# SOLSTICE: An Electronic Journal of Geography and Mathematics.

(Major articles are refereed; full electronic archives available).

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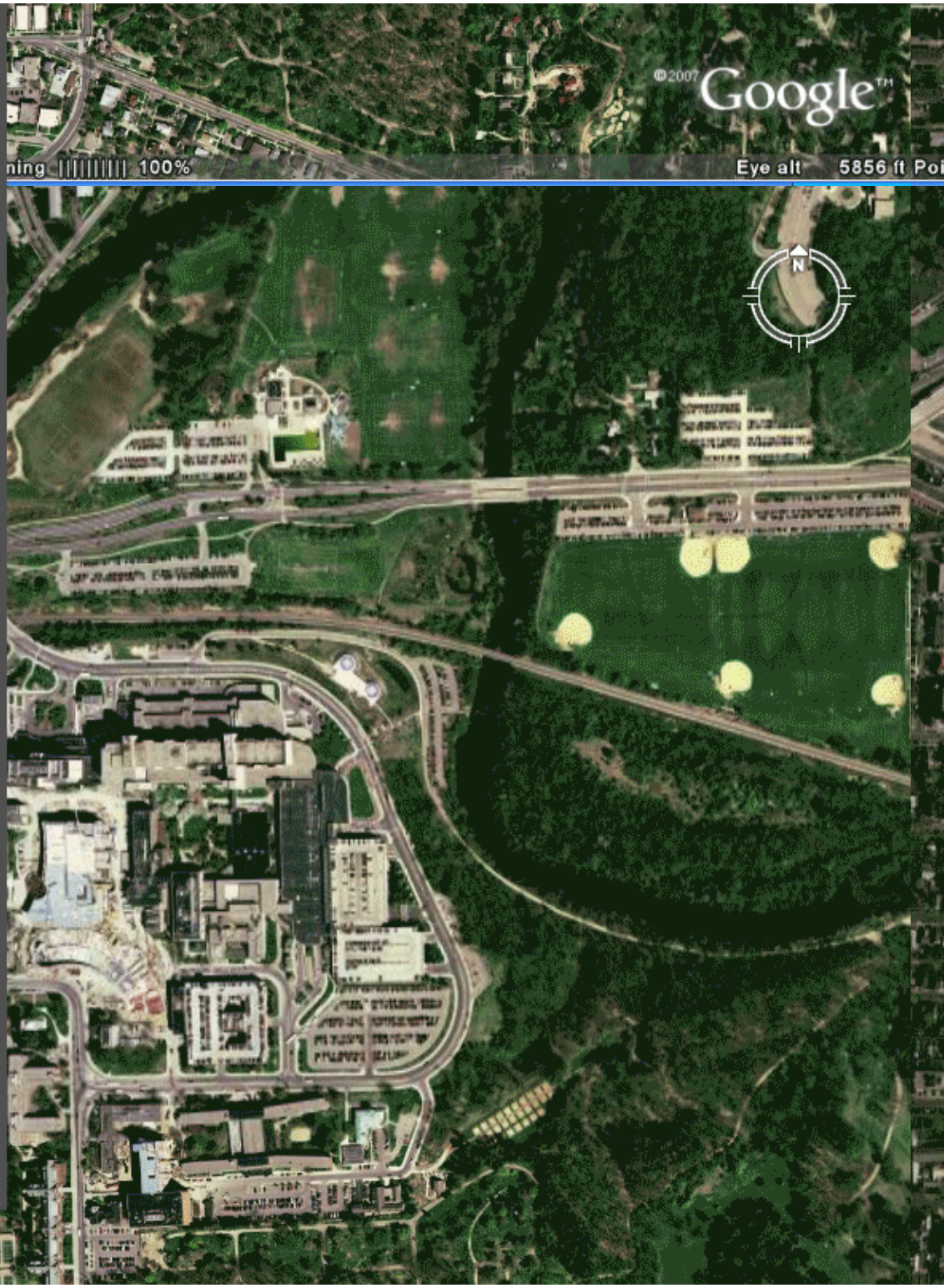
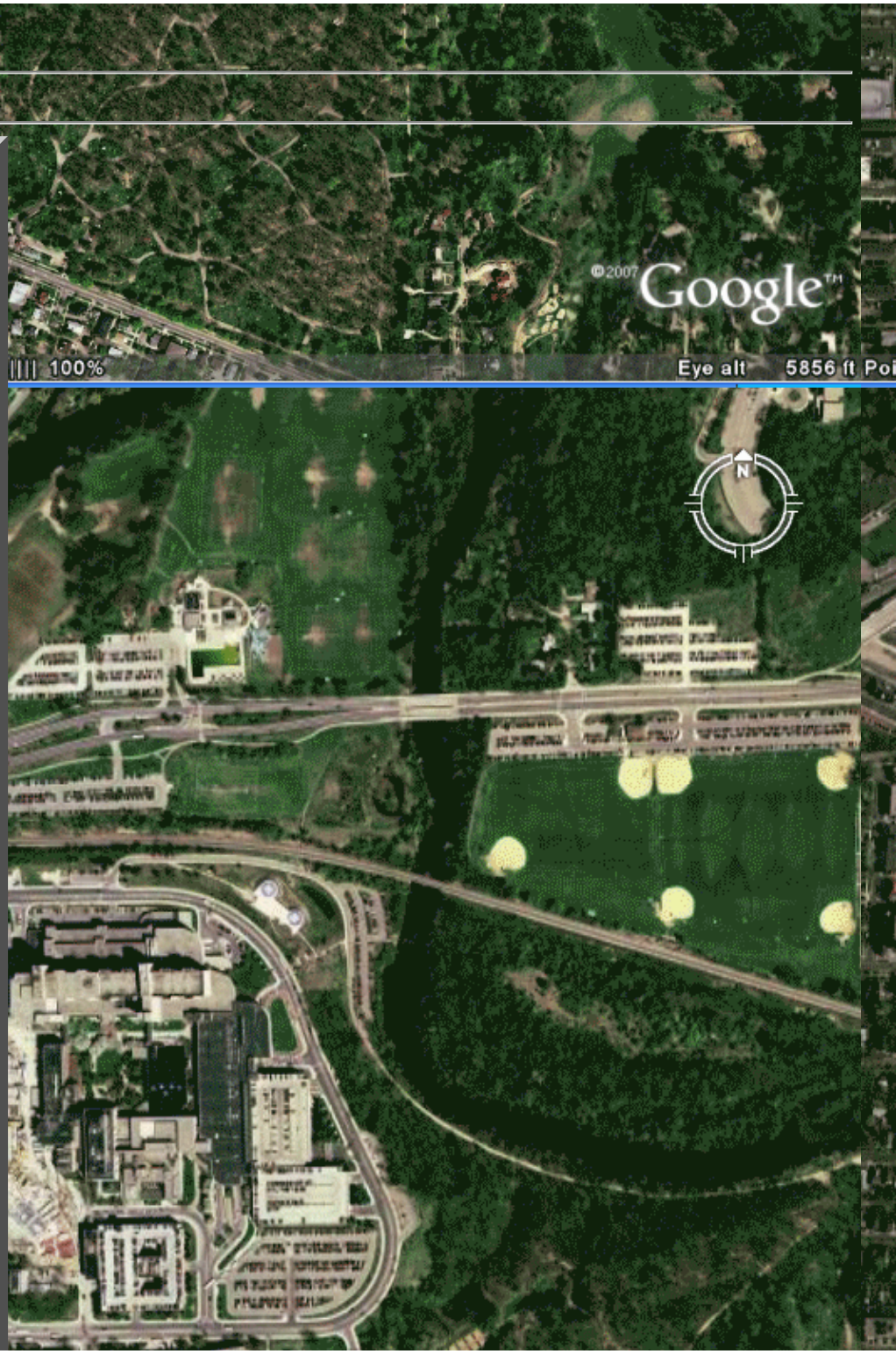
SOLSTICE,
VOLUME XIX, NUMBER 1;
JUNE, 2008.



Cover background bus animation from Lars Schumann's work in this issue.



Institute of Mathematical Geography




*Solstice: An Electronic Journal of Geography and Mathematics*,
Volume XIX, Number 1
Institute of Mathematical Geography (IMaGe).

sarhaus@umich.edu
http://www.imagenet.org

***Solstice*** **was a Pirelli INTERNETional Award Semi-Finalist, 2001 (top 80 out of over 1000 entries worldwide)**

**One article in Solstice was a Pirelli INTERNETional Award Semi-Finalist, 2003 (Spatial Synthesis Sampler).**

***Solstice*** **is listed in the Directory of Open Access Journals maintained by the University of Lund where it is maintained as a "searchable" journal.**

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**Solstice is listed in Geoscience e-Journals**

***Solstice*** **is listed in the EBSCO database.**

**IMaGe is listed on the website of the Numerical Cartography Lab of The Ohio State University: http://ncl.sbs.ohio-state.edu/4_homes.html**

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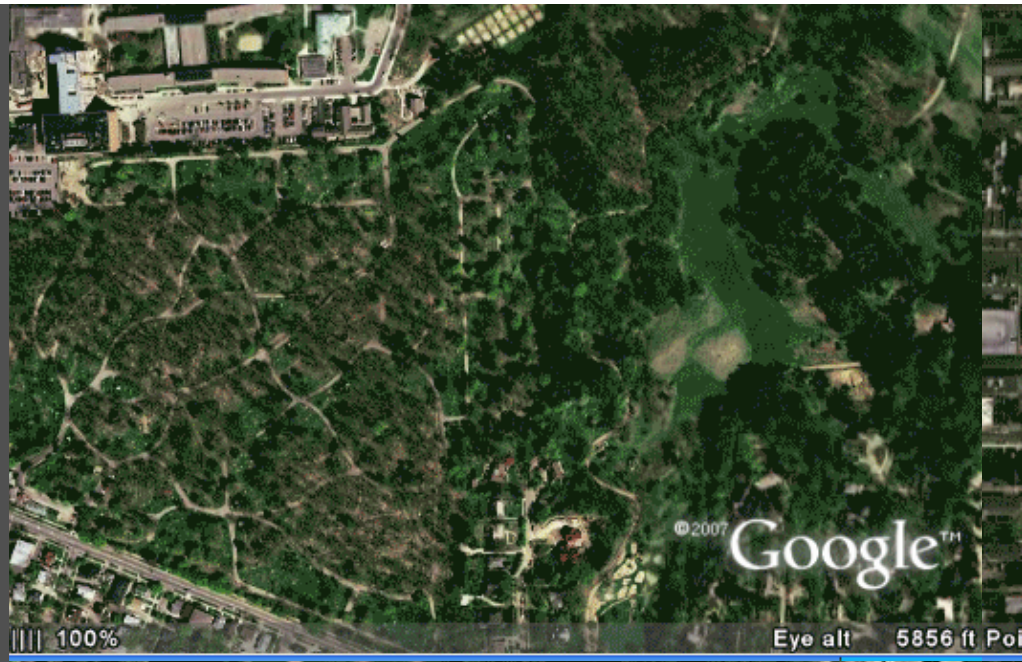
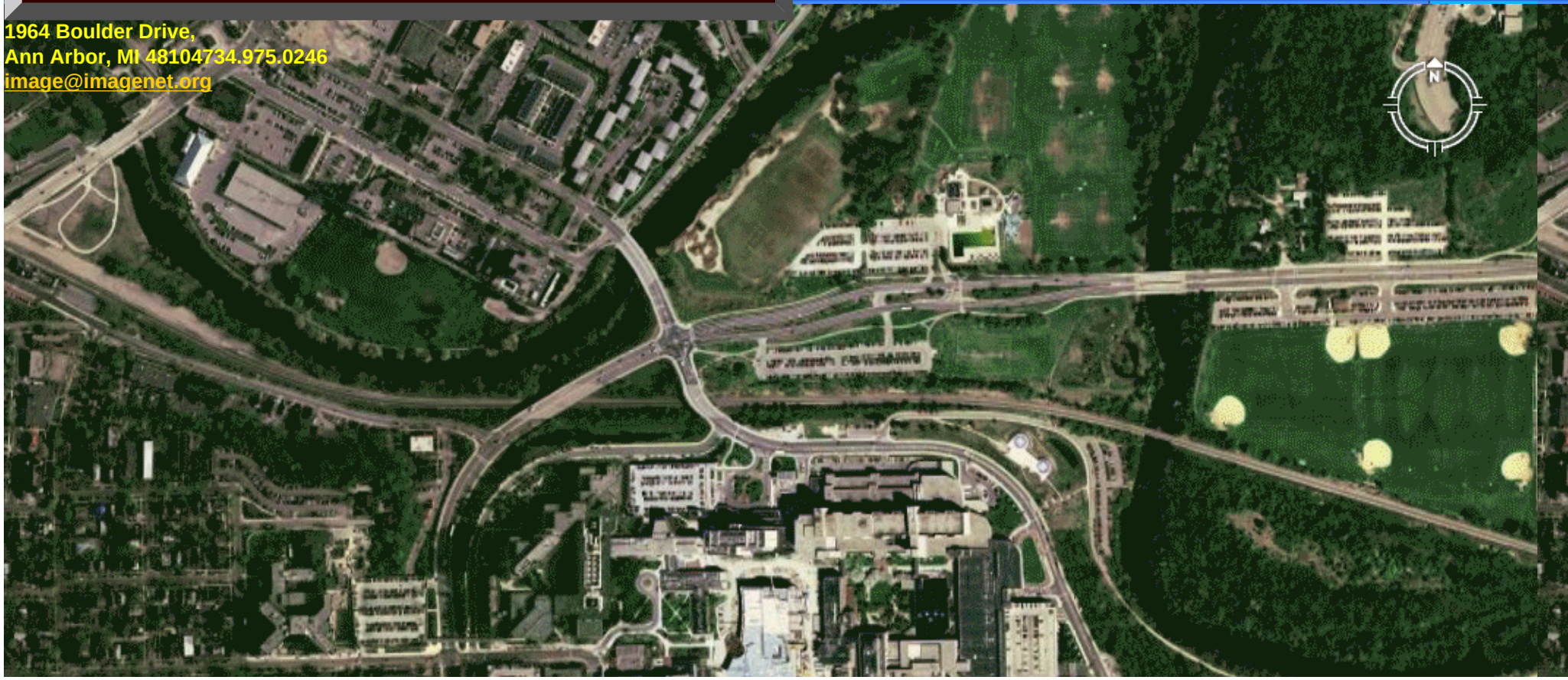
**Congratulations to all *Solstice* contributors.**




**1964 Boulder Drive,**
**Ann Arbor, MI 48104734.975.0246**
**image@imagenet.org**



**SOLSTICE: AN ELECTRONIC JOURNAL OF GEOGRAPHY AND MATHEMATICS**
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MISSION STATEMENT

The purpose of Solstice is to promote interaction between geography and mathematics. Articles in which elements of one discipline are used to

shed light on the other are particularly sought. Also welcome are original contributions that are purely geographical or purely
mathematical. These may be prefaced (by editor or author) with commentary suggesting directions that might lead toward the desired interactions.
Individuals wishing to submit articles or other material should contact an editor, or send e-mail directly to sarhaus@umich.edu.

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## SOLSTICE ARCHIVES

Back issues of Solstice are available on the WebSite of the Institute of Mathematical Geography, http://www.imagenet.org and at various sites
that can be found by searching under "Solstice" on the World Wide Web. Thanks to Bruce Long (Arizona State University, Department of Mathematics)
for taking an early initiative in archiving Solstice using GOPHER.

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## PUBLICATION INFORMATION

To cite the electronic copy, note the exact time of transmission from Ann Arbor, and cite all the transmission matter as facts of publication. Any copy that
does not superimpose precisely upon the original as transmitted from Ann Arbor should be presumed to be an altered, bogus copy of *Solstice*. The
oriental rug, with errors, serves as the model for creating this weaving of words and graphics.

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# Awards and Recognition

(See Press Clippings page for other.)

- 2008: S. Arlinghaus invited to speak at Google 3D Warehouse Base Camp in Mountain View, CA at the GooglePlex. Had to decline the invitation; nonetheless, was nice to be thought of as representing higher education in regard to work already done.
- 2008: Best of 3D Warehouse awards number over 50.
- 2007: Best of 3D Warehouse awards (blue ribbons); these buildings come up default in all free downloads of Google Earth when the "3d buildings" checkbox is checked. They are designed for planning, rather than for architectural, purposes; file size is kept small. What is important is giving the "impression" of the building rather than giving large amounts of detail. View the associated .kmz files in Google Earth to understand the context; they are attached to the linked pages below. Be sure to turn on the "terrain" switch, otherwise buildings made in older software (older versions of Google SketchUp) will float above the surface.
    - Archimedes's models (S. Arlinghaus is "Archimedes").
        - Campus models of Arlinghaus: 1 (Alumni Center), 2 (Angell Hall), 3 (Angell Hall Complex), 4 (Art Museum, first model), 5 (Art Museum, second model), 6 (Bagnoud Building), 7 (Biomedical Sciences Building), 8 (Bursley Hall), 9 (C. C. Little Building), 10 (Chemistry Building), 11 (Clements Library, first model), 12 (Clements Library, second model), 13 (Crisler Arena), 14 (Dennison Building, first model), 15 (Dennison Building, second model), 16 (East Hall, first model), 17

(East Hall, second model), 18 (Frieze Building), 19 (Hatcher Library North), 20 (Hatcher Library South), 21 (Haven Hall), 22 (Hill Auditorium, first model), 23 (Hill Auditorium, second model), 24 (Kraus Natural Science Building), 25 (Michigan League, first model), 26 (Michigan League, second model), 27 (Literature, Science, and the Arts Building), 28 (Mason Hall), 29 (Michigan Stadium), 30 (Modern Language Building), 31 (Northwood IV), 32 (Pharmacy College), 33 (Power Center), 34 (Rackham Building, first model), 35 (Rackham Building, second model), 36 (Randall Laboratory), 37 (Schembechler Hall), 38 (Shapiro Library), 39 (Tappan Hall, second model), 40 (Tisch Hall), 41 (University Hospitals), 42 (West Hall, first model), 43 (West Hall, second model).

