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*Graduate Seminar*  
&  
*Student Technical Conference*



*Tuesday April 15<sup>th</sup>, 2014*

*Department of Geodesy and Geomatics Engineering*

*University of New Brunswick*

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The Department would like to welcome you to the  
Spring 2014 Graduate Seminar & Student Technical Conference

Where:

***Gillin Hall – Room D-108***

When:

***Tuesday, April 15<sup>th</sup> 2014 at 10:00am***

***Department of Geodesy and Geomatics Engineering***

Geodesy and Geomatics Engineering  
**Graduate Seminar and Student Technical Conference**

**Spring 2014**

**Chair:** *Heather McGrath (PhD)*

**Tuesday, April 15<sup>th</sup> 2014 (GD108)**

**10:00**      **Welcome note**

**10:05**      **Military Integration of VGI Technology**

*POJMAN, Vlastimil (MEng)*

**10:25**      **Stereo-based Building Detection in Very High Resolution Satellite Imagery  
using IHS Color System**

*JABARI, Shabnam (PhD)*

**10:45**      **Efficient Method for Registering Stereo-based Elevations with Off-Nadir  
VHR Satellite Imagery**

*SULIMAN, Alaeldin (PhD)*

**11:05**      **FPGA-based Architecture for Real-Time Low-Level Processing of Multiple  
Video Streams**

*GUO, Ge (MScE)*

**11:25**      **Coffee Break**

- 12:00**      **Quality Assessment of Pan-sharpened Color Image in Comparison with 1-chip Bayer Filter Color and 3-chip Color Images in Various Lighting Conditions**  
*ADHAM-KHIABANI, Sina (PhD)*
- 12:20**      **Gaussian Background Modeling Algorithm Enhanced with Noise Reducing in FPGA-Based System for Real-Time Moving Object Detection with Static HD Camera**  
*GUO, Ge (MScE)*
- 12:40**      **A Comparison of Moving Object Detection Methods for Real-Time Moving Object Detection**  
*ROSHAN, Aditya (PhD)*
- 1:00**        **Enhancement of PPP Convergence Time and Positional Accuracy through the Inclusion of Galileo IOV and FOC Satellite Observations**  
*WHITE, Ryan (MScE)*
- 1:20**        **Closing Remarks**

Spring 2014 Graduate Seminar & Student Technical Conference

## **ABSTRACTS**

*Contact the Authors for a copy of the full papers.*

*Department of Geodesy and Geomatics Engineering*



# **Military Integration of VGI Technology**

POJMAN, Vlastimil

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## **Abstract**

During military operations on foreign soil the quality of roads and highways in the field of operations is of primary importance. The transportation of fuel, supplies and troops as well as the patrols performed by allied troops are daily tasks. These generally poorly constructed highways, side roads, bridges and fords are damaged by heavy traffic, weather and enemy forces making it difficult for the allies to effectively travel through the area.

During the most recent mission in Afghanistan, the tracking of the damage was a fragmented function performed by each country or unit making it difficult to obtain information in a unified matter by all users.

To address this issue, Esri ArcGIS, Esri web solutions and the Esri Collector smartphone application were used to create a system of recording, editing and sharing information about the roads and bridges. This combined solution allows for the data to be collected by several sources; phone, SMS, and website amongst others. The app can capture photos and location information and can be uploaded immediately. The final output can be edited and shared in a graphic form with the public or selected groups by controlling access and administrative rights.

# **Stereo-based Building Detection in Very High Resolution Satellite Imagery using IHS Color System**

JABARI, Shabnam

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## **Abstract**

Automatic detection of buildings out of urban objects is not a straightforward task due to the existing spectral and textural similarities. The problem gets even worse in buildings with pitched roofs. Pitched roof buildings receive dissimilar amount of solar radiation on their different faces causing different brightness values for a single roof. Thus, in object based classification methods, each side will probably be assigned to different segments preventing proper building boundary detection. In this study, in order to detect the proper building boundaries through image segmentation, IHS (Intensity, Hue, and Saturation) color system is used. Then, to detect buildings out of the segmented image, elevation information extracted from stereo satellite imagery is benefited. The presented method was tested on GeoEye stereo imagery and 92% of the image buildings were detected precisely.

# **Efficient Method for Registering Stereo-based Elevations with Off-Nadir VHR Satellite Imagery**

SULIMAN, Alaeldin

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## **Abstract**

Registration of optical images with elevation data is important for many applications, such as image classification and building detection. Despite the fact that very high resolution (VHR) satellite images are acquired mostly off-nadir, the use of such images in the previous research works is less common than the nadir ones. This is due to the problem of high relief distortion of above-ground objects, such as buildings, in these off-nadir images. This problem makes the accurate geometric alignment of off-nadir VHR images with orthographic digital surface models (DSMs) almost impossible unless a true orthorectification process is implemented. However, true orthoimages are expensive, time consuming and mostly difficult to achieve. This paper proposes a method for registering the DSM elevations with off-nadir VHR optical imagery by projecting the ground elevations back to the image space using the relevant sensor model information. For economic purposes, DSM elevations are derived using off-nadir VHR stereo images (stereo-based elevations) from which one of the images is then used for the registration. The proposed method was found to be efficient in terms of sub-pixel accuracy of registration and ease of implementation. Additionally, it preserves the original image information which is essential for image segmentation and classification applications.

