



**NOTICE OF  
UNIVERSITY ORAL**  
GEODESY AND GEOMATICS ENGINEERING  
Master of Science in Engineering

**Pingping Xie**

**April 26, 2004**

**@ 9:00 am**

**Room E11 - Head Hall**

**Board of Examiners:**

**Co-Supervisors:**

**Dr. Yun Zhang, GGE**

**Examining Board:**

**Dr. David Coleman, GGE**

**Dr. Weichang Du, Computer Science**

**Chair:**

**Dr. Susan Nichols, GGE**

**A Web-Based 3D Visualization Prototype System for High-Resolution Satellite  
Colour Stereo Images**

**ABSTRACT**

This thesis presents a Web-based 3D Visualization Prototype System (W3VPS) for high-resolution satellite stereo images. The W3VPS automatically generates 3D colour images using stereoscopic techniques for Web-based applications; it uses IKONOS images as source data, but is capable of using any other form of high-resolution satellite stereo images.

The W3VPS uses a well-established 2D affine orientation model for automatic re-sampling of epipolar images and then forms 3D anaglyph images. The W3VPS does not require rigorous orientation parameters, DTMs, or GCPs as inputs for 3D generation. A new image-matching algorithm is developed for the automatic matching of correspondences. It modifies Zhang's [1995] SM method and includes a new algorithm for eliminating outliers that is based on the regression diagnostic approach. This matching algorithm successfully and efficiently finds a set of correspondences and eliminates the majority of reported correspondence outliers. For refinement of the 3D effect, a new method is developed based on the Quadtree technique. Finally, a one-tier Web client/server architecture is implemented for 3D Web visualization and provides ready access and exchange of files and full functionality to a dispersed user community.

Research results demonstrate the possibility of visualizing a natural environment in colour 3D using high-resolution satellite images and presenting this on the Web through a fast, cost-effective system. Further, the successful implementation of the W3VPS shows that the integration of photogrammetric principles with Web technologies is available for further development of Web-based satellite stereo image applications.