        - DDA models of Arlinghaus: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
    - Build Your Campus competition models--student participants each won at least one blue ribbon, as a Best of 3D Warehouse award
        - Lauren Leigh Hoffman: Dana Building
        - Juan Sergio Ponce de Leon: Yost Arena, South Quad
        - Andrew Walton: Golf Course Clubhouse

- 2007: University of Michigan models of about 300 buildings included in the online folder resulting from the "Build Your Campus" competition.
- 2007: Archimedes selected by Google as a "Featured Modeler."
- 2006: Google 3D Warehouse, "Google Picks" then go to "Cities in Development" http://sketchup.google.com/3dwarehouse/ to see textured models of downtown Ann Arbor buildings.
- 2006*: 3D Atlas of Ann Arbor, Version 2*. Google Earth Community, ranked a "Top 20 Rated Post" on Entrance page, December 8, 2006.
- 2006*: 3D Atlas of Ann Arbor, Version 2*. Rated a 5 globe production (top score) in Google Earth Community, November 2006.
- 2004: Sandra L. Arlinghaus and William C. Arlinghaus, Spatial Synthesis Sampler, *Solstice*, Summer 2004. Semi-Finalist, Pirelli 2003 INTERNETional Award Competition.
- 2004: Sandra Lach Arlinghaus, recipient, The Presidentâ€™s Volunteer Service Award, March 11, 2004.
- 2003: Jeffrey A. Nystuen, won the 2003 Medwin Prize in Acoustical Oceanography given by the Acoustical Society of America. The citation was "for the innovative use of sound to measure rainfall rate and type at sea". It is awarded to a young/mid-career scientist whose work demonstrates the effective use of sound in the discovery and understanding of physical and biological parameters and processes in the sea.
- 2002: Sandra L. Arlinghaus, William C. Arlinghaus, and Frank Harary. *Graph Theory and Geography: an Interactive View (eBook)*, published by John Wiley and Sons, New York, April 2002. Finished as a Finalist in the 2002 Pirelli INTERNETional Award Competition (in the top 20 of over 1200 entries worldwide).
- 2001: *Solstice*, Semi-Finalist, Pirelli 2001 INTERNETional Award Competition in the

Environmental Publishing category.

- 1992: *Solstice*, article about it by Ivars Peterson in *Science News*, 25 January, 1992..
- 1991: *Solstice*, article about it by Joe Palca, *Science* (AAAS), 29 November, 1991.

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# EDITOR'S INTRODUCTION

Google Earth offers exciting new ways to visualize spatial data. 3D buildings make the scenes look "real" so that navigating the scene is similar to driving through actual streets. A large challenge to the new technology, however, is to incorporate the wisdom of the past in such a way that new directions of inquiry or new ways to communicate are uncovered. The selection of articles in this issue of Solstice focus on that idea and build on some similar efforts in earlier issues of Solstice.

Related links to earlier articles in Solstice:

Arlinghaus, Sandra Lach. Visualizing a Map of Walter Christaller, Poland 1941: Part I, Benchmarking the Map Solstice, December, 2006.
Arlinghaus, Sandra Lach. Visualizing a Map of Walter Christaller, Poland 1941: Part II, Interpolation of the Benchmarked Map Solstice, December, 2006.
Arlinghaus, Sandra L. and Batty, Michael. Visualizing Rank and Size of Cities and Towns: Part I, England, Scotland, and Wales,1901-2001 Solstice, December, 2006.
Arlinghaus, Sandra L. and Batty, Michael. Visualizing Rank and Size of Cities and Towns: Part II, Greater London, 1901-2001 Solstice, December, 2006.

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# Google Earth Applications in a Community Information System: Scio Residents for Safe Water

Roger Rayle
Scio Residents for Safe Water, srsw@googlegroups.com

Water quality issues often are not uppermost in the minds of homeowners or decision-makers. The water is there and we tend to take for granted that it is clean, safe, and plentiful. Community groups can work to heighten awareness of these issues. New visualization technology is very helpful in capturing attention from groups that might otherwise remain complacent. The linked website illustrates ongoing work in this arena. The link is to a live site so that readers might return and see the latest. In terms of long-range persistence, however, the work is also captured in a zipped file and archived in Deep Blue with a persistent url. The persistent url will continue to be available and will contain this explanation. Read the material below the screen shots to learn some of the technical detail and application orientation of this author.

Link to live url:
http://groups.google.com/group/srsw/web/srswhome

Link to persistent url for all of Solstice:
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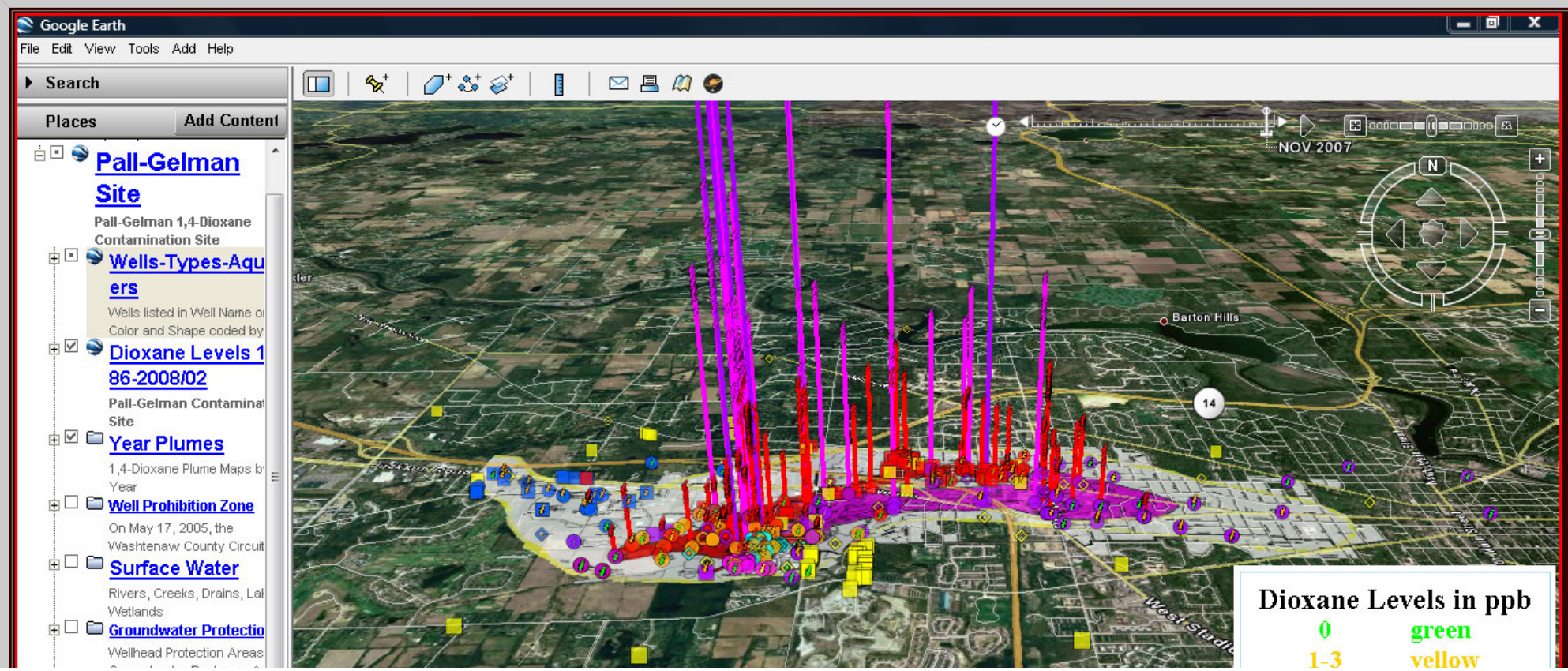
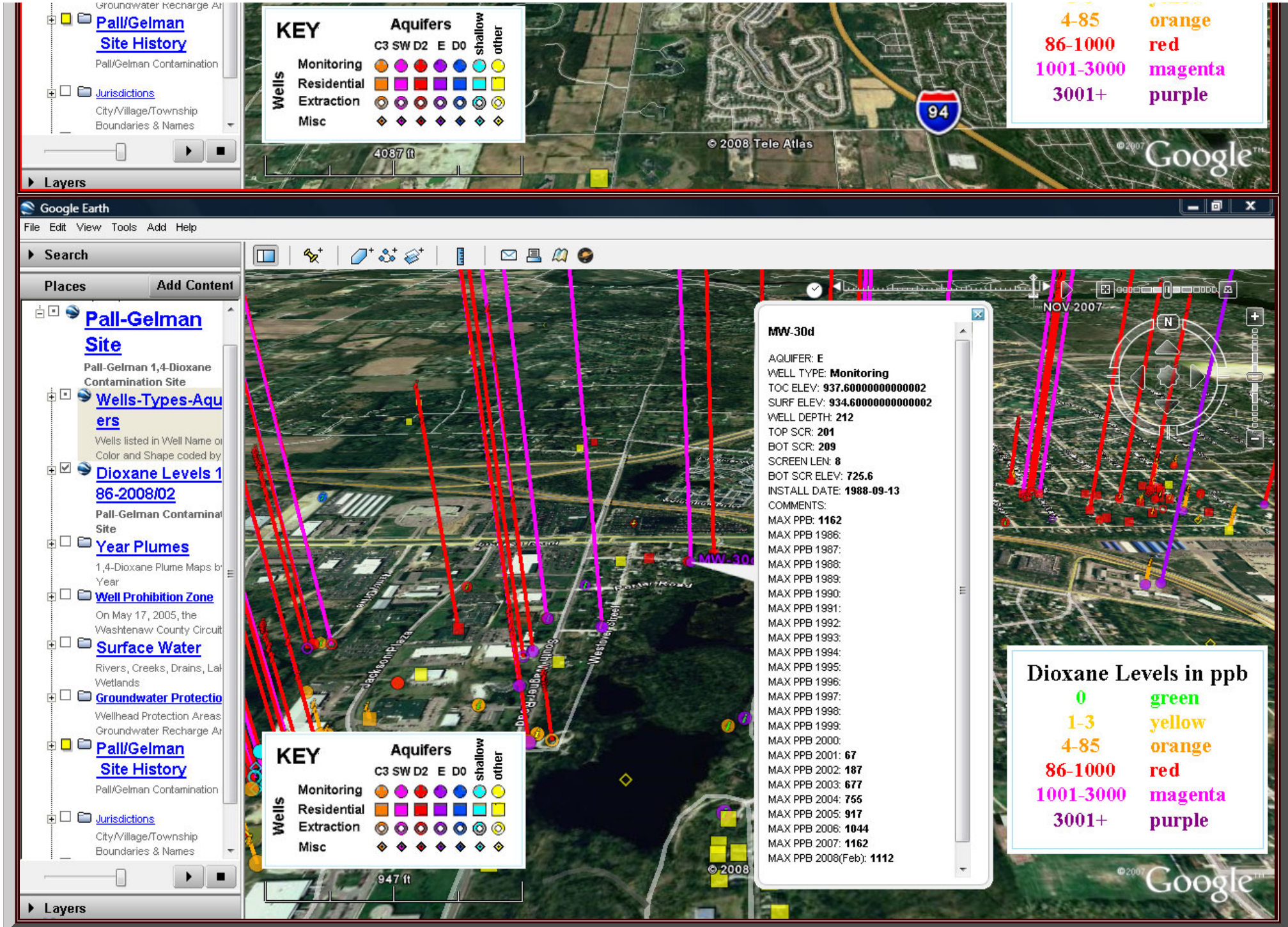
Static screen shots from Google Earth:






Roger Rayle really likes Google Earth. Before Google Earth came along, he spent tens of hours every

few months creating two-dimensional depictions of new well sampling data for a local groundwater cleanup which he has been monitoring as a citizen volunteer for over fourteen years.

Now with the basic version of Google Earth, in a couple of hours, he can generate a quarterly updated, four-dimensional plot showing the location of over 16,000 pollution samples taken since 1986. A bar whose height represents the concentration of the contaminant is shown at the exact X-Y longitude/ latitude for each sample location with the fourth dimension being date sampled. The result viewed on Google Earth gives a clear indication of which ways the contamination plumes are moving, how fast, and at what concentrations.

Roger developed his technique to plot large datasets to Google earth beginning in April 2007. Working from an initial KML sample file provided by Dr. Sandra Arlinghaus, he first constructed a template with the desired colors, line weights, and icons for the categories of data to be plotted. Then he used a simple mail/merge process to generate the placemark KML code from the placemarks section of the sample template. Finally, he copied and pasted the result into the original template, replacing the sample placemarks, and opening the result in Google Earth. He happened to use Word and Excel for the mail/merge and Notepad++ for editing the KML template and final code, but other such programs should work just as well.

Besides showing the data points as bar graphs, Roger has tweaked his templates to show the sample name and date when one mouses over each placemark and to show a pop-up box of associated well data when one clicks on a sample placemark.

The sample data is just one level in a comprehensive mashup that also includes

- a surface marker for each of over 300 sample locations color coded by aquifer and shape coded by well type,
- image overlays of contamination plume maps by year
- image overlays of groundwater protection areas for municipal supply wells,
- image overlays of groundwater flow studies,
- shape files for a surface water features and well restricted zones,
- shape files of groundwater recharge areas,
- schematic diagrams of original treatment attempts and subsequent cleanup efforts.

This periodically updated mashup is used as a presentation tool for public meetings and as a decision support tool at technical meetings where the state, local government, and citizen representatives review cleanup proposals and make recommendations.

Roger helps others use Google Earth as a platform to display large datasets in 4-D. He considers it an outstanding free tool to allow community stakeholders to present multifaceted views of reality in a concise, unified format that can effectively influence decision makers.

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**http://www.imagenet.org**

# Huron River Tour, Ann Arbor

Matthew Naud
Environmental Coordinator and Assistant Emergency Manager, Systems Planning Unit, City of Ann Arbor

City planning for rivers is a challenge because these "wet" parks are waters of the state and not under direct control of the municipality. However, there are many services provided by the river to the residents of Ann Arbor - including drinking water, recreational spaces, and viewsheds - and without a long-term plan for the river with clear management strategies, invasive aquatics, sedimentation, and significant expenses will limit future recreational and other uses of the river.

The Environmental Coordinator and Water Quality Manager for the City of Ann Arbor are lead staff on the Huron River and Impoundment Management Plan effort. Together, we are attempting to visually demonstrate key features of the river, the relationships among river stretches, the primary users of the river and services provided by the river, and the many challenges to her sustainability. Google Earth provides an opportunity to cost effectively provide images at different scales - the broad stretches on which the plan is based and the specific locations of key users. We plan to develop a 15 minute introductory film for public meetings that creatively couples the Google Earth tour with archival images, video footage from the Community Television Network (CTN) and voice narration.

Download Google Earth to view the attached file and follow along on our tour of the Huron River. The live link below is to the City of Ann Arbor website, as context. To see the Google Earth file, download the zipped file from Deep Blue and load the .kmz file in Google Earth.

Link to live url:
http://www.a2gov.org/

Link to persistent url for all of Solstice:
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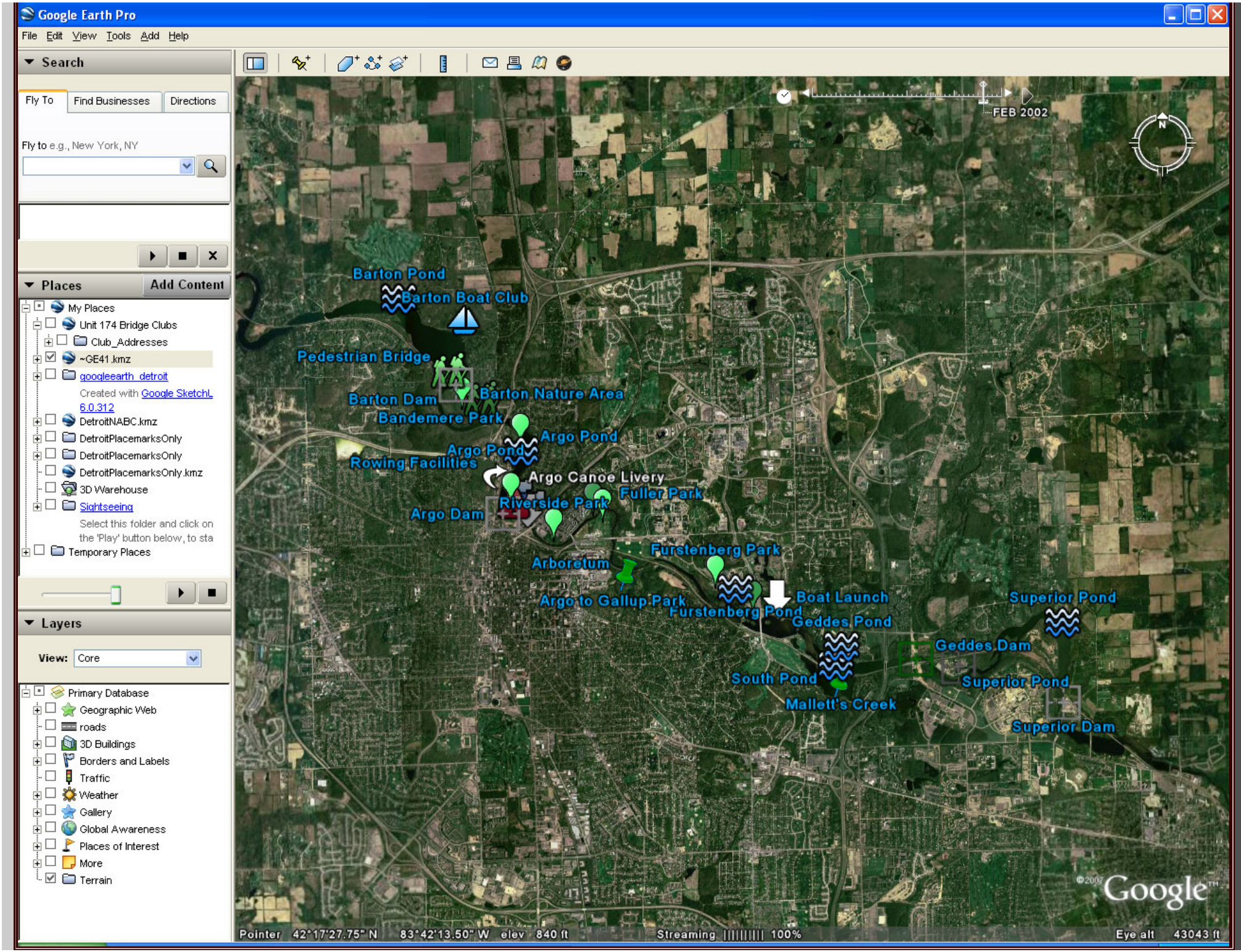
Static screen shot from Google Earth:


Google Earth Pro
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., New York, NY
Places
Add Content
My Places
Unit 174 Bridge Clubs
Club_Addresses
~GE41.kmz
googleearth_detroit
Created with Google SketchL
6.0.312
DetroitNABC.kmz
DetroitPlacemarksOnly
DetroitPlacemarksOnly
DetroitPlacemarksOnly.kmz
3D Warehouse
Sightseeing
Select this folder and click on
the 'Play' button below, to sta
Temporary Places
Layers
View: Core
Primary Database
Geographic Web
roads
3D Buildings
Borders and Labels
Traffic
Weather
Gallery
Global Awareness
Places of Interest
More
Terrain
FEB 2002
Barton Pond
Barton Boat Club
Pedestrian Bridge
Barton Dam
Barton Nature Area
Bandemere Park
Argo Pond
Argo Pond
Rowing Facilities
Argo Canoe Livery
Fuller Park
Riverside Park
Argo Dam
Arboretum
Furstenberg Park
Argo to Gallup Park
Furstenberg Pond
Boat Launch
Superior Pond
Geddes Pond
Geddes Dam
South Pond
Superior Pond
Mallett's Creek
Superior Dam
©2007 Google™
Pointer 42°17'27.75" N 83°42'13.50" W elev 840 ft
Streaming 100%
Eye alt 43043 ft

