

SBIR Topic Number:
AF05-011

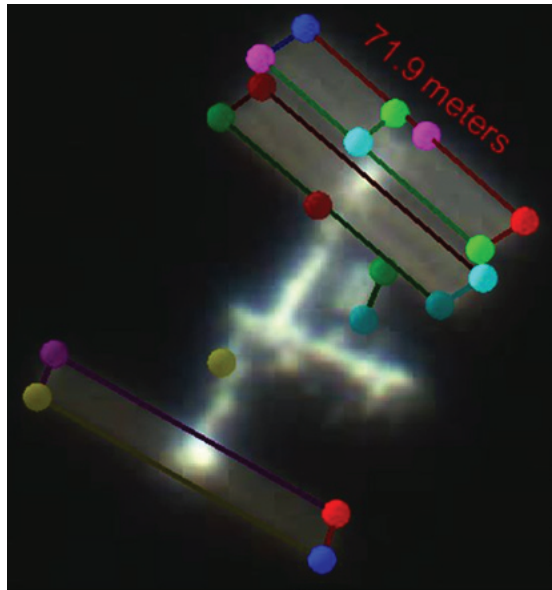
SBIR Title:
Algorithms for Stereo Image Creation from a Sequence of Two-Dimensional Images

Contract Number:
FA9451-06-C-0035

SBIR Company Name:
Stellar Science Ltd Co.,
Albuquerque, NM

Technical Project Office:
AFRL Directed Energy
Directorate, Kirtland AFB,
NM

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.



One SSA-related mensuration test scenario which used imagery Collected by amateur astronomer, Dirk Ewers

	Dist	Res	Rot
Pt# 3	72.9151	72.1393	74.0764
Pt# 4	72.9151	0	7.31353
Pt# 5	72.1393	7.31353	0
Pt# 6	74.0764	14.705	10.2749
Pt# 7	10.2331	71.8424	70.6728
Pt# 8	90.8497	72.8794	69.4179
Pt# 9	94.5747	82.5542	79.1966
Pt# 10	74.2634	92.9603	86.9012
Pt# 11	78.1222	101.104	95.3044
Pt# 12	43.4463	32.8078	33.7136
Pt# 13	40.6639	32.8379	33.5181
Pt# 14	35.5514	41.4441	42.007
Pt# 15	41.6291	35.7132	33.8671

3D Mensuration from Uncalibrated 2D Images

- The Air Force requires a method capable of accurately extracting three-dimensional (3D) measurements from two-dimensional (2D) imagery
- Stellar Science has developed a software prototype tool that computes 3D measurements of satellite geometry from a series of 2D images
- This new capability can outperform the existing Space Situational Awareness (SSA) image mensuration techniques, and Stellar Science is working with the Air Force to transition this technology into operational use
- It is envisioned that these techniques could also be effectively applied within other imaging domains as well, including air to ground imagery

RD09-1360

A

DISTRIBUTION A:
Approved for public
release; distribution
unlimited.

Air Force Requirement

Ground based space surveillance sensors capture not single snapshots, but sequences of images of a satellite as it passes overhead. Due to the satellite's motion (position and orientation) relative to the sensor, the sequence contains numerous, slightly different, views of the satellite.

The Air Force requires a method capable of accurately extracting three-dimensional (3D) measurements from two-dimensional imagery.

SBIR Technology

Stellar Science has developed a software prototype tool that computes 3D measurements of satellite geometry from a series of two-dimensional images. The images may be acquired during a single pass or multiple imaging passes, and need not be calibrated, nor even acquired from the same sensor.

Once an image analyst identifies object features of interest (each in two or more images), the algorithm automatically estimates the 3D position of each feature, modulo a scale factor.

Potential Air Force Application

Stellar Science has tested this multi-frame image mensuration capability using five different telescope-to-satellite imaging scenarios. In total, the tests have yielded 220 measurements with an average error of around 10 inches (roughly 2.5 image pixels). These results indicate that this new capability can outperform the Air Force's existing Space Situational Awareness (SSA) image mensuration techniques, and Stellar Science is working with the Air Force to transition this technology into operational use.

Furthermore, it is envisioned that these techniques could also be effectively applied within other imaging domains as well, including air-to-ground imagery.

Company Impact

"The SBIR program has enabled Stellar Science to conduct research that would have otherwise been overlooked. This research has already proven its value to the Air Force and has jump started two new software product lines within our company," said Dr. Conrad J. Poelman, owner of Stellar Science.

Stellar Science is a computer software company providing leading-edge scientific analysis software for its customers. The firm combines quality object-oriented software development skills with scientific expertise in fields such as 3D modeling and simulation, image processing, scientific visualization, artificial intelligence, and numerical optimization.



SBIR/STTR

Air Force SBIR Program
AFRL/XP
1864 4th Street
Wright-Patterson AFB OH 45433

AF SBIR/STTR Program Manager: Augustine Vu
Website: www.sbirsttrmall.com
Comm: (800) 222-0336
Fax: (937) 255-2219
e-mail: afrl.xppn.dl.sbir.hq@wpafb.af.mil

