Monterey Institute of International Studies
A Graduate School of Middlebury College

Graduate School of International Policy & Management

COURSE SYLLABUS – SPRING 2012

WKSH8533A: Geospatial Tools for Nonproliferation Analysis – 1 Credit

2 March 6:00-9:00pm
3 March 9:00am-5:00pm
4 March 9:00am-3:00pm

McGowan MG102

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COURSE DESCRIPTION

This course serves to introduce students to the increasingly important role of overhead reconnaissance and imagery analysis in world affairs, and a basis for a greater appreciation of the potential role of the new, freely available, geospatial tools for nonproliferation applications. We will explore how, together with commercial satellite imagery, these tools can be used to promote "all-source synergy." Foremost among the geospatial tools are the "Digital Virtual Globes" (i.e., GoogleEarth, Bing Maps, SkylineGlobe, etc.) that can provide the basis for 3-D visualization of known and suspected facilities of interest. As additional "open sources," these new geospatial tools have heralded a new era of "global transparency." They can be used to substantially augment existing information gathering techniques, procedures, and analyses involving the remote detection of undeclared facilities, as well as support ongoing monitoring and verification of various international treaty (e.g., NPT, FMCT) relevant activities and programs. Additional information can be derived from "Crowdsourcing" in the form of labels and figures as provided by a "free" cadre of global browsers and/or by knowledgeable locals, hobbyists, and tourists of the surrounding locales useful in identifications, through BLOGS and WIKI virtual globe "layers" (e.g., Wikimapia). The workshop will be equally divided between instructional sessions, using both the lecture and case methods and practical hands-on exercises to enable the student to conduct future independent research.

COURSE OBJECTIVES

Students successfully completing this course will be able to:

- Access and analyze relevant geospatial and visualization information for nonproliferation applications in a timely and efficient manner and learn how to derive new value-added information for future analysis and reporting.

TEXTBOOKS AND OTHER MATERIALS

Recommended Readings and Websites:
1) Frank V. Pabian, "Commercial Satellite Imagery: Another Tool in the Nonproliferation Verification and Monitoring Tool-Kit," chapter 12 in the NUCLEAR SAFEGUARDS, SECURITY AND NONPROLIFERATION textbook, 2008, http://www.elsevier.com/wps/find/bookdescription.cws_home/714662/description#description.

2) Yahya A. Dehqanzada and Ann M. Florini, "Secrets for Sale: How Commercial Satellite Imagery Will Change the World," Carnegie Endowment for International Peace, 2000, http://carnegieendowment.org/files/FINALreport.pdf.

3) Dino A. Brugioni, "The Art and Science of Photoreconnaissance," *Scientific American*, March 1996, pp. 78-85. (available only as a pdf, to be posted electronically) National Public Television (PBS) recently completed a documentary on the role of overhead reconnaissance played in the discovery of advanced weapons systems during World War II, which provides a nice introduction for this topic. Dino Brugioni is commentator in this video as well: http://video.pbs.org/video/2187853726/.

4) Become familiar with the following websites:

National Geospatial Intelligence Agency: www.nga.mil
Institute for Science and International Security: http://isis-online.org/satellite-imagery
IMINT and Analysis: http://geimint.blogspot.com
Digital Globe: http://www.digitalglobe.com/
GeoEye: http://www.geoeye.com/CorpSite/

METHODOLOGY AND POLICIES

This workshop will provide the student with an introduction to the increasingly important role of overhead reconnaissance in world affairs, a brief overview of imagery analysis, and a greater appreciation of the potential role of the new, freely available, geospatial tools for nonproliferation applications, with historical exemplars. As additional "open sources," these new geospatial tools have heralded a new era of "global transparency." They can be used to substantially augment existing information gathering techniques, procedures, and analyses involving the remote detection of undeclared facilities, as well as support ongoing monitoring and verification of various treaty (e.g., NPT, FMCT) relevant activities and programs.

Foremost among the geospatial tools are the "Digital Virtual Globes" (i.e., GoogleEarth, Bing Maps, etc.) that are far better than previously used 2-dimensional plan-view line drawings for visualization of known and suspected facilities of interest. Additional information can be derived from "Crowdsourcing" in the form of labels and figures as provided by a "free" cadre of global browsers and/or by knowledgeable locals, hobbyists, and tourists of the surrounding locales useful in identifications, through BLOGS and WIKI Layers (e.g., Wikimapia). This information is even more powerful when it can be combined as layers on Google Earth and with SketchUp for 3-dimensional visualization.

The workshop will be equally divided between instructional sessions and practical hands-on exercises to enable the student for future independent research.

ACADEMIC CONDUCT

All students will be held to policies and procedures listed in the most current Policies and Standards Manual (PSM). This includes, but is not limited to, our Student Honor Code and regulations on plagiarism. A complete copy of the Policies and Standards Manual (PSM) can be found here: (http://www.miis.edu/media/view/23925/original/policy_and_standards_manual_update.pdf).

REQUIREMENTS AND GRADING

REQUIREMENT: Each student is required to bring a WI-FI Internet enabled laptop to class with the latest versions of both Google Earth and SketchUp already installed. They can be downloaded at these locations respectively: http://www.google.com/intl/en/earth/index.html and http://sketchup.google.com/intl/en/

GRADING: WKSH 8533A is graded on a pass-fail basis. It should be kept in mind, however, that students are expected to be familiar with the reading and participate in class discussions and exercises. Mere attendance is not sufficient to merit a "pass." If anyone anticipates an unavoidable absence for all or part of class on a given day, please discuss this with the instructor, in advance if possible.

SCHEDULE AND WEEKLY ASSIGNMENTS

Presentations:

1) The History of overhead reconnaissance: "From CORONA to Commercial"
2) "Imagery Analysis 101"
3) New Geospatial Tools for Safeguards Applications
4) Review of exemplar cases of creative geospatial "Crowdsourcing" applications for nonproliferation, and within other scientific and social disciplines (e.g., environmental monitoring, disaster relief, meteor crater finds, etc.)

Hands-on student exercises:

1) Basic Imagery analysis quizzes (unclassified as provided by NGA and Australian Agency DIGO on their websites)
2) "Google Earth 101": How to use it and how to use it more effectively with respect to gleaning geo-tagged information from the available Geospatial Information System (GIS) layers
3) "SketchUp modeling 101": student exercise on how to build 3-D models using Google earth commercial satellite imagery together with ground imagery (and making x/y measurements directly, and deriving z (heights) from shadows)
4) Combining both of above in PowerPoint/report graphics to enhance reader/observer visualization and comprehension.

Final Application Team Project:

Exemplar case study of a potential proliferation related facility using the geospatial information tools taught in class.

Wrap-up:

1) Final review on how these applications can be used to best serve the international nonproliferation community
2) Final Q&A session
3) Student Reviews to improve workshop for future participants

Handouts:

1) INMM paper
2) Copies of slides in handout form
3) Textbook Chapter Bibliography and Annexes
4) Original geospatial tools application team project