhance image exploitation

result in another contract to implement the field deployable processor.

TSC has won over 140 contracts and received almost \$40 million in revenues from SBIRs since 1993. The SBIR program has also helped TSC expand business beyond the SBIR program, including over \$30 million in non-SBIR DoD and commercial contracts.

As a result, the company has grown from a \$17 million business in 1993 to a \$60 million enterprise in 2006, and has acquired four other companies along the way.

About the Company

Technology Service Corporation is an employee-owned, high-technology company that provides engineering services and specialized products to U.S. Government agencies and private industry. TSC develops and demonstrates sensor and subsystem prototype equipment, and designs and manufactures electronic circuit boards and test devices. TSC also develops and provides computer software for radar positioning, geographic information services, and sensor/system modeling and simulation. ■

Company Information

Technology Service
Corporation
55 Corporate Drive, 3rd
Floor
Trumbull, CT 06611-1377
Phone: 203.268.1249
Fax: 203.452.0260
www.tsc.com

Robert S. Graziano,
President and CEO
Founded: 1966
Number of employees: 330