Near Real-Time Processing Techniques for Generation of Integrated Data Products
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The Air Force requires more capable methods for real-time processing and integration of multi-band passive imagery, 2D LADAR data and 3D LADAR data. Required products include real-time displays, fused imagery for aided target detection and/or identification, target geo-location, and data compression to facilitate real-time down-linking of imagery. During Phase I of this project, DII examined the AF requirements and developed an architecture for real time processing of multi-sensor data. In addition, DII developed a demonstration application, FlyCastDemo that fused and displayed visible, thermal IR, LADAR intensity imagery with a fused 3D scene.

DII's Approach

DII developed the Multi-View 3D (MV3D) family of software needed to solve those needs. MV3D includes the MV3D C++ Library that provides high performance versions of the image processing and fusion algorithms. MV3D software is designed to benefit from future advances in both computer hardware (multi-core CPU's and high-performance GPU's) and open source software (OpenGL, OpenCV, Python, etc.). MV3D will include over 50 processing modules including: sensor data input, 2D image processing, 2D image fusion, quality metrics evaluations, key-point detection, key-point matching, camera pose calculation, image motion calculation, dropout correction, 3D model generation, 2D-3D image fusion, 3D rendering methods and display controls.

An initial application, FlyCastDemo, was implemented during this project. FlyCastDemo was shown to be able to fuse and display a multi-band, panoramic 3D scene. On this project, fused data includes 3D flash lidar range data, lidar intensity imagery, and visible, near-infrared and thermal infrared camera imagery.

Phase I of the project produced the following:

- Multi-View 3D (MV3D) Architecture Design and Initial Implementation
- The FlyCastDemo, MV3D Real-Time Panoramic View Display Application
- FlyCastDemo was provided to AFRL for evaluation at the end of Phase I
- A Design for a 3D Prototyping and Analysis Environment
- An Initial Library of 2D Image Processing, Fusion and Evaluation Modules

The when completed the MV3D architecture and application software will provide the Air Force with a greatly enhanced ability to utilize 3D sensing capabilities to meet its mission requirements.

DII also plans to license high performance versions of MV3D software to commercial vendors for use in their commercial products.