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TITLE	Methodology and Tools for Aligning Vector and Image Data
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KEYWORDS	Aligning, Vector data, conflation, image registration, invariants, parameter space, image understanding.
ABSTRACT	This research addresses the rising critical need for automated conflation of vector/raster data as more and more high resolution data are collected for updates/improvement of graphic products employed in various mission areas of the Army and other user communities. Our conflation methodology derives from the integration of two well-established conflation approaches, and is developed with a preliminary software design in Phase I. Successful testing using Government data will be followed with a Phase II effort wherein we will complete the conflation system design and produce a prototype ready for deployment as a commercial product. Our approach starts with a deep scientific understanding of the complexities/challenges that characterize the conflation problem. We attack the misalignment issues of nonlinearity, disparate scales, uncontrolled noise, etc., on a first principles basis using rigorous mathematics rather than empirical trial and error adjustments that basically distribute the misalignment rather than attack fundamental causes. In developing our integrated methodology, we will establish the synergism achieved by combining two approaches: use of algebraic algorithms and similarity transformation of local features. We establish three fundamental research hypotheses about these complementing approaches, which will be tested and evaluated in order to provide a technical roadmap toward the optimal conflation solution.
BENEFITS	Our optimal conflation solution is aimed at minimizing human intervention while maximizing automation of the process. We take advantage of preprocessing activities that identify/assess available metadata and prior knowledge about data sets. We initially examine data source differences in resolution, orientation, and feature mismatching, and thereby inform/expedite the subsequent processing steps as tangible economic and efficiency benefits. For example, we

	<p>will early identify those situations where feature matching is not at all feasible and avoid further expenditure of resources for conflating. We understand the Army preferences for a conflation solution that is compatible with available COTS. We will bring to bear our experience in taking geospatial solutions to the commercial markets. We anticipate potential commercial applications in user communities such as the DoD and other Federal agencies as well as in local governments and private sector markets. The conflation problem is persistent and common to users of geospatial data, who employ high resolution imagery to update/improve corresponding map data. We conservatively estimate the potential commercial market in the range of \$55 million to \$165 million annually. This proposed research will leverage more than \$2.5 million already invested in our prior relevant work, thus benefiting the Army's SBIR program.</p>
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