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http://www.imagenet.org

# Detroit North American Bridge Championship: the Google Earth Display

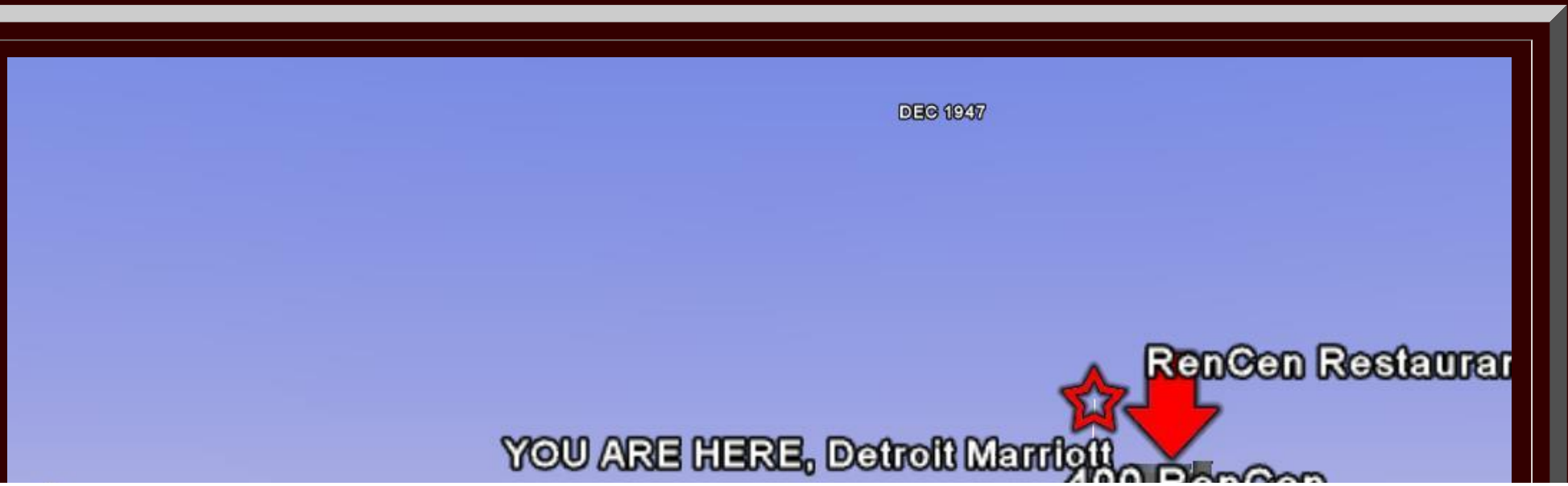
Sandra Lach Arlinghaus
Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment

In March 2008, the author and two colleagues (William C. Arlinghaus and Ron Horwitz) served as co-chairs for the North American Bridge Championships held March 6-16 in the Detroit Marriott at the Renaissance Center. The event took over the entire 72 story hotel; effective communication was critical. One facet of an elaborate system was a laptop display projected on the wall. Google Earth captured some of the more complex arrangements concerning restaurant location and contact information. Marty Hirschman and his committee compiled and wrote the Restaurant Guide given in hard copy to all participants. Often, however, as at many conferences, participants did not always have handouts with them when they wanted them. Thus, competitors could come to a staffed desk, ask questions, and navigate through the streets of Detroit on a laptop to find where they might be going, first in the virtual world so that they were ready to proceed with adventure in the real world. The Google Earth display was a fine feature in support of other materials.

Unzip the associated files archived in Deep Blue to uncover the .kmz files and load them into Google Earth. Turn on the 3D Building switch in Google Earth to obtain a more realistic view of downtown Detroit.

Link to persistent url for all of Solstice:
http://deepblue.lib.umich.edu/handle/2027.42/58219

Static screen shot from Google Earth:

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# Unit 174 American Contract Bridge League Bridge Clubs: Greater Houston

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(H) 281-494-9644
(C) 713-851-1511
BertOnstott@ComCast.net

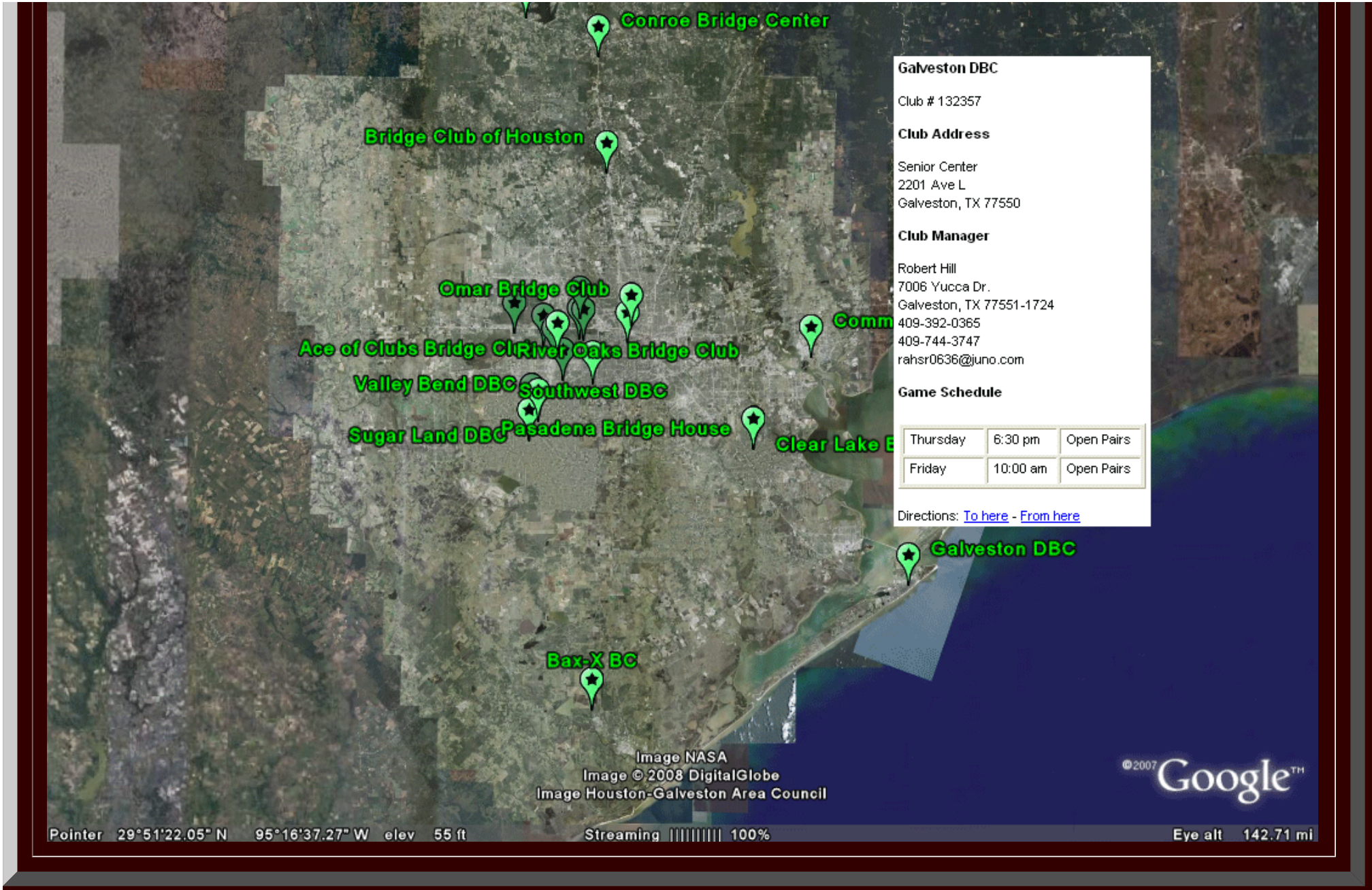
Large organizations with many members might find it particularly helpful to use Google Earth to visualize elements of their database. The animation below illustrates this idea for the location of duplicate bridge clubs in the Houston area: click on Galveston and information for the Galveston Duplicate Bridge Club pops up. Download the linked .kml file to see the file containing similar information for each marked club. Or, follow the link to the live url to see the linked kmz/kml file as it appears in Google Maps (imported there for the convenience of the non-technical reader not wishing to download Google Earth). Maintenance of a file such as this one is far easier than original creation of it. Thus, people looking for game times and contact information, as well as any special information, can find it at a glance for the whole area and make travel and game plans accordingly; they might also expect that the information will be current, given the relative ease of maintenance.

To view the .kml file, download the material from the zipped file that is archived in Deep Blue with a persistent url. The persistent url will continue to be available and will contain this explanation.

Link to live url:
http://www.d16acbl.org/U174/

Link to persistent url for all of Solstice:
**http://deepblue.lib.umich.edu/handle/2027.42/58219**

Static screen shots (animated) from Google Earth:

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# Another Tale of Two Cities
## Neighborhood Watch from Ann Arbor to Baghdad

Sandra Lach Arlinghaus
Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment

Neighbors watching out for the welfare of neighbors is as old as the humanity, itself. When strong systems for neighborly assistance are in place, secure and happy (or improving) neighborhoods are the result. The attached link illustrates one effort to comment on this idea using data from two disparate situations: Ann Arbor, Michigan, where systematic neighborhood watch networks have been in place for 50 years (since about 1967) and Baghdad, Iraq, where systematic neighborhood watch networks are newly emerging social structures.

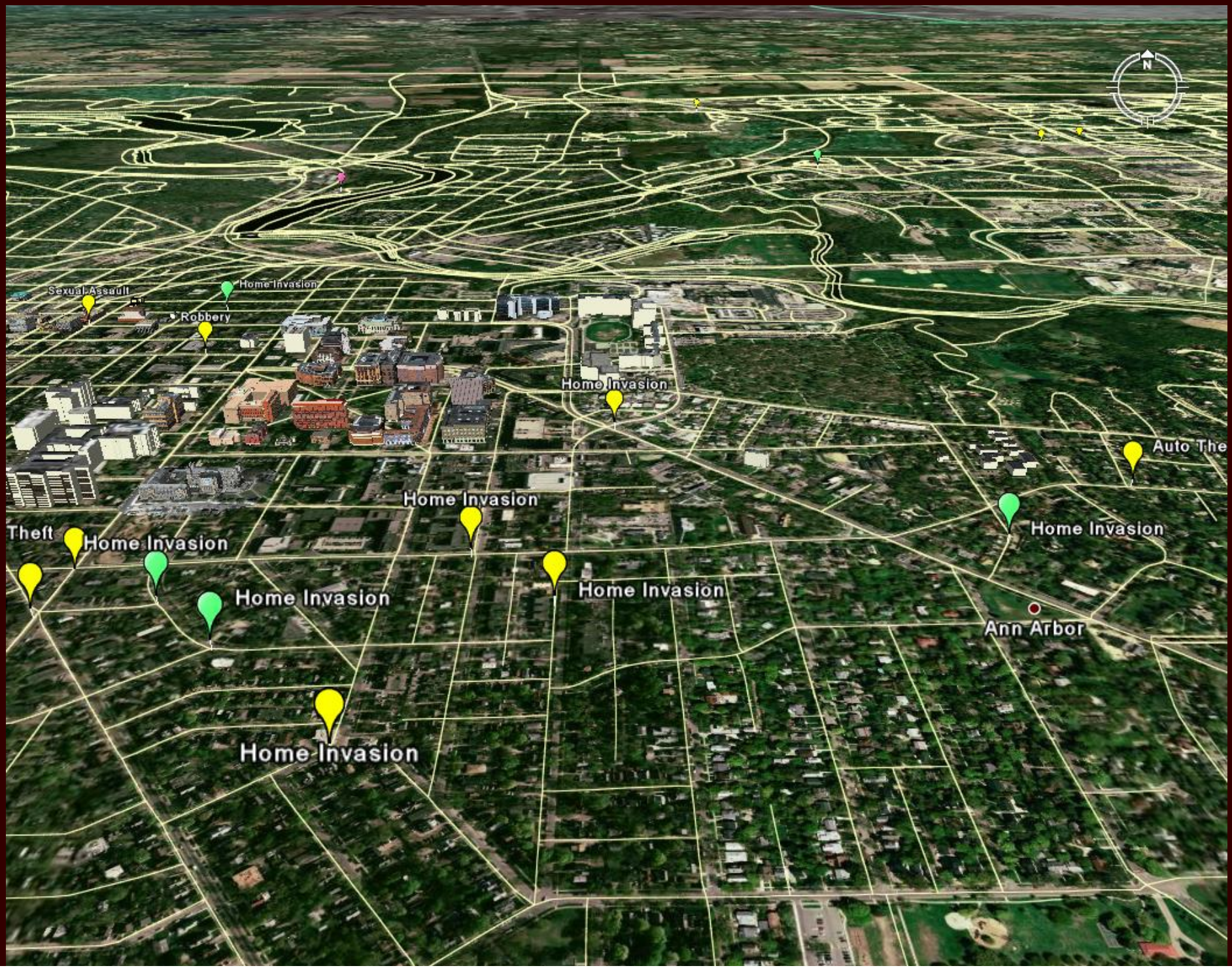
The two parts of the website emerged originally from two different interests. The Ann Arbor part came from the author's continuing participation in the City of Ann Arbor Neighborhood Watch program (of the Ann Arbor Police Department): both as a block captain in that system and as a member of the City-wide Neighborhood Watch Advisory Panel. The Baghdad part emerged as an opportunity to compare and constrast two systems using the GEOMAT methodology which Ann Larimore and the author use in teaching courses at The University of Michigan.

The linked website illustrates the current status of the GEOMAT progress. The link is to a live site so that readers might return and see the latest. In terms of long-range persistence, however, the work is also captured in a zipped file and archived in Deep Blue with a persistent url. The persistent url will continue to be available and will contain this explanation.

Link to live url:
http://www-personal.umich.edu/%7Esarhaus/MapsAndTimelines/Fall2007/Arlinghaus/

Link to persistent url for all of Solstice:
**http://deepblue.lib.umich.edu/handle/2027.42/58219**

Static screen shot from Google Earth:


N
Sexual Assault
Home Invasion
Robbery
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Auto The
Home Invasion
Home Invasion
Theft
Home Invasion
Home Invasion
Home Invasion
Home Invasion
Ann Arbor
Home Invasion


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# Real-time Animation Scripts for Google Earth

Lars Schumann
Research Computer Specialist and Manager, 3D Laboratory in the Duderstadt Center, The University of Michigan

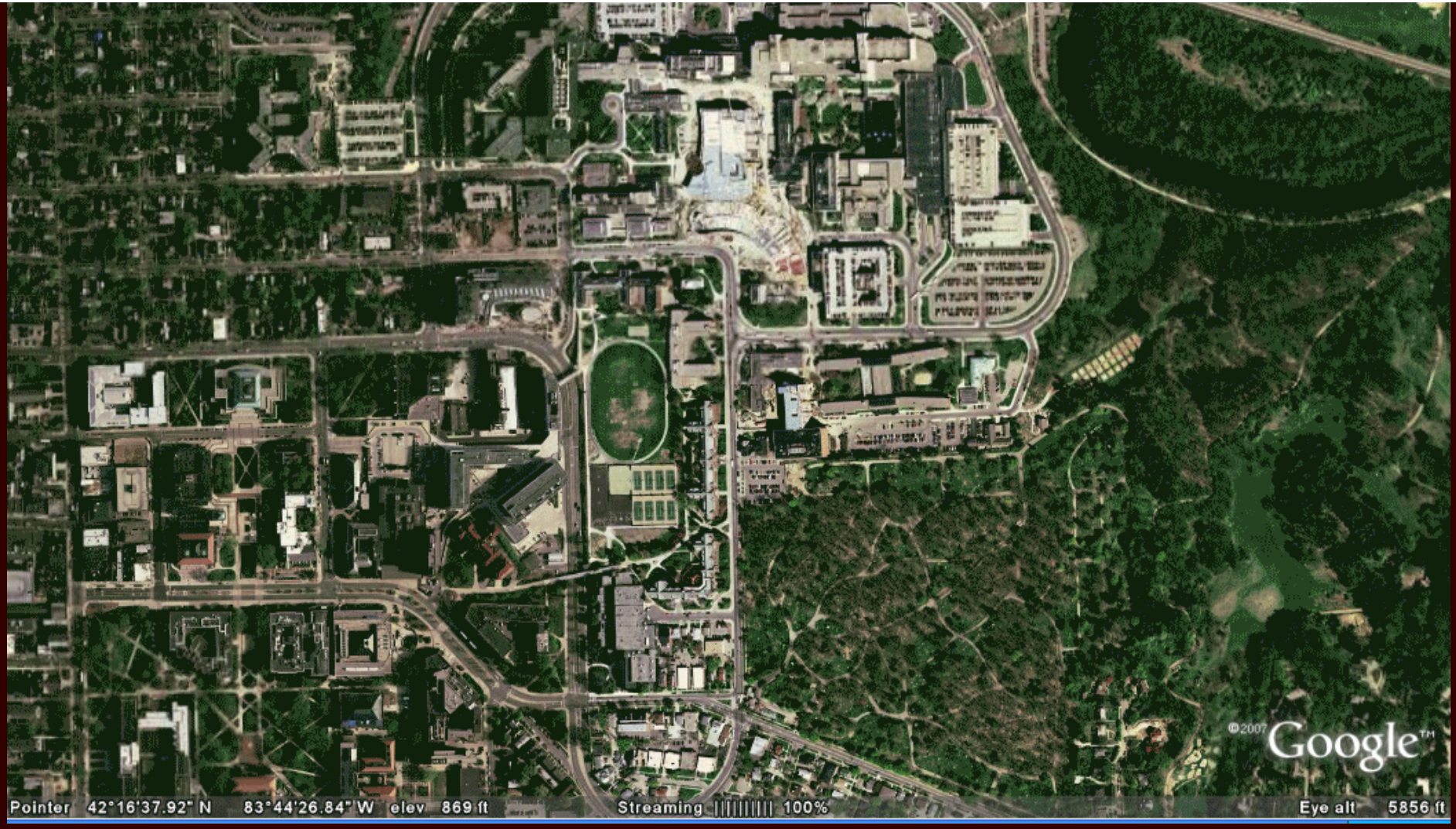
Google Earth files are an outstanding way to organize and visualize large amounts of infomation from complex data sets. Once the initial effort of site creation has been made, maintenance of the site, in terms of updating it with respect to data coming at frequent and perhaps unpredictable intervals, may become a substantial task. Ways to automate that issue are suggested on the link below. The linked website illustrates ongoing work in this arena. The link is to a live site so that readers might return and see the latest. In terms of long-range persistence, however, the work is also captured in a zipped file and archived in Deep Blue with a persistent url. The persistent url will continue to be available and will contain this explanation.