# **FPGA-based Architecture for Real-Time Low-Level Processing of Multiple Video Streams**

GUO, Ge

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## **Abstract**

The spatial resolution and frame rate of now days' video imaging applications tend to be higher and higher. And in many cases, more than one video stream is involved in an video processing system. Both factors impose challenge on computational power of conventional video processing platform. To deal with this challenge and increase the efficiency of video processing especially for multiple video inputs, in this paper, an FPGA-based architecture for real-time low-level processing of multiple video streams is presented. The purpose of this architecture is to take over the time consuming low-level video/image processing in order to free the resource on a PC platform and accelerate the entire video/image processing chain. A real-time anaglyph video system has been achieved under this architecture and the testing shows that the proposed architecture has the capacity of 1.8GB/s in term of memory bandwidth.

# **Quality Assessment of Pan-sharpened Color Image in Comparison with 1-chip Bayer Filter Color and 3-chip Color Images in Various Lighting Conditions**

ADHAM-KHIABANI, Sina

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## **Abstract**

UNB pan-sharp method has demonstrated its ability in producing high resolution color images by fusing high resolution panchromatic and low resolution multispectral (Color) satellite imagery. Initial research on the security camera systems shows that the concept could be utilized on the earth and for various kinds of imaging and monitoring cameras. Nowadays, 1-chip and 3-chip cameras are widely used to produce color images and videos. These cameras have solid performance in high and normal lighting conditions. However in low lighting conditions, due to narrow spectral bandwidths, the color images turn noisy and less sensitive. Moreover, due to the characteristics of the prisms and filters in these cameras, color distortions can usually be observed especially on the edges of the objects. Furthermore, the quality of color rendering in these images decreases in lower lighting conditions. This research focuses on producing high resolution color images through the security cameras based on the fusion idea noted above. In this paper, different acquired instances under various lighting conditions have been utilized to evaluate the proposed concept. The research proves that pan-sharpening strategy can produce high resolution color images with less noise, smoother edges and better color rendering in comparison with a 1-chip camera system and under the same lighting conditions.

# **Gaussian Background Modeling Algorithm Enhanced with Noise Reducing in FPGA-Based System for Real-Time Moving Object Detection with Static HD Camera**

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## **Abstract**

Moving object detection is the fundamental for many other video processing and analysis algorithms. Real-time MOD is important because it is required by many video applications. Gaussian modeling algorithm is one of the background modeling algorithms that are used for static camera MOD problems. The paper systematically introduces and reinterprets the Gaussian modeling algorithm and propose an FPGA-based MOD system that implements this algorithm and achieves real-time MOD. During the implementation, an issue of noise introduced by the system feature is solved by enhancing the labeling rule with noise reduction technique. Finally, a FPGA-based MOD system that works at 30fps@1280×720p is presented—a real-time MOD solution for HD video.

# **A Comparison of Moving Object Detection Methods for Real-Time Moving Object Detection**

ROSHAN, Aditya

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## **Abstract**

A Moving object detection has a wide variety of applications from traffic monitoring, site monitoring, automatic theft identification, face detection to military surveillance. Many methods have been developed across the globe for moving object detection, but it is very difficult to find one which can work globally in all situations and with different types of videos. The purpose of this paper is to evaluate existing moving object detection methods which can be implemented in software on a desktop or laptop, for real time object detection. There are several moving object detection methods noted in the literature, but few of them are suitable for real time moving object detection. Most of the methods which provide for real time movement are further limited by the number of objects and the scene complexity. This paper evaluates the four most commonly used moving object detection methods as background subtraction technique, Gaussian mixture model, wavelet based and optical flow based methods. The work is based on evaluation of these four moving object detection methods using two (2) different sets of cameras and two (2) different scenes. The moving object detection methods have been implemented using MatLab and results are compared based on completeness of detected objects, noise, light change sensitivity, processing time etc. After comparison, it is observed that optical flow based method took least processing time and successfully detected boundary of moving objects which also implies that it can be implemented for real-time moving object detection.

# **Enhancement of PPP Convergence Time and Positional Accuracy through the Inclusion of Galileo IOV and FOC Satellite Observations**

WHITE, Ryan

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## **Abstract**

With the successful completion of the European Space Agency's (ESA) Galileo In-Orbit Validation (IOV) campaign and the planned launch of several more Full-Operational Capability (FOC) satellites in the coming months, point positioning users will, for the first time, be offered a potential enhancement of performance capabilities through the inclusion of Galileo observables into their existing processing schemes. These observables will perhaps have the greatest impact on the performance of positional accuracies and convergence times in situations where Galileo satellites are located at relatively high elevation angles and the observation of low elevation angle satellites is limited. It is then the goal of this research to modify the University of New Brunswick's (UNB) GPS Analysis and Positioning Software (GAPS) to include the use of Galileo observables into its processing scheme in order to determine the observed impact of the Galileo observables on positional precision and convergence times. Appropriate data will be gathered in a way that reflects a low elevation angle limitation. This data will subsequently be processed in the modified version of GAPS to generate measured accuracies and convergence times that will be compared to those generated by a GPS-only solution. The results of these comparisons should show that the inclusion of Galileo observables into existing processing schemes will increase the accuracy of positional solutions while also decreasing the times required for the convergence of the solutions. If such an enhancement of performance capability is observed, the possible implications would include justification for the further enhancement of other available processing applications to include the use of Galileo observations. Also, as a result of the Galileo observable inclusion, GAPS will become the first freely available online precise point positioning (PPP) service to do so.





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