Minnesota Microscopy Society Newsletter

Local affiliate of Microscopy Society of America
Local affiliate of Microbeam Analysis Society

MMS January 1999 NEWSLETTER

January Meeting

Extracting Objects with Adaptive Segmentation Techniques: Going Beyond Intensity Thresholding

Speaker: Peter Eggleston
Senior Director of Business Development
Amerinex Applied Imaging, Inc.,
409 Main St., Amherst MA 01002

Date: Thursday January 21, 1999

Location: The Pendergast Room, Student Center
St. Paul Campus, University of Minnesota.

Time: 5:00 - 8:00 PM

Program: 5:00 - 6:00 Wine/Cider & Cheese Social
6:00 - 7:00 Dinner
7:00 - 8:00 Talk

Dinner and social hour: $10.00/ person for members. Make reservations by contacting Gib Ahlstrand (612-625-8249; giba@puccini.crl.umn.edu) **on or before** Monday, January 18, 1999.

Abstract

In designing automated systems for interpretation of micrographs, it is often the goal to separate and discern various objects within the image data. After segmentation, measurements of the objects, called features, can then be calculated and used for process or statistical analysis. Simple segmentation schemes based on single threshold operations, often lack the sophistication to deal with intricate or subtle details of the image data, or require user intervention in the threshold selection process. This talk will present and discuss advanced techniques which adapt to the data, and which can operate autonomously without human supervision.

Most image analysis software packages utilize segmentation schemes based on the principle of intensity analysis. These segmentation techniques assume that a significant and constant gray level change occurs

between the objects of interest and the background, and that objects of interest have uniform shading. However, this is most often an erroneous assumption making these techniques fragile, and quite commonly requiring well-controlled conditions or human supervision. Thresholding, based on similarity in intensity[2], is perhaps the most common segmentation technique. The value of the threshold is critical as it sets the discriminating criterion for the segmentation process. Most often, the threshold selection is arrived at by user interaction. An alternative method is to set threshold points at valleys in the histogram of the pixel data. This makes the threshold process more adaptive, and can be used to select multiple threshold points if multiple object classes are desired.[3] However, this method will work only if the objects truly have uniform pixel distributions within the classes, which is often not a valid assumption. Uneven lighting can be extremely detrimental to this thresholding process. Prefiltering techniques, such as low stop filtering, can be used to correct uneven lighting conditions. Alternatively, local pixel neighborhood based threshold selection, rather than image wide threshold selection may be used. Thus, the threshold operator is made adaptive and can account to some degree for changes across the image.[4]

Additionally, various morphological and transform techniques can be used to locate objects of interest through a process of template matching. The premise here is that a high degree of correlation exists between the template and the object being matched.[5] While this process may work well for very regular objects such as manufactured parts, it leaves much to be desired for use in the laboratory environment. In many cases, some objects are touching or overlapping and are therefor segmented into only one object, rather than discrete components. One solution to under-segmentation is to avoid it. For example, region-growing techniques be employed as a segmentation method to deter under-segmentation.[6] A common technique used to dissect regions which are connected is a morphological operation called opening. Morphological opening may be quite fragile and fail if the objects being segmented are of many differing sizes, are irregular in shape, and have holes or perforations within their bodies, but quite often, proper preprocessing can be used to successfully avoid these problems. Region splitting methods based on the watershed or convex segmentation can be successfully employed to break apart objects that have convex shape characteristics. [7]

1. Myler, H.R. and A.R. Weeks, 1993, *The Pocket Handbook of Image Processing Algorithms in C*, 1993 Prentice Hall, , pg. 207.
2. Phillips, D., 1994, *Image Processing in C*, Prentice Hall, pp. 53-72.
3. Kohler, R., 1981, "A Segmentation Technique Based on Thresholding," *Computer Graphics and Image Processing*, vol. 19, pp. 319-338.
4. Myler, H.R. and A.R. Weeks, 1993, *Computer Imaging Recipes in C*, Prentice Hall, pp 399-403
5. Galbiati, Jr., L., 1990, *Machine Vision & Digital Image Processing Fundamentals*, Prentice Hall, pp. 120-6.
6. Levine, M. and S. Shaheen, 1981, "A Modular Computer Vision System for Image Segmentations," *IEEE transactions on Pattern Analysis and Machine Intelligence*, Vol. 3, No. 5, pp. 540-554.
7. *The KBVision™ System Task Reference Manual*, Amerinex Applied Imaging, Inc., 1996, pp. 61-3.

Project Micro

This year we are starting to work with the Science Museum of Minnesota to put on a microscopy class for kids and families. The classes will follow the "Microscopic Exploration" manual. The classes will run on Saturdays from 1-4 PM at the Science Museum. You will need to have had training to use the festival guide, but if you have not had it already we will run a training session prior to the first class.

We will need 4-6 volunteers for each of the following dates:
February 20th - Kids only class; grades 3-6

March 6th - Kids 8-12 with parents
April 24th - Kids only class; grades 3-6

As an added bonus, this years ScienceFest at the Bell Museum is also on Saturday March 6th from 10:00 until 3:00 PM, and we will need additional volunteers for that event. We have a few volunteers at present, but need more. Please consider signing up for these events, in the past those taking part (the kids and the volunteers) have enjoyed them tremendously and we are very much appreciated by these organizations.

Please respond to Stuart McKernan (stuartm@tc.umn.edu or (612) 624-6009) if you can help with any of these sessions.

Membership Database Notice

Since the Twin Cities area codes have now officially changed over, please let us know if your number has changed from 612 to 651, so that we can update our records. Reply to stuartm@tc.umn.edu or (612) 624-6009

MMS February Meeting

Geology of Subeconomic Gold Deposits in the Virginia Horn, Northeastern Minnesota

Speaker: Mark Jirsa, Senior Geologist
Minnesota Geological Survey
2642 University Ave., St. Paul, MN
(jirsa001@tc.umn.edu www.geo.umn.edu/mgs)

Date: Thursday February 18, 1999

Location: Campus Club, Dale Shepard Room
415 Coffman Memorial Union
University of Minnesota, East Bank (see map).

Time: 5:00 - 8:00 PM

Program: 5:00 - 6:00 Wine/Cider & Cheese Social
6:00 - 7:00 Dinner
7:00 - 8:00 Talk

Dinner and social hour: $10.00/ person for members.

Make reservations by contacting Mike Coscio (612-514-1331; mike.coscio@medtronic.com) **on or before** Monday, February 15, 1999

Abstract

Several significant –though presently subeconomic– gold deposits occur within Archean greenstone bedrock in the area known as the Virginia Horn. The area has a long history of gold "shows", dating back to the days of J.W. Gruner and F.F. Grout (Grout, 1937), and some visible gold can still be found locally in altered rocks in and adjacent to quartz veins. Three prospects were worked to varying degrees by exploration companies in the late 1980's, and one of these, the "Viking prospect", was extensively drilled. The exploration focused on pervasively altered felsic porphyry intrusions having variably well developed deformation envelopes and associated carbonate-sericite alteration. Recent mapping and petrographic study by the MGS (Jirsa and others, 1998; Jirsa and Morey, 1999), together with geochemical and microprobe analyses by Peter McSwiggen (U of M–funded in part through the Natural Resources Research Institute) provides further information on the geologic setting, potential sources of Au, and relative timing of mineralization in these prospects and the surrounding area.

Gold is associated with altered felsic porphyries and its country rocks that include a somewhat older assemblage of greenstone bedrock and a younger sequence–the Midway–that contains unusual volcanic and conglomeratic strata. Volcanic conglomerate in the Midway sequence contains clasts of the stratigraphically older greenstone and porphyries; together with clasts of a distinctive hornblende-phyric trachyandesite that is not represented among the older greenstone flows. The trachyandesite occur as flows and pyroclastic units that are interbedded with lenticular deposits of volcanic conglomerate in a manner interpreted to indicate approximately coeval volcanism and fluvial (stream) sedimentation within a linear, restricted, and tectonically active basin. Drill core and outcrop evidence indicates that the Midway sequence unconformably overlies greenstone on one side, and is bounded by a regional-scale, strike-slip fault on the other. Structural analyses show that the Midway sequence was deposited after an early, pre-cleavage folding event (D1) in greenstone, but before the regional metamorphic cleavage-forming D2 deformation. Lithologic and structural attributes are consistent with deposition in a strike-slip, or "pull-apart" basin, similar to those developed along the San Andreas Fault and other wrench fault systems. Alteration and gold mineralization occurred late in the D2 deformation event.

The stratigraphic, structural, and petrographic characteristics of the Midway sequence are similar to those of the Timiskaming Group and other Timiskaming-type rocks in Canada. There, the field relationship between Timiskaming-type strata and country rocks is commonly unclear and geochronologic analysis is required to resolve the temporal framework. However, the Midway sequence is lithologically and structurally very distinct from the subjacent strata. From a mineral deposits prospective, the similarity of the Midway sequence to the Timiskaming Group is important because the latter is associated with major structures along which lie some of the largest lode gold deposits and most productive mines in the world.

REFERENCES

Grout, F.F., 1937, Petrographic study of gold prospects of Minnesota: Economic Geology, v.37, p. 56-68.

Jirsa, M.A., Boerboom, T.J., and Morey, G.B., 1998, Bedrock geologic map of the Virginia Horn, Mesabi Iron Range, St. Louis County, Minnesota: Minnesota Geological Survey Miscellaneous Map M-85 (digitial), scale 1:48,000.

Jirsa, M.A., and Morey, G.B., eds., 1999, Contributions to the geology of the Virginia Horn, Mesabi Iron Range, Minnesota: Minnesota Geological Survey Report of Investigations (in preparation).

March Meeting

8th Annual Metallographic Event

MMS Joint meeting with the American Society of Metals

Speaker: Joseph Sigmund,
SONIX

Topic: Acoustic Microscopy

Date: March 24, 1999

Location: St. Louis Park VFW

Time: 6:00 - 8:30 PM

Program: 6:00 - 6:45 Social Hour.
6:45 - 7:30 Dinner.
7:30 Speaker.

Spring Symposium

Topic: Latest Trends in Microscopy

Date: Thursday, May 13, 1999

Location: Sheraton Midway
I-94 at Hamline Avenue
St. Paul, MN

Upcoming National Events

SCANNING 99

Sponsor: FAMS, Inc. (Foundation for Advances in Medicine and Science) and *SCANNING, The Journal of Scanning Microscopy*

Topic: Acoustic Microscopy

Date: April 11-14, 1999

Location: Hyatt Regency O'Hare at
O'Hare International Airport, Chicago, Illinois.

Contact: Mary K. Sullivan, SCANNING99
Phone: 201-818-1010, www.scanning.org

Microscopy and Microanalysis ‘99

Sponsor: Microscopy Society of America
Microbeam Analysis Society

Date: August 1-5, 1999

Location: Portland, OR

Abstract Deadline: August 15th

Contact: http://www.msa.microscopy.com