Link to live url:
http://www.larsi.org/portfolio/GoogleEarth/

Link to extra file based on file above:
Lars.html

Link to persistent url for all of Solstice:
**http://deepblue.lib.umich.edu/handle/2027.42/58219**

Static screen shot from Google Earth (appears on the cover of this issue of Solstice); an animation from 72 static frames:

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http://www.imagenet.org

# Mouth Geography...Or, Sleep Apnea and Linguistics?

William E. Arlinghaus
The University of MIchigan, A.B. Theoretical Linguistics

Broadly viewed, the human mouth is a cave. Stalactite upper incisors fit neatly into stalagmite lowers. A salivary river keeps the cave moist and feeds a host of small organisms that populate this cave. The uvula, a skin flap at the back of the mouth, hangs down into the entry to the air passage into the body. (If you wish to read about the biology of the uvula, please check out any number of other sites.) The uvula has a linguistic function in the formation of some consonants. In some individuals, when the uvula flops against the back of the mouth cavity during sleep, a blockage of air flow occurs and the supply of oxygen is cut for a few instants. This problem can apparently be more than mere snoring; it can be a serious medical issue called sleep apnea. Thus, the uvula serves as a sort of a dam to the flow of air.

One way to improve flow is to remove the dam. Indeed, uvular surgery appears to be one solution to serious sleep apnea. Unlike the concrete man-made dam, the uvula is living tissue including muscle fiber. Thus, it seems natural to wonder if there might be a way to "train" the tissue to stay out of the dam-like position: to divert the dam's action on the flow rather than the flow's action around or over the dam.

Language trains parts of the mouth. From English, the tongue learns to take a position to say "th". From Zulu, it learns various clicks to supplement vocal chord noise. There are numerous interesting sounds that come from the myriad human languages of the world. Indeed, there are languages that employ the "uvular trill" as supplementary to vocal chord sounds. Most or some dialects of French, German, Dutch, Italian, and Swedish employ the uvular trill. Thus, several research questions of possible interest emerge:

1. Do individuals who use the "uvular trill" as part of their language pattern on a regular basis have better "trained" uvular muscle fibers than do others?
2. Do language groups using uvular trills have a lower (higher) incidence of sleep apnea than do language groups not employing the uvular trill?
3. Depending on the answer to 2, might training of the uvular muscles, through the systematic linguistic study and practice of phonetics, divert the damming effect of the uvula and relieve at least some sleep apnea issues?

Listen to the sounds of the author making uvular trills in the linked .wav file. Figure 1 shows an animation of the visual profile of the sounds. Note the regularity of pattern. The animation first shows the entire pattern. It then successively zooms in on the yellow line retained in original position in the strip at the top and altering position in the screen filling most of the animation.

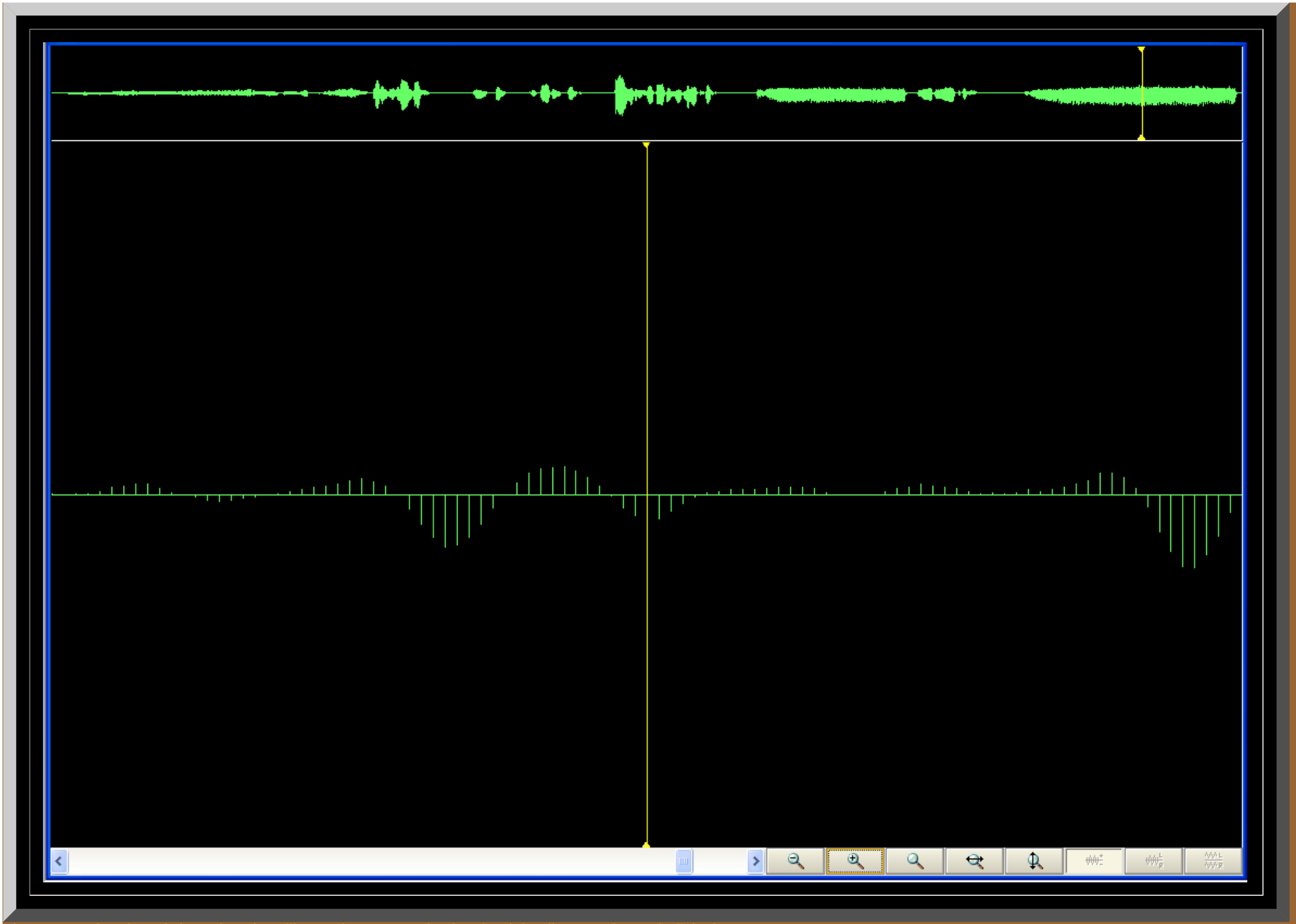
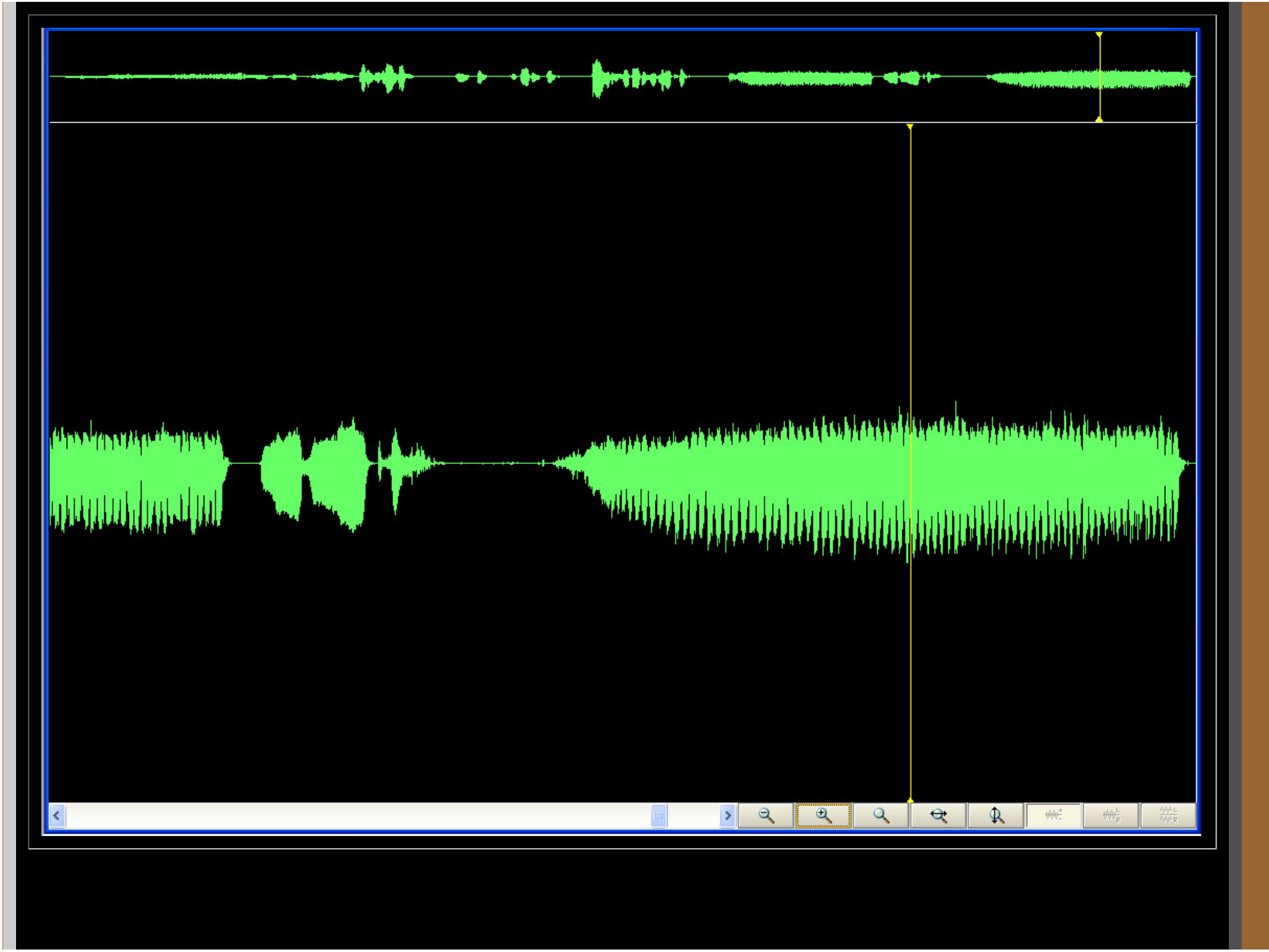
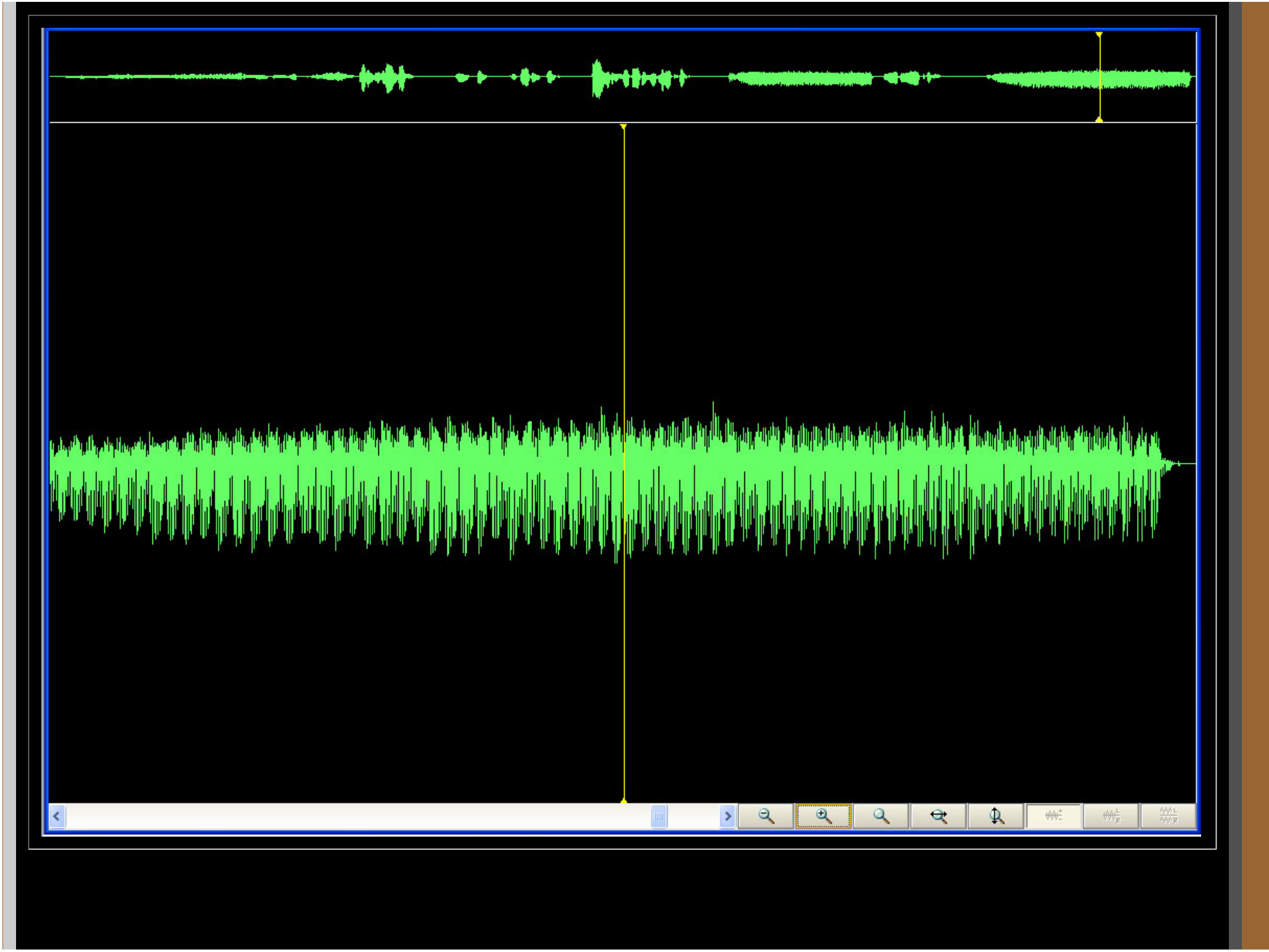
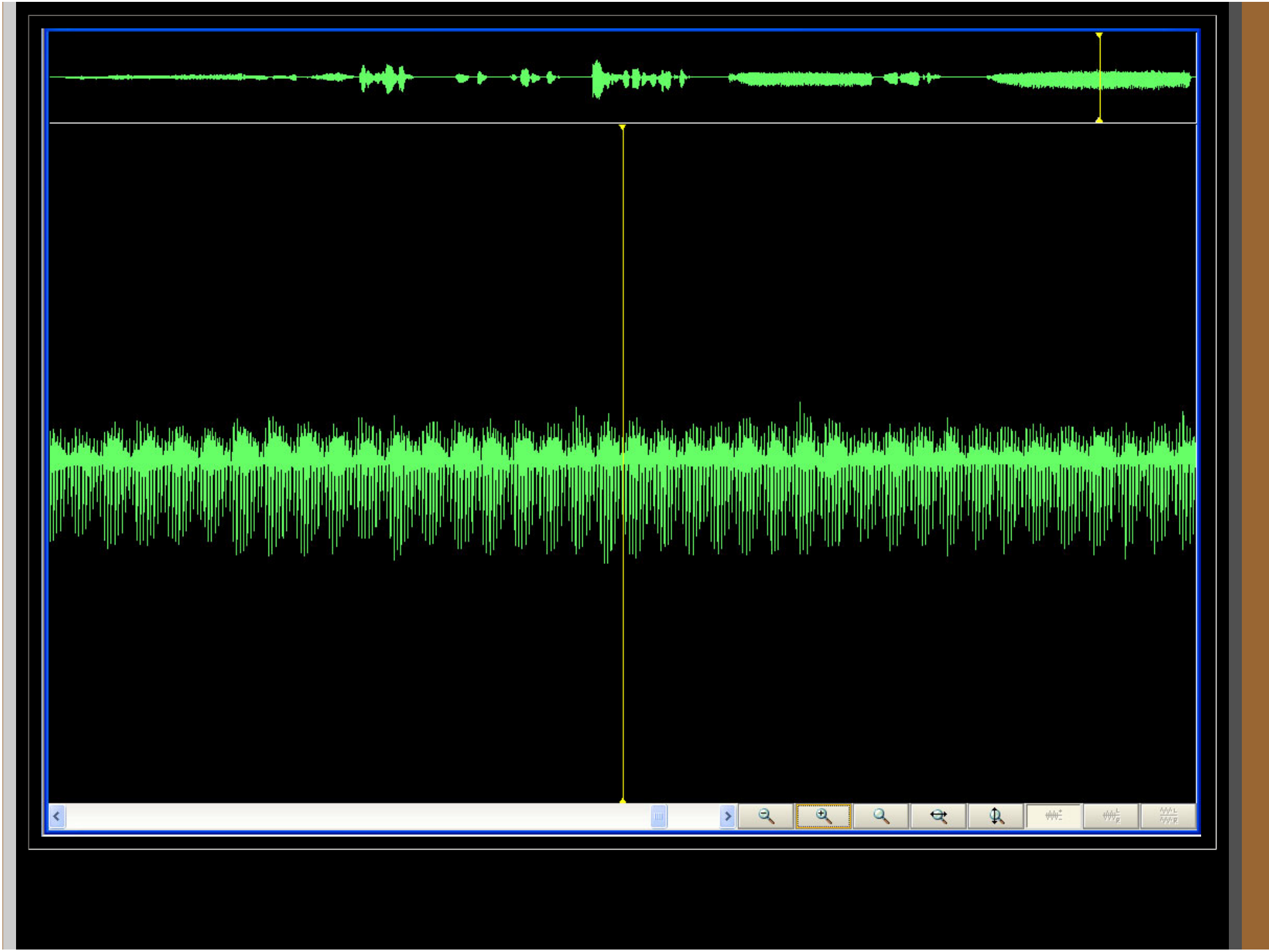


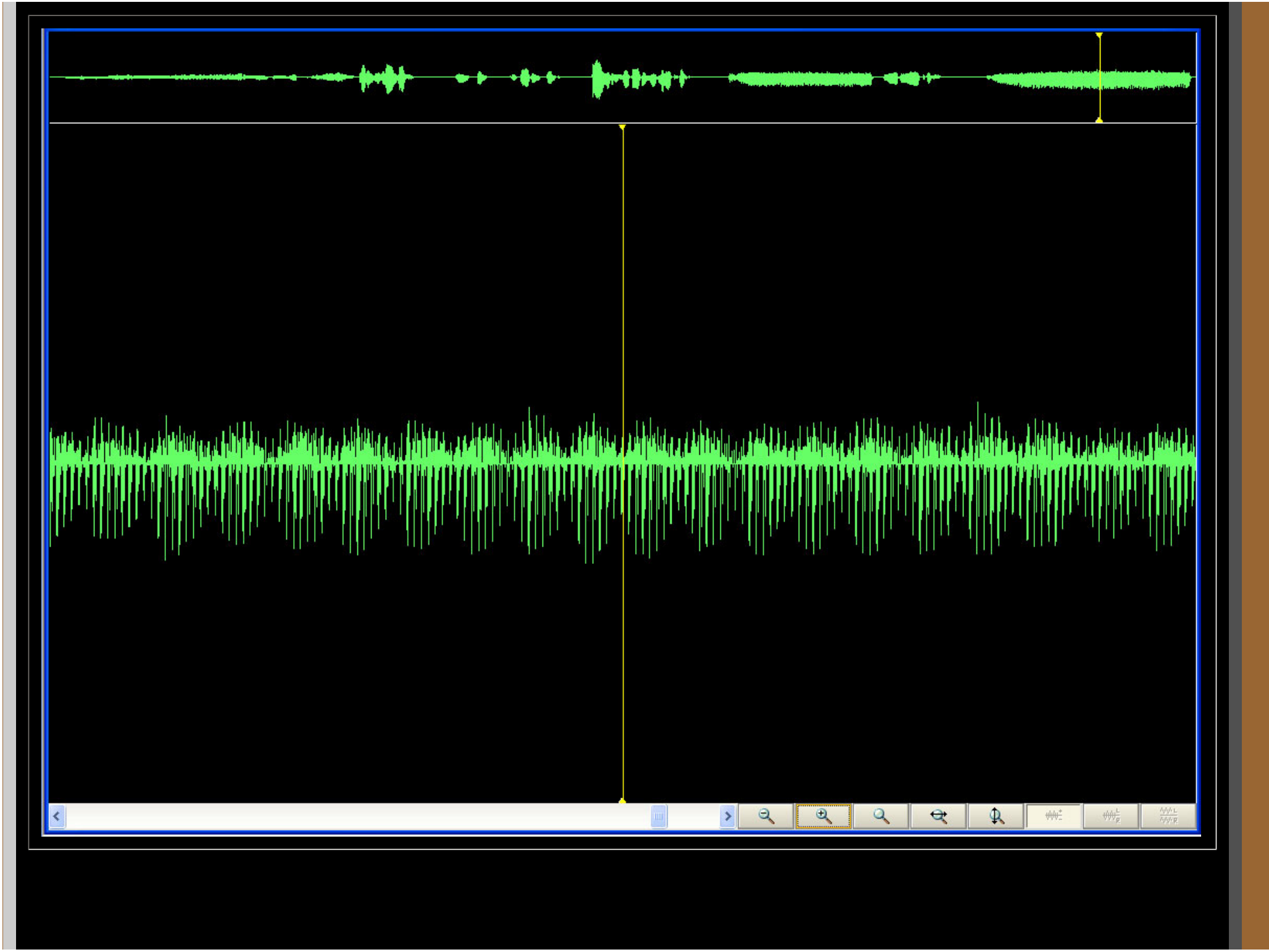
Figure 1. Animation of view of uvular trill sound at successive levels of detail. Note the periodicity in the final sound (yellow line centered in it as a reference line).

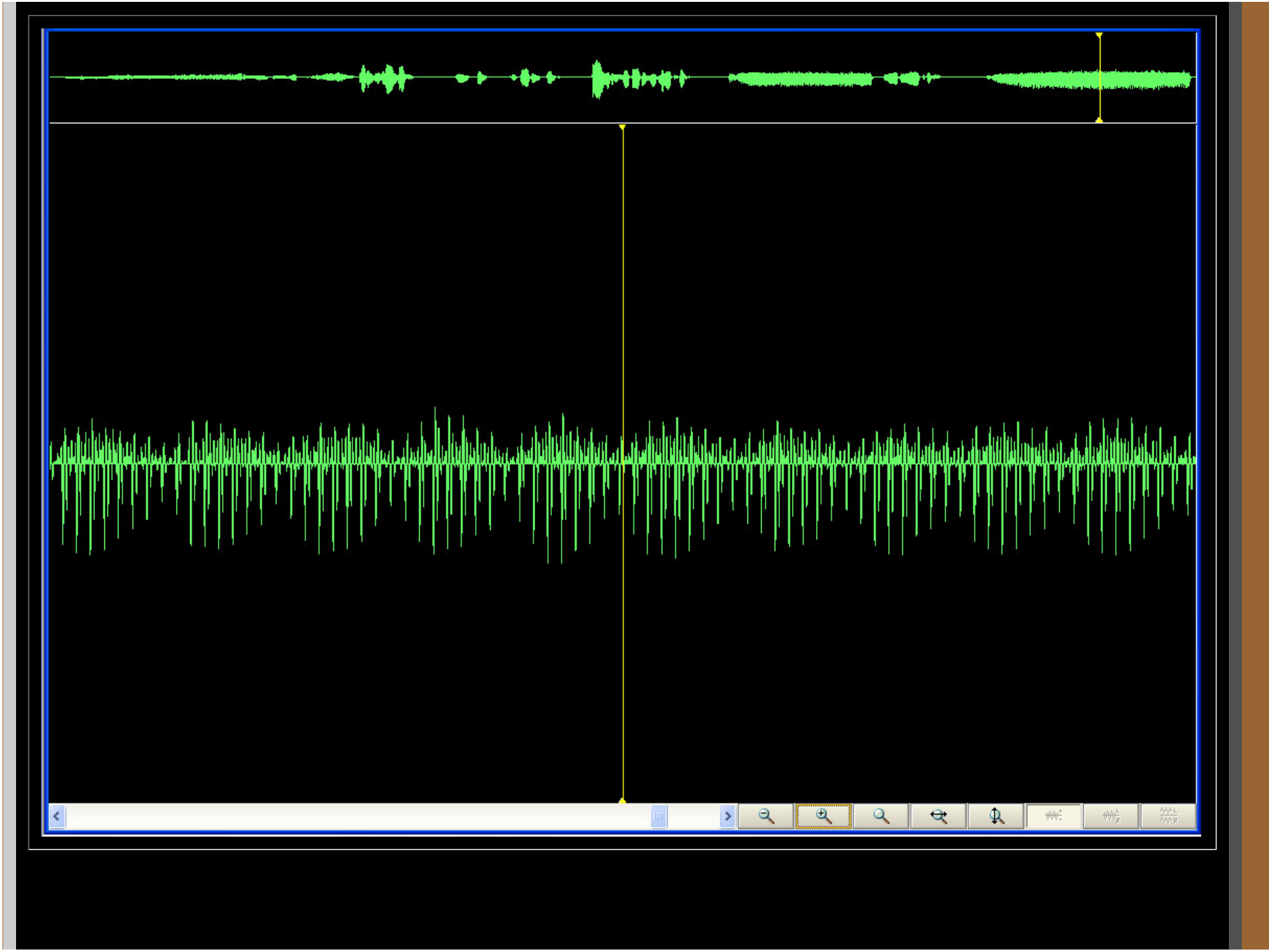
Figure 2 shows the pattern as a set of 12 screen captures. The reader wishing to have animation, but also to have control to stop it at will, might wish instead to view the linked movie file.

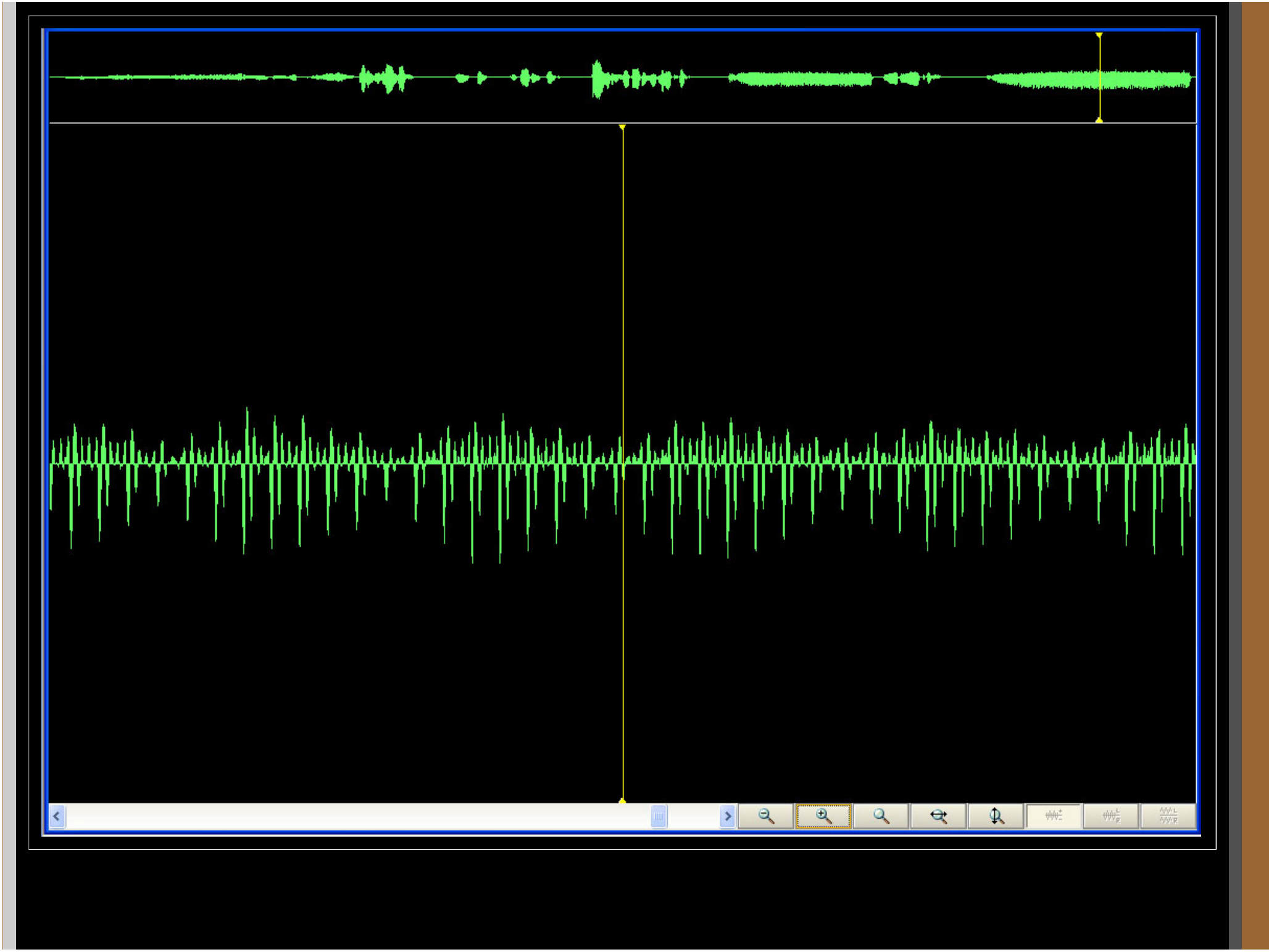


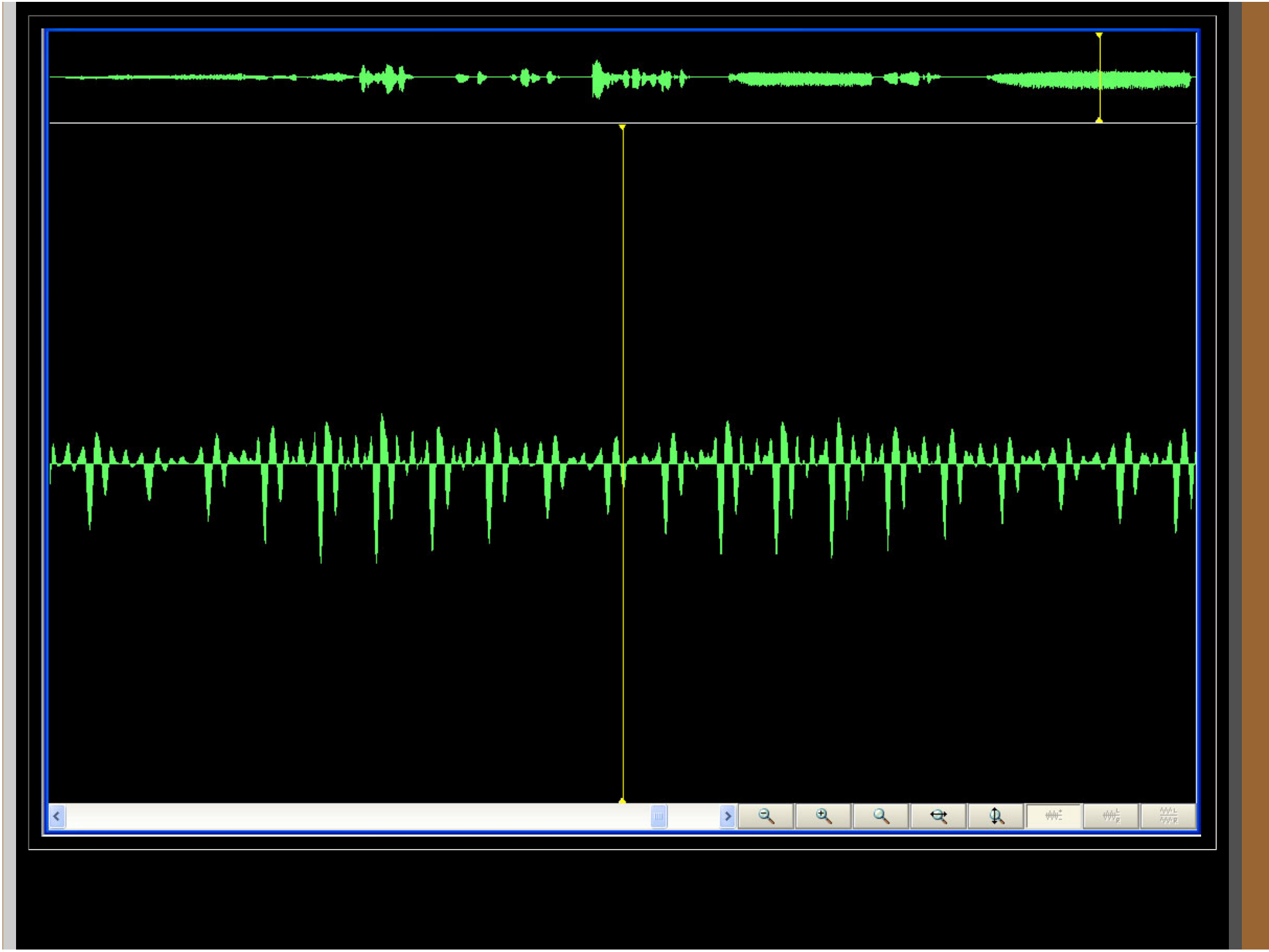


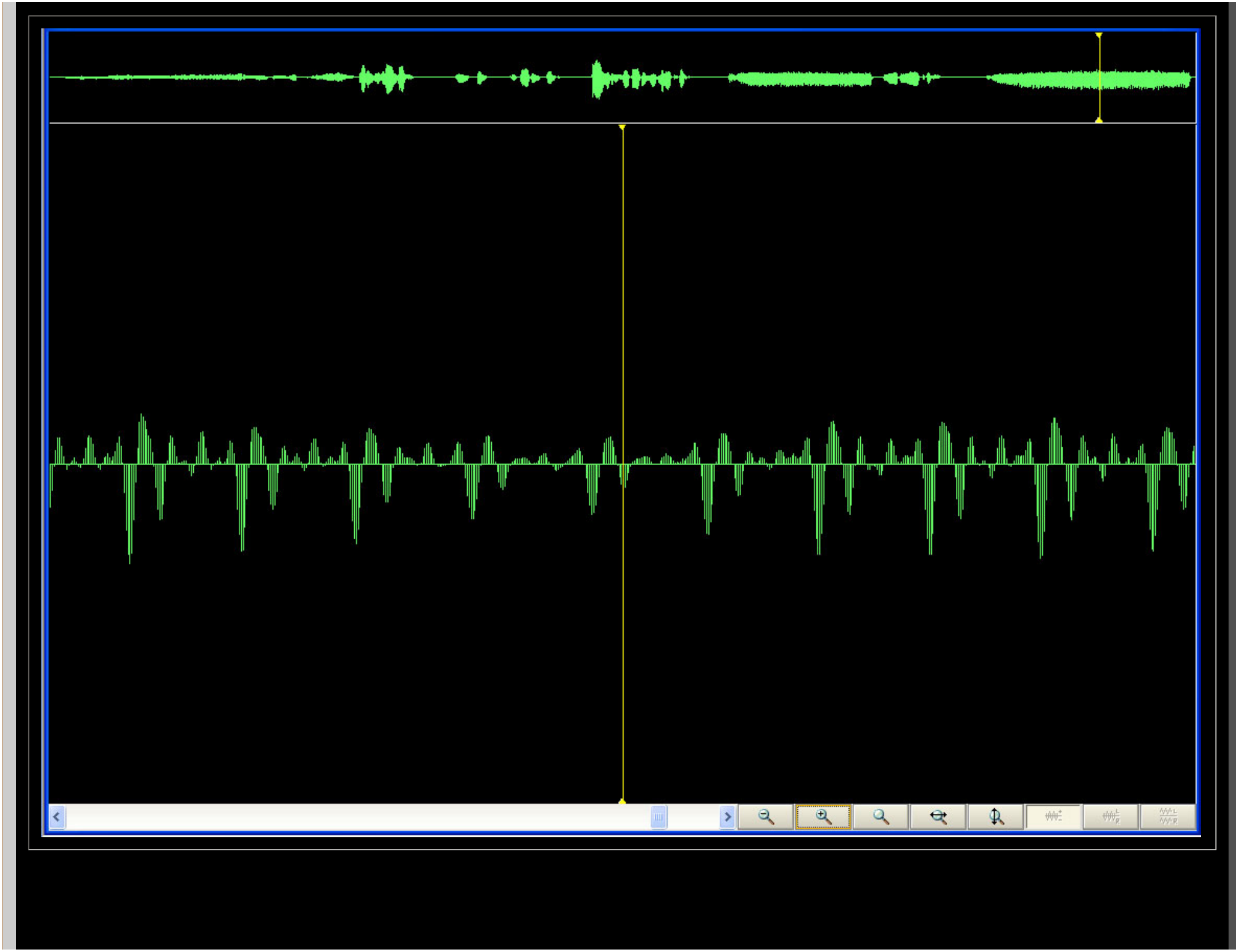


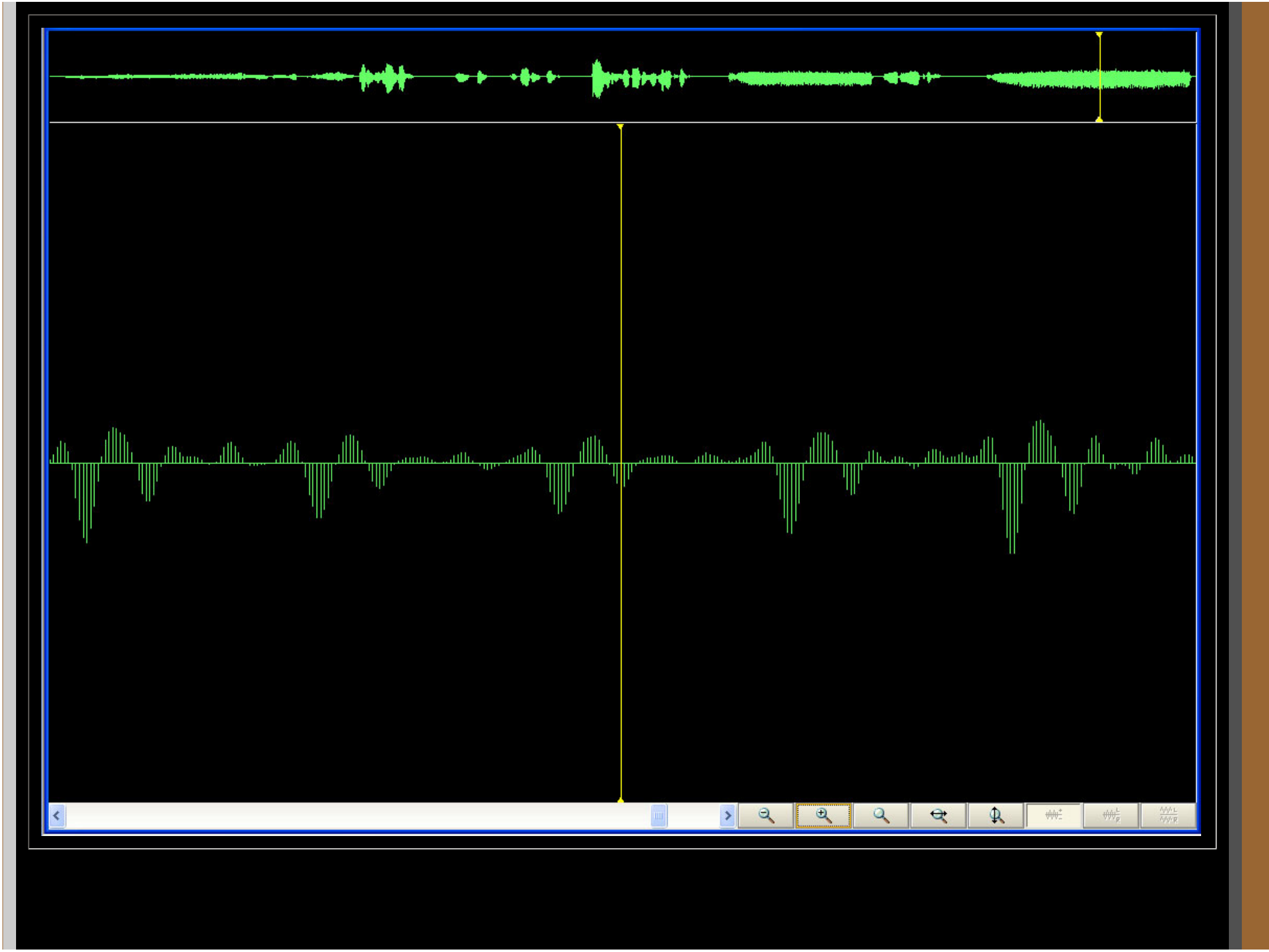


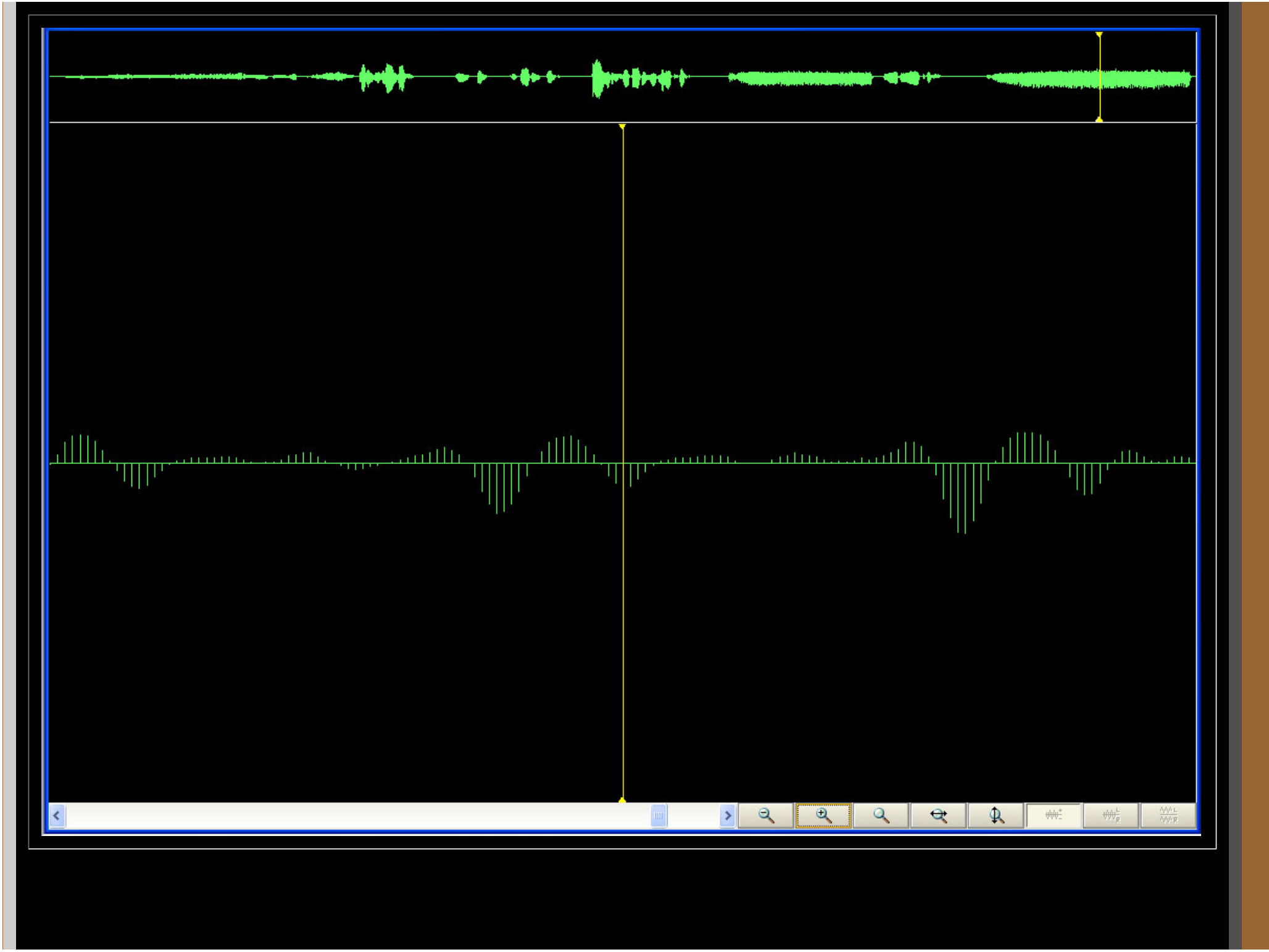


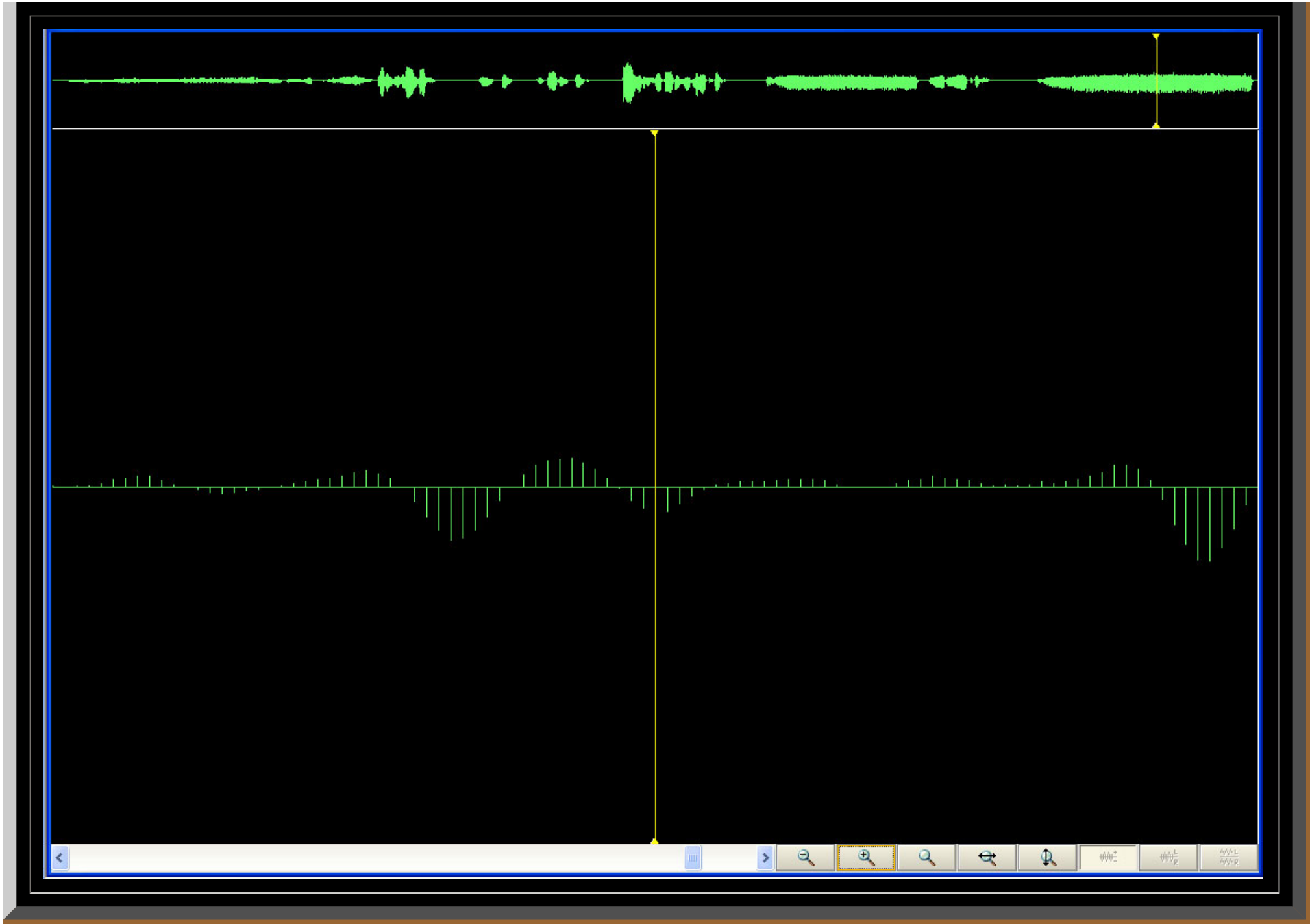












Do individuals who can easily replicate this pattern have a greater or lesser likelihood of sleep apnea?
Is there a relationship at all?  It might be an interesting question to pusue!

References

Wikipedia, Stalagtite, http://en.wikipedia.org/wiki/Stalagmite
Wikipedia, Uvula, http://en.wikipedia.org/wiki/Uvula
Wikipedia, Uvular Trill, http://en.wikipedia.org/wiki/Uvular_trill
**Persistent URL: http://deepblue.lib.umich.edu/handle/2027.42/58219**

Software used:

Adobe Photoshop
WavePad Master's Edition, NCH Software.

***Solstice: An Electronic Journal of Geography and Mathematics*,**
**Volume XIX, Number 1**
**Institute of Mathematical Geography (IMaGe).**

**Please contact an appropriate party concerning citation of this article: sarhaus@umich.edu**
**http://www.imagenet.org**

# Deep Blue: IMaGe Author Applets

Sandra Lach Arlinghaus
Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment

With this issue of *Solstice*, all volumes of IMaGe publications now have a persistent url in Deep Blue, the permanent electronic archive at The University of Michigan Library. Look at the Deep Blue IMaGe home page: http://deepblue.lib.umich.edu/handle/2027.42/58219 . If you are a *Solstice* author, please refer to this permanent url as well as to any live links you might normally cite. Readers interested in online archiving of this sort might be interested in following links in the references below that pertain to "D Space."

Notice on the IMaGe home page in Deep Blue that there is a button near the top that says "Authors." A click on that will bring up a list that includes all IMaGe authors of books, all IMaGe authors who have given permission to have their individual works archived under their own names in Deep Blue, and all co-authors of such authors (an indirect generation) also in Deep Blue.

In this note, Java applets are used to portray various relations among IMaGe authors and others as well as to exhibit the structure of IMaGe publications. The applet in Figure 1 shows the general structure of IMaGe publications. Successive figures, Figures 2, 3, 4, and 5, exhibit detail within various publication series. Pull the root (in red) around and rearrange author or other groupings to look for pattern. Hit the scramble button and see where the labels settle in an equilibrium position.

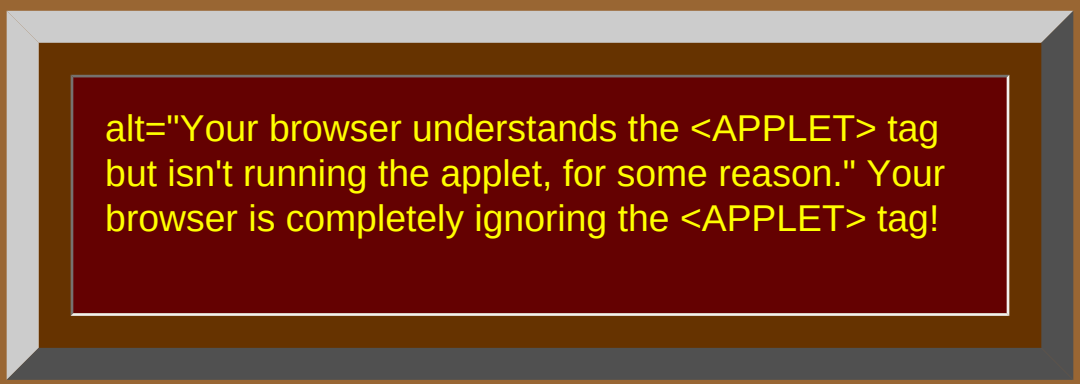



Figure 1. IMaGe publications.

alt="Your browser understands the <APPLET> tag but isn't running the applet, for some reason." Your browser is completely ignoring the <APPLET> tag!

Figure 2. IMaGe eBook series.

alt="Your browser understands the <APPLET> tag but isn't running the applet, for some reason." Your browser is completely ignoring the <APPLET> tag!

Figure 3. IMaGe Monograph Series.

The inner ring in Figure 4 represents author names from the first decade (1990-1999) of publication. The outer ring represents author names from the second decade (2000-present) of publication. The intermediate ring represents author names publishing in both decades, as a visual bridge from one decade to the next.

alt="Your browser understands the <APPLET> tag but isn't running the applet, for some reason." Your browser is completely ignoring the <APPLET> tag!

Figure 4. Solstice: An Electronic Journal of Geography and Mathematics.

alt="Your browser understands the <APPLET> tag but isn't running the applet, for some reason." Your browser is completely ignoring the <APPLET> tag!

Figure 5. IMaGe Reprint series.

Not all IMaGe authors have yet indicated that they wish to be directly included in Deep Blue (such indication is a prerequisite to inclusion). If all were to so indicate, then the applets above would enlarge substantially.

The applet in Figure 6 represents the research collaboration graph showing IMaGe authors in Deep Blue who have co-authors in Deep Blue that are NOT also IMaGe authors. While the applets in Figures 1-5 illustrate collaboration opportunities within the shell of IMaGe, the applet in Figure 6 suggests IMaGe's existing collaboration opportunities within the broader, but still limited, Deep Blue context (over 40,000 entries in Deep Blue at the time of the writing of this note).

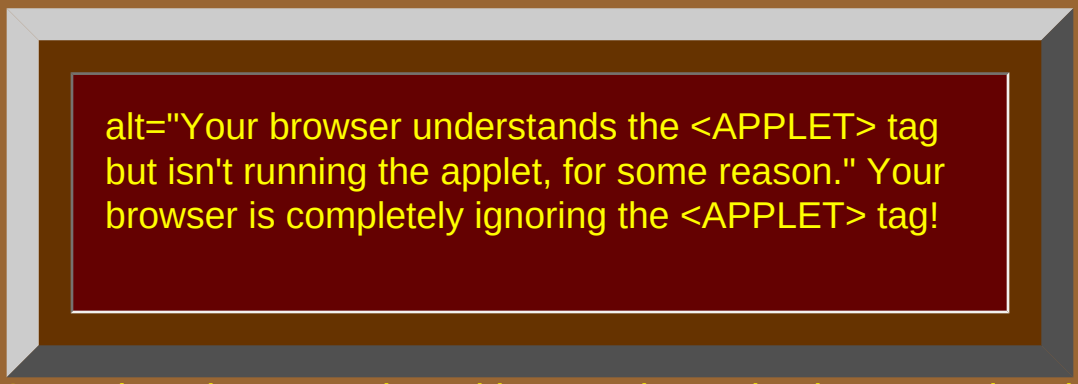



Figure 6. IMaGe authors in Deep Blue with co-authors also in Deep Blue that are NOT also IMaGe authors.

One might extend the process to include all entries in d-space or other broader collaboration environments. J. Grossman has, for many years, done elaborate research in mathematics involving graph-theoretic analyses of the "Erdös" number of an author as it represents research collaboration. He has captured the information in a wide variety of manners, including graphically.

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References:

DSpace:

- DSpace home: http://www.dspace.org/
- Wikipedia article: http://en.wikipedia.org/wiki/DSpace

Grossman, Jerrold. The Erdös Number Project. http://www.oakland.edu/enp/

The author thanks Jim Ottaviani and Karl Longstreth, both of The University of MIchigan Library.

*If you detect errors or omissions, please contact the author directly.*

***Solstice: An Electronic Journal of Geography and Mathematics*,**
**Volume XIX, Number 1**
**Institute of Mathematical Geography (IMaGe).**

**Please contact an appropriate party concerning citation of this article: sarhaus@umich.edu**
**http://www.imagenet.org**

# Mail

## List of Individuals who sent e-mail subsequent to the last issue.

Jonathan Mayer
Estelle Cashman
Karen Hart
Waldo Tobler
Harold Moellering
Andrea Frank
Joan Gerard

# SOLSTICE ARCHIVES

Click the issue you wish to read; Volumes I to V are typeset using TeX. For typeset TeX articles containing images, see the Monograph Series. 

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## 2007
**Volume XVIII, Number 2, 2007**

- **Special Issue on Projective Geometry Constructions**
- **Sandra Lach Arlinghaus, Geo/metry/graphy -- Visual Unity**
- **Sandra Lach Arlinghaus, The Animated Pascal**
- **Sandra Lach Arlinghaus, Desargues's Two-Triangle Theorem**
- **Announcement and Invitation: New Student Series in IMaGe eBooks**
- **In Memoriam: Allen K. Philbrick; Norton S. Ginsburg**
- **Mail**
- **Solstice Archive**

## 2007
**Volume XVIII, Number 1, 2007**

**Front matter: June, 2007.**
**Editorial Board, Advice to Authors, Mission Statement.**

**Awards**

**Article (reviewed)**
**Peter Martin, Spatial Analysis through the Looking Glass**

**Announcement**
**Sandra Lach Arlinghaus, *3D Atlas of Ann Arbor, 3rd Edition***

**Notes**

- **Diana Sammataro: Update on the Varroa Mite Map [with Editorial Commentary]**
- **Editorial Commentary on Essays of this Section**
  - **Goutami Bandyopadhyay: The Prediction of Indian Monsoon Rainfall: A Regression Approach**

- Goutami Bandyopadhyay and Surajit Chattopadhyay: Autocorrelation Structure Analysis and Auto Regressive Prediction of the Time Series of Mean Monthly Total Ozone overArosa, Switzerland

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**2006**
Volume XVII, Number 2, 2006
**SPECIAL ISSUE ON INTERNET GEOMETRY AND GEOGRAPHY**

**Front matter: December, 2006.**
Editorial Board, Advice to Authors, Mission Statement.

Awards

**Articles (reviewed):**

- Introduction to the Special Issue
- **Sandra L. Arlinghaus and Michael Batty. Visualizing Rank and Size of Cities and Towns**
  - Part I: England, Scotland, and Wales, 1901-2001
  - Part II: Greater London, 1901-2001
- **Sandra Lach Arlinghaus. Visualizing a Map of Walter Christaller, Poland 1941**
  - Part I: Benchmarking the Map.
  - Part II: Interpolation of the Benchmarked Map.

**Notes:**

- **Diana Sammataro: Update on the Varroa Mite Map**
- **Sandra Lach Arlinghaus:**
  - *Announcement: 3D Atlas of Ann Arbor, 2nd Edition*;
  - Banda Aceh: A View on the Globe

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**2006**
Volume XVII, Number 1, 2006

Cover

**Front matter: June, 2006.** Editorial Board, Advice to Authors, Mission Statement. Awards

**Articles (reviewed):**

- **Waldo Tobler.** Looking at Some Data from Isard **From a presentation given at the Western Regional Science Association in Santa Fe, New Mexico, February, 2006.**
- **Sandra L. Arlinghaus and William C. Arlinghaus. Maps and Decisions:** Part II--Ambiguity; Part III--Redistricting; Part IV--Club Data
- **Sandra Lach Arlinghaus. 3D Atlas of Ann Arbor: The Google EarthÃ‚Â® Approach** Part I; Part II

**Research Announcement:**

- **Sandra L. Arlinghaus and Michael Batty.** Zipf's Hyperboloid?

**Book Reviews:**

- **Wildberger, Norman.** *Divine Proportions: Rational Trigonometry to Universal Geometry.* **Review by S. Arlinghaus**

**Puzzle:**

- **William C. Arlinghaus.** PseudoCoupÃ‚Â® : A Psubtle Puzzle
- Link to Solution

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**2005**
Volume XVI, Number 2, 2005

- Cover
- **Front matter: Winter, 2005.** Editorial Board, Advice to Authors, Mission Statement.
- Awards

**Articles (reviewed):**

- **Veronique Van Acker and Frank Witlox** Exploring the Relationships between Land-use System and Travel Behaviour Concepts: Some First Findings **[ed.] This file displays best in Microsoft Internet Explorer or Avant browsers**
- **Waldo Tobler** Using Asymmetry to Estimate Potential **From a talk given in Redondo Beach, CA--1005.** [ed.] Readers who enjoy Professor ToblerÃ¢â‚¬â„¢s article may also wish to consider work by Jerrold Grossman involving Research on Collaboration in Research, http://www.oakland.edu/enp/research.html, and related topics on Professor GrossmanÃ¢â‚¬â„¢s home page, http://personalwebs.oakland.edu/~grossman/
- **John D. Nystuen** Photo Essay: The Emerald Ash Borer **Photos in this essay looked best using screen set at highest resolution available.**
- **Sandra L. Arlinghaus and William C. Arlinghaus** Beyond the Shadow **Variation on a submission for the Pirelli Relativity Challenge of 2005.**
- *NEWS: UPDATE ON THE 3D ATLAS OF ANN ARBOR*
  - **Sandra Lach Arlinghaus Archimedes in Ann Arbor?**
  - **Alyssa J. Domzal, Ui Sang Hwang, and Kris J. Walters, Jr. Virtual Flood in the Allen Creek Floodplain and Floodway**
- Mail
- Solstice Archive

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**2005**
**Volume XVI, Number 1, 2005**

- Cover
- **Front matter: Winter, 2005.** Editorial Board, Advice to Authors, Mission Statement.
- Awards

## In Memoriam

- Frank Harary
- Saunders Mac Lane

## Articles (reviewed):

- **Sandra Lach Arlinghaus**

  Spatial Synthesis
  The Evidence of Cartographic Example: Hierarchy and Centrality
- **Sandra Lach Arlinghaus et al.**

  Kioskland: A Strategy for Linking Hierarchical Levels of Virtual Reality Maps

## Research Announcements

- **Ann Evans Larimore with Sandra Lach Arlinghaus and Robert Haug**

  A Methodology for Historical Geography: Internet Implementation
- **Sandra Lach Arlinghaus**

  Spatial Synthesis: Investigations in Progress

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**2004**
Volume XV, Number 1, 2004

- Cover
- **Front matter: Summer, 2004.** Editorial Board, Advice to Authors, Mission Statement.
- Awards **to Solstice Authors**

## Articles (reviewed, except where noted):

- **Sandra Lach Arlinghaus and William Charles Arlinghaus**

  Spatial Synthesis Sampler. Geometric Visualization of Hexagonal Hierarchies: Animation and Virtual Reality
- **Klaus-Peter Beier** One Optimization of an Earlier Model of Virtual Downtown Ann Arbor
- **Frank J. A. Witlox, Aloys W. J. Borgers, Harry J. P. Timmermans** Modelling Locational Decision Making of Firms Using Multidimensional Fuzzy Decision Tables: An Illustration
- **Sandra L. Arlinghaus, Fred J. Beal, and Douglas S. Kelbaugh** The View from the Top: Visualizing Downtown Ann Arbor in Three Dimensions
- **Marc Schlossberg** Visualizing Accessibility II: Access to Food
- **Peter A. Martin** Energy Flow: Spatial and Temporal Patterns
- **Alma S. Lach** Winter Windows: Ice Largo
- **Seung-Hoon Han** Spatial Analysis of Subway Zones in Boston, Massachusetts
- **Andrew Walton** A Golfer's Resource: Huron Hills Golf Course, Ann Arbor,

Michigan

- **Thana Chirapiwat (link to his server, unreviewed material)** Visualization of Geographic Information with VRML

---

**2004**

Volume XV, Number 2, 2004

- Cover
- **Front matter: Winter, 2004.** Editorial Board, Advice to Authors, Mission Statement.
- Awards

**Articles (reviewed):**

- **Sandra Lach Arlinghaus** Spatial Synthesis: 3D Atlas of Ann Arbor
- **Peter Martin** Cross-discipline Analogy: Information Impedance Matching
- **Sandra Lach Arlinghaus** Goode's 80th!

## Notes, Research Announcements, and Observations

- **Gottfried Hogh** Continental USA Travel Tracks
- **Sandra Arlinghaus and Braxton Blake** Two Rivers Ridge: Capturing Art

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**2003**

Volume XIV, Number 1, 2003

- Cover
- **Front matter: Summer, 2002.** Editorial Board, Advice to Authors, Mission Statement.
- Awards **to Solstice Authors**

**Articles (reviewed):**

- **Sandra Arlinghaus, Michael Batty, and John Nystuen** Animated Time Lines: Coordination of Spatial and Temporal Information
- **Sutapa Chaudhuri and Surajit Chattopadhyay** Viewing the relative importance of some surface parameters associated with pre-monsoon thunderstorms through Ampliative Reasoning
- **Kulwinder Kaur** On $L^1$-Convergence of Modified Sine Sums

  **TeX file link.**
- **Sandra Lach Arlinghaus**
  1. Ann Arbor, Michigan: Virtual Downtown Experiments
  2. Tornado Siren Location: Ann Arbor, Michigan

**Special section, I, on Ann Arbor, Michigan.**

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Volume XIV, Number 2, 2003

- Cover
- **Front matter: Winter, 2003.** Editorial Board, Advice to Authors, Mission Statement.
- Awards **to Solstice Authors**

**Articles (reviewed):**

- **Sandra Arlinghaus, Robert Haug, Ann Larimore** Lewis and Clark, 200 Years: A Visual Tribute to an Exploration. The Gates of the Rocky Mountains.
- **Surajit Chattopadhyay**

  Dependence of Production of Paddy on the Total Annual Rainfall: A Different Approach

  Combating the complexity in spatial data: A neuronal approach
- **Sandra Lach Arlinghaus** Ann Arbor, Michigan: Virtual Downtown Experiments, Part II
- **Taejung Kwon, Adrien A. Lazzaro, Paul J. Oppenheim, Aaron Rosenblum** Ann Arbor, Michigan: Virtual Downtown Experiments, Part III

---

**2002**

Volume XIII, Number 1, 2002

- Cover
- **Front matter: Summer, 2002.** Editorial Board, Advice to Authors, Mission Statement.

**Research Note:**

- **Sandra Arlinghaus, Salma Haidar, and Mark Wilson**

  Animated Map Timeline, Syria

**Articles (reviewed):**

- **B. Derudder and F. Witlox**

  Classification Techniques in Complex Databases: Assessment of Vagueness and Sparsity in a Network of World Cities
- **John D. Nystuen**

  The ThÃƒÂ¼nen Society, North American Division
- **Sandra Lach Arlinghaus**

  The Lights Are On, All Over the World

---

**Mapping Projects, Urban Planning 507, 2002**
**The University of Michigan**
**(selections):**

**Interactive Internet Maps:**

- **Eun-Young Kim:**

  Bus Stops and Bus Users in the City of Detroit
- **Hyeyun Lee (also includes animated maps):**

  The Relationship between Bicycle Accidents and Lanes of Travel at Downtown Ann Arbor Intersections

**Animated Maps:**

- **Jeanine Chura McCloskey:**

Beach Closures in Oakland County, Michigan: Using GIS as an Investigative Tool

- **Makoto Noguchi:**

  The Possibility of Extending the Streetcar Line in Kagoshima City, Japan

Materials Received

Volume XIII, Number 2, 2002

- Cover
- **Front matter: Winter, 2002.** Editorial Board, Advice to Authors, Mission Statement.

**Articles (reviewed):**

- **Marc Schlossberg** Visual Accessibility with GIS
- **Robert F. Austin** Cost Proxy Models in Rural Telephone Companies
- **Surajit Chattopadhyay** Predicting Pre-monsoon Thunderstorms--A Statistical View through Propositional Logic
- **Robert F. Austin and Porter E. Childers** Disaggregation and Targeting of Universal Service Support
- **Kulwinder Kaur, Babu Ram, and S. S. Bhatia,** TeX file **for the reader to run LaTeX, or, a .pdf below:** $L^1$-Convergence of Cosine Series with Hyper Semi Convex Coefficients
- **Sandra L. Arlinghaus and William C. Arlinghaus** Spatial Synthesis: A Research Program

**2001**
**Volume XII, Number 1, 2001**

- Cover
- **Front matter: Summer, 2001**
  - Editorial Board, Advice to Authors, Mission Statement.
  - Update from Diana Sammataro: Varroa Mite Animated Map
- **Articles:**
  - **John D. Nystuen, Photo Essay.** Water Rustlers? (High-speed connection recommended.)
  - **Sandra L. Arlinghaus and William C. Arlinghaus** The Neglected Relation
  - **Sandra Lach Arlinghaus** Maps and Decisions: Allen's Creek Floodplain, Opportunity or Disaster?

- **Book Reviews:**
  - **Kameshwari Pothukuchi reviewer of: Fast Food Nation: The Dark Side of the All-American Meal by Eric Schlosser, New York: Houghton Mifflin, 2001.**
  - **Richard R. Wallace reviewer of: High Technology and Low-Income Communities: Prospects for the Positive Use of Advanced Information Technology edited by Donald A. SchÃƒÂ¶n, Bish Sanyal, and William J. Mitchell, MIT Press, 1999.**

---

**Volume XII, Number 2, 2001**

- Cover
- **Front matter: Winter, 2001--Editorial Board, Advice to Authors, Mission Statement.**
- **Articles:**
  - **Waldo Tobler, Spherical Measures without Spherical Trigonometry**
  - **John D. Nystuen, What's At Home? Shelter for the Poor in Low Income Cities**
  - **Sandra Lach Arlinghaus, Base Maps, Buffers, and Bisectors**

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**2000**

**Volume XI, Number 1, 2000**

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**Front matter: Summer, 2000**

Editorial Board, Advice to Authors, Mission Statement.

**John D. Nystuen**

Set in Stone: An Analemma in Northern Italy

**Richard Wallace**

Personal Reflections on Solar Power

**Sandra Lach Arlinghaus**

Animaps, IV: Of Time and Place

On a slow modem this article will take a long time to load.

Book Review.

Review of: Arundhati Roy, *The Cost of Living*, Modern Library, 1999, 126 pp., $11.95 (pap.).
**Reviewer: Richard Wallace.**

---

**Volume XI, Number 2, 2000**

Cover

**Front matter: Winter, 2000**

Editorial Board, Advice to Authors, Mission Statement.

**To the Memory of Donald Frederick Lach, 1917-2000**
Dedication
**John D. Nystuen, Photo Essay**
Fifty Years of Spatial Analysis: A Symposium in Honor of William L. Garrison 1950-2000
(High-speed connection recommended.)
**Sandra L. Arlinghaus and Lloyd R. Phillips**
A Neighborhood Information System within Ann Arbor, Michigan
**Courtney Gober**
Animaps, Again
**Nakia D. Baird**
Animap Sequences
(High-speed connection recommended)

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**1999**
**Volume X, Number 1, 1999**
Cover
**Front matter: Summer, 1999.** Editorial Board, Advice to Authors, Mission Statement.
**Dedication** To John D. Nystuen, on the occasion of his retirement from The University of Michigan
**John D. Nystuen,** Metropolitan Mining: Institutional and Scale Effects on the Salt Mines of Detroit
**Sandra L. Arlinghaus and William C. Arlinghaus.** Animaps III: Color Straws, Color Voxels, and Color Ramps.
**Richard Wallace. Book Review:** AndrÃƒÂ© I. Khuri, Thomas Mathew, and Bimal K. Sinha, Statistical Tests for Mixed Linear Models**, John Wiley & Sons, 1998, 352 pp., $69.95 (cloth).**
**Seema Desai Iyer. Book Review:** Castells, Manuel (1996). The Rise of the Network Society (The Information Age: Economy, Society and Culture, Volume 1). **Malden, MA: Blackwell Publishers, Inc. (556 pages, bibliography 51 pages, index 23 pages).**

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**Volume X, Number 2, 1999**
Cover
**Front matter: Winter, 1999**
Editorial Board, Advice to Authors, Mission Statement.
E-mail from readers
Festschrift: Nystuen CD
**Jeffrey A. Nystuen**
Listening to Raindrops
**Sandra L. Arlinghaus**

A Map of Jackson, Mississippi

**Books Received; Brief Summaries:**

Julius S. Bendat, Nonlinear Systems Techniques and Applications

Paul M. DeRusso, Rob J. Roy, Charles M. Close, Alan A. Desrochers, State Variables for Engineers

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**1998**

**Volume IX, Number 1, 1998**

**Cover and table of content**

**Front matter: Summer, 1998. Editorial Board, Advice to Authors, Mission Statement.**

**Sandra L. Arlinghaus, William D. Drake, and John D. Nystuen with data and other input from: Audra Laug, Kris S. Oswalt, and Diana Sammataro. Animaps.**

**Frank E. Barmore (reprinted, in part, from The Wisconsin Geographer (with permission)). Spatial Analysis, the Wisconsin Idea and the UW-System. The Use and Abuse of Dispersion Statistics**

**Sandra L. Arlinghaus, Ruben De la Sierra. Revitalizing Maps or Images?**

**John D. Nystuen. Book Review: The Universe Below by William J. Broad (New York: Simon and Schuster, 1997, 432 pages)**

---

**Volume IX, Number 2, 1998**

**Cover**

**Front matter: Winter, 1998. Editorial Board, Advice to Authors, Mission Statement.**

**Sandra Lach Arlinghaus. Animated Four Color Theorem: Sample Map.**

**Sandra Lach Arlinghaus. Animaps, II.**

**Daniel Albert. Book Review: Rising Tide: The Great Mississippi Flood of 1927 and How it Changed America, by John M. Barry**

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**1997**

**Volume VIII, Number 1, 1997**

**Front matter: Summer, 1997 Editorial Board, Advice to Authors, Mission Statement.**

**Author: John D. Nystuen. Why Whales Don't Freeze or Kidney-Shaped Airports: Spatial Analysis and Spatial Design.**

**Author: Frank Harary. To the Memory of Clyde Tombaugh, 1906-1997.**

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**Volume VIII, Number 2, 1997**

**Front matter: Winter, 1997. Editorial Board, Advice to Authors, Mission Statement.**

**John D. Nystuen. The Photographic Record. SunSweep: A Visit on the Summer Solstice.**

**Sandra L. Arlinghaus, Frederick L. Goodman, Daniel A. Jacobs. Buffers and Duality.**

**Sandra L. Arlinghaus, William C. Arlinghaus. A Graph Theoretic View of the Join-Count**

Statistic.

John D. Nystuen, Andrea I. Frank. Differences in Feature Representation in Digital Map Bases.

**1996**

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John D. Nystuen, Rhonda Ryznar, Thomas Wagner. "The Greening of Detroit, 1975-1992: Physical Effects of Decline."
Sandra Lach Arlinghaus. "Algebraic Aspects of Ratios."
Daniel Jacobs. "U.S. Route 12 Buffer."

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Sandra Lach Arlinghaus. "Web Fractals: An Overview."
Sandra Lach Arlinghaus. "Part II. Elements of Spatial Planning. Theory. Merging Maps: Node Labeling Strategies."

**1995**

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Richard Wallace: "Motor Vehicle Transport and Global Climate Change: Policy Scenarios."
Sandra L. Arlinghaus, William C. Arlinghaus, John D. Nystuen: "Discrete Mathematics and Counting Derangements in Blind Wine Tastings."

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Sandra Lach Arlinghaus: "Elements of Spatial Planning: Theory. Part I."

**1994**

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Virginia Ainslie and Jack Licate: "Getting Infrastructure Built. Cleveland Infrastructure Team Shares Secrets of Success."
Frank E. Barmore: "Center Here; Center There; Center, Center Everywhere."
Barton R. Burkhalter: "Equal-Area Venn Diagrams of Two Circles: Their Use with Real-World Data."
Sandra L. Arlinghaus, William C. Arlinghaus, Frank Harary, John D. Nystuen. "Los Angeles, 1994--A Spatial Scientific Study."

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**Sandra L. Arlinghaus, William C. Arlinghaus, Frank Harary: "The Paris Metro: Is its Graph Planar?"**
**Sandra Lach Arlinghaus: "Interruption!"**
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**1991**

**Volume II, Number 1, 1991**

**Sandra L. Arlinghaus, David Barr, John D. Nystuen: "The Spatial Shadow: Light and Dark--Whole and Part."**

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**Reprint. Saunders Mac Lane: "Proof, Truth, and Confusion, The Nora and Edward Ryerson Lecture at The University of Chicago in 1982."**
**Robert F. Austin: Digital Maps and Data Bases: Aesthetics versus Accuracy."**

**1990**

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**Reprint. William Kingdon Clifford: "Postulates of the Science of Space."**
**Sandra Lach Arlinghaus: "Beyond the Fractal."**
**William C. Arlinghaus: "Groups, Graphs, and God"**

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**John D. Nystuen: "A City of Strangers: Spatial Aspects of Alienation in the Detroit Metropolitan Region."**
**Sandra Lach Arlinghaus: "Scale and Dimension: Their Logical Harmony."**
**Sandra Lach Arlinghaus: "Parallels Between Parallels."**
**Sandra L. Arlinghaus, William C. Arlinghaus, and John D. Nystuen: "The Hedetniemi Matrix Sum: A Real-world Application."**
**Sandra Lach Arlinghaus: Fractal Geometry of Infinite Pixel Sequences: "Super-definition" Resoultion?"**

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# Press Clippings

**(quotation of entire text, when a link appears) and notations about IMaGe publications.**

## Recent:

- *3D Atlas of Ann Arbor, Version 2*. Rated a 5 globe production (top score) in Google Earth Community, November 2006.
- Urban 3D visualization, Ann Arbor News, front page, April 28, 2004.
- Tornado Sirens article, Ann Arbor News, front page, June 3, 2003 with follow-up July 10, 2003.

## Archived:

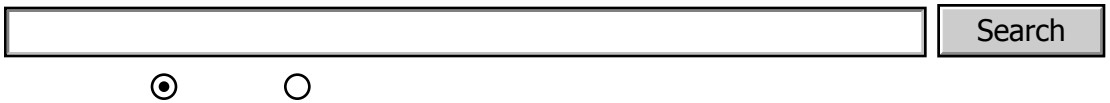
- From Ernestos Kostas, Entomology, Agriculture Western Australia, Plant Research and Development Services, A225, 3 Baron-Hay Court, South Perth, WA, notes that their bee pests and diseases page at http://www.agric.wa.gov.au:7000/ento/bee.htm now carries a link to a map in *Solstice* (with permission) at, http://www.agric.wa.gov.au:7000/ento/bee7.htm
- NASA News Excerpt, National Aeronautics and Space Administration and Goddard Space Flight Center, February 28, 2000 Press Release about work of Jeffrey Nystuen (see article in Solstice Volume X below)--GSFC Press Release 00-24. Or, click here to see a copy of the page to which that site was linked, for the first two weeks of March, 2000.
- *Science*, AAAS, 29 November, 1991. Article about Solstice.
- *Science News*, 25 January, 1992. Article about Solstice.
- *Newsletter*, Association of American Geographers, 1992
- *American Mathematical Monthly*, September 1992, in Telegraphic Reviews section notes Solstice as "one of the world's first electronic journals using TeX."
- *Harvard Technology Window*, 1993.
- *Graduating Engineering Magazine*, 1993.
- *Papers in Regional Science*: The Journal of the Regional Science Association. Vol. 72, No. 4, Oct. 1993. Gunther Maier and Andreas Wildberger, Wide Area Computer Networks and Scholarly Communication in Regional Science. "Only one journal in this directory can be considered to be related to Regional Science, Solstice: An Electronic Journal of Geography and Mathematics."
- *Earth Surface Processes and Landforms*, 18(9), 1993, p. 874.
- *On Internet*, 1994.
- *Professional Geographer*, Association of American Geographers.
- *Urban Specialty Group Newsletter*, Association of American Geographers.
- *Zentralblatt fur Mathematik*, Springer-Verlag, Berlin.
- *Mathematics Magazine*
- *Journal of the American Statistical Association*

## Citations to reviews of individual monographs (by number in monograph series):

- **I**MaGe Monograph 1, "Telegraphic Review," *The American Mathematical Monthly*, December, 1989.
- IMaGe Monograph 2, Sylvia L. Thrupp, Alice Freeman Palmer Professor of History, Emeritus, The University of Michigan.
- IMaGe Monograph 3, Essays on Mathematical Geography, *Mathematical Reviews* , 1990. Review by Dwight Read, Professor of Anthropology, UCLA.
- IMaGe Monograph 3, Essays on Mathematical Geography, "Telegraphic Review," *The American Mathematical Monthly*, May/June, 1989, Review by Lynn Arthur Steen.
- IMaGe Monograph 5, Essays on Mathematical Geography--II, *Mathematical Reviews* , 1990. Review by Dwight Read, Professor of Anthropology, UCLA.
- IMaGe Monograph 5, Essays on Mathematical Geography--II "Telegraphic Review, " *The American Mathematical Monthly*, May/June, 1989. Review by Lynn Arthur Steen.
- IMaGe Monograph 6, *The American Mathematical Monthly* March, 1990.
- IMaGe Monograph 6, *Mathematical Reviews* , Issue 90j. 1990.
- IMaGe Monograph 7, *The American Mathematical Monthly*, April, 1990.
- IMaGe Monograph 8, *The American Mathematical Monthly*, January, 1990.
- IMaGe Monograph 8, *Mathematics Magazine* , 1989.
- IMaGe Monograph 8, *Newsletter of the Urban Geography Specialty Group* of the AAG. 1990.
- IMaGe Monograph 8, *Zentralblatt fur Mathematik* , 1990.
- IMaGe Monograph 9, "Telegraphic Review," *The American Mathematical Monthly*, December, 1989.
- IMaGe Monograph 9, An Atlas of Steiner Networks in *Mathematical Reviews* by Michael B. Richey, January, 1991.
- IMaGe Monograph 11, "Telegraphic Review," *The American Mathematical Monthly*, December, 1990.
- IMaGe Monograph 12, *The Journal of Regional Science*, 1993.
- IMaGe Monograph 12, *The Journal of Classification*, 1993.
- IMaGe Discussion Papers (new series) 1, *Professional Geographer* , 1990.

  IMaGe Discussion Papers (new series) 1, *The American Mathematical Monthly*, 1990.

IMaGe publications are also archived in many of the standard online sources. Please e-mail us if you know of some other citation you think we should include.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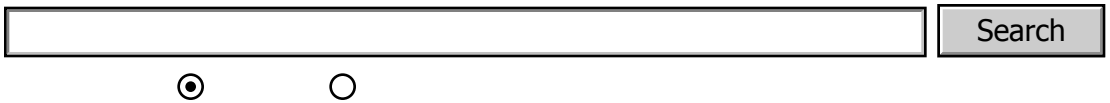
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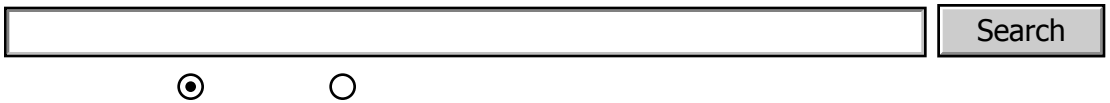
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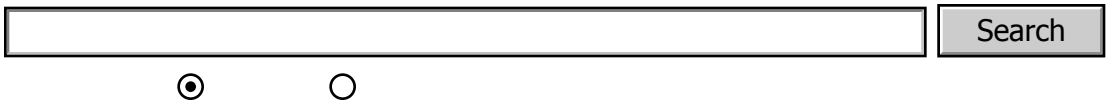
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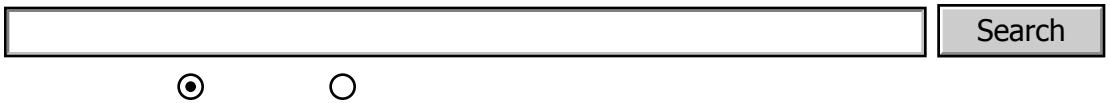
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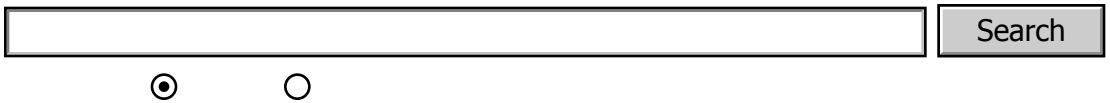
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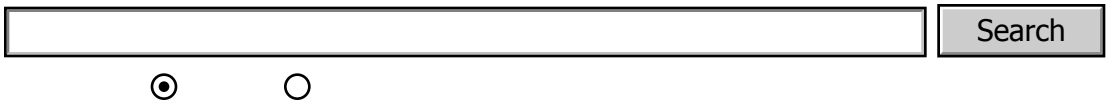
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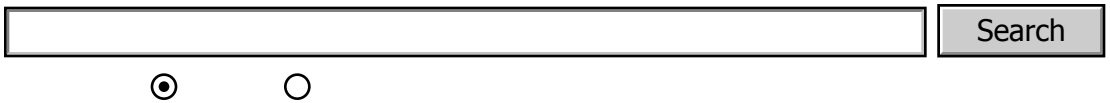
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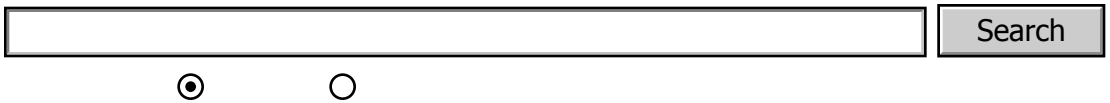
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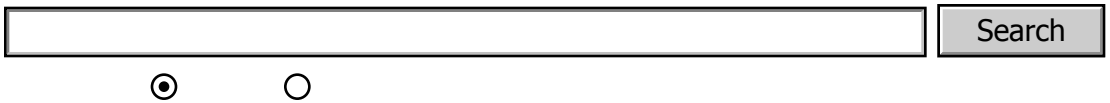
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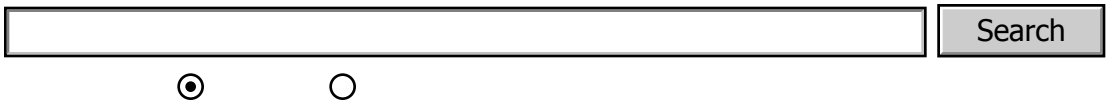
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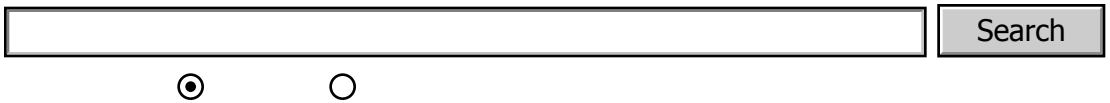
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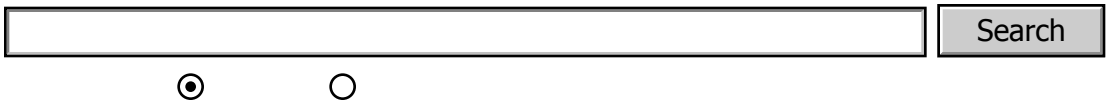
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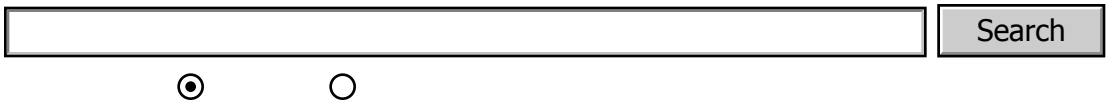
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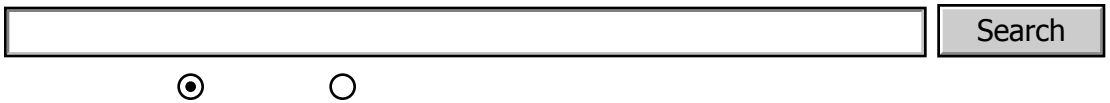
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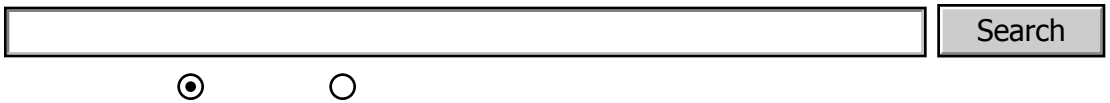
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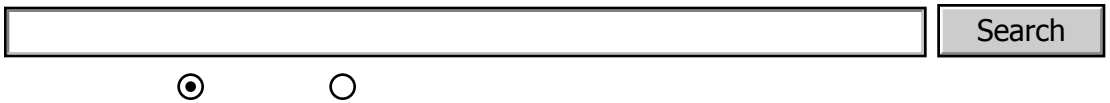
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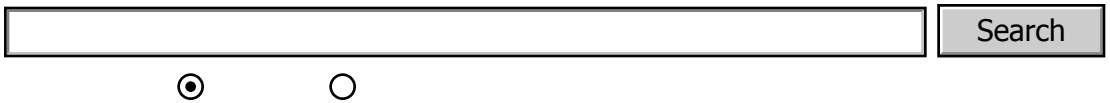
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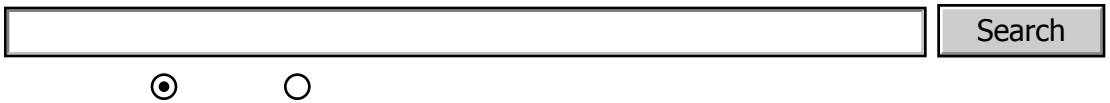
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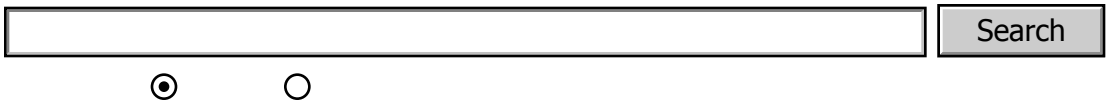
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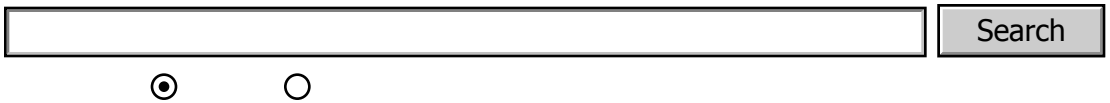
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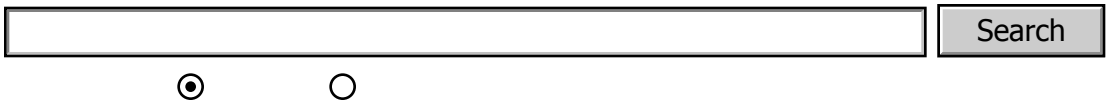
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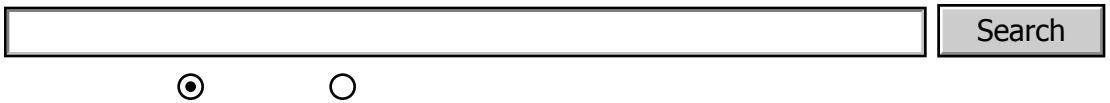
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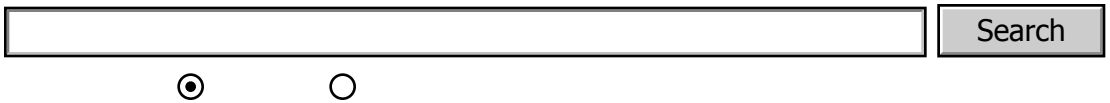
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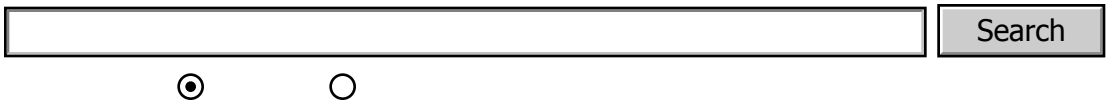
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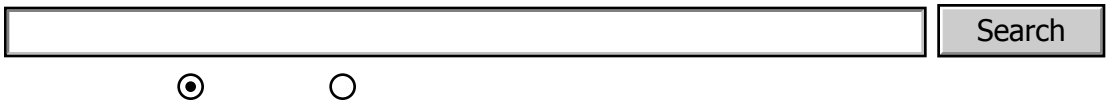
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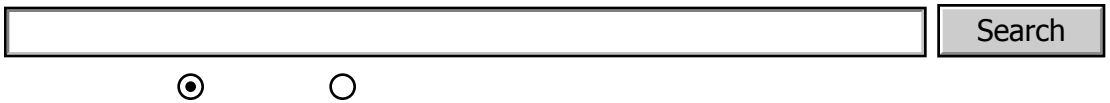
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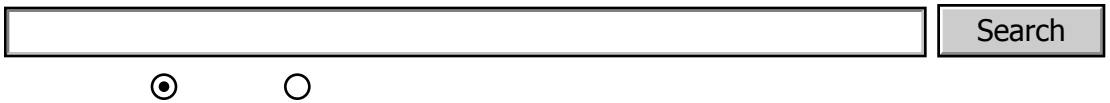
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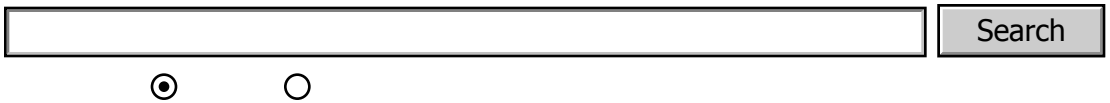
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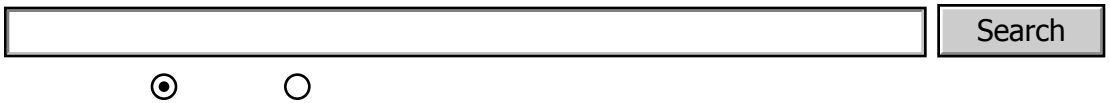
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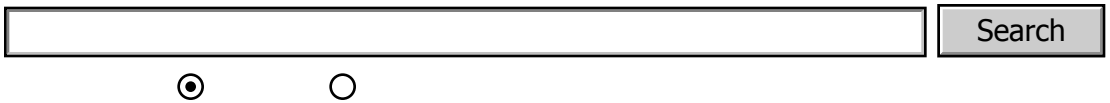
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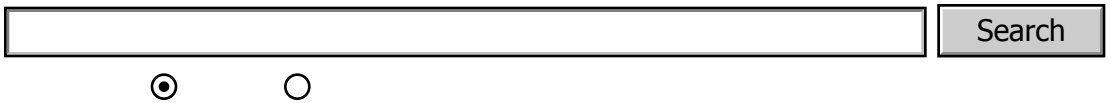
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