NOTICE OF THESIS PROPOSAL PRESENTATION

Geodesy and Geomatics Engineering

Doctor of Philosophy

Rakesh Mishra

Tuesday, August 23, 2011 @ 2:00 PM
Head Hall – Room E-11

Supervisor:	Dr. Yun Zhang, Geodesy and Geomatics Engineering
Supervisory Committee:	Dr. David Coleman, Geodesy and Geomatics Engineering
	Dr. Julian Meng, Electrical and Computer Engineering
Chair:	Dr. Sue Nichols, Geodesy and Geomatics Engineering

SOFTWARE SYSTEM FOR AUTOMATIC EXTRACTION OF VEHICLE INFORMATION FROM SINGLE PASS HIGH RESOLUTION SATELLITE IMAGERY

ABSTRACT

Increasing volume of already-high traffic loads create new challenges for traffic management and planning. A moving vehicle's information (position, speed, and direction) is a key source of information for traffic planning. Furthermore, vehicle monitoring has applications in security surveillance and military application. Today's road systems are equipped with a suite of sensors for monitoring traffic status, such as induction loops, overhead radar sensors and video sensors. While they all deliver reliable measurements, the results are merely point-based in nature. On the other hand, information provided by remote sensing techniques covers a larger area and thus could often be useful for better understanding the dynamics of the traffic. The high resolution satellite imagery gives a synoptic view of complex traffic situations and the associated context. Furthermore, it allows spatially continuous monitoring of traffic conditions in a large area.

In recent research works, high resolution satellites images have been mainly used to detect vehicles from panchromatic (Pan) imagery which possesses higher resolution than multispectral (MS) imagery. Vehicle detection from Pan images is suitable for counting vehicles and determining traffic congestion. However, position, speed, and direction of vehicles are very important input for traffic planning and management. The recently-launched high resolution satellite, WorldView-2, has three sensors: one Pan and two MS. Because of a slight time gap in acquiring images from these sensors, the WorldView-2 images capture three positions of a moving vehicle. Therefore, theoretically it is possible to determine three ground positions of a moving vehicle from Pan and MS images and then compute its speed. Practically, these calculations are challenging. As the time interval is very low, a small error in calculation of vehicle position will lead to a very high error in speed calculation. Another challenge is the different resolution of Pan and MS images. A few attempts have been made to determine vehicle's information (position, speed and direction) using QuickBird imagery. However, either there is a need to detect vehicle's manually from Pan and MS images or accuracy of determining vehicle's information is quite low.

The goal of this research work is to develop a new technology to extract a vehicle's information (position, speed, and direction) using WorldView-2 imagery. The research work will be accomplished in two stages. The first stage will focus on the development of algorithms to accurately determine a vehicle's information from WorldView-2 imagery through: 1) automatic detection of moving vehicles in Pan and MS images; and 2) calculating vehicles' speed. In the second stage, the developed algorithms will be implemented in a software system using the object-oriented software development methodology. Finally, an accuracy assessment of the results will be undertaken to validate the results.

Faculty Members and Graduate Students are invited to attend the 20 minute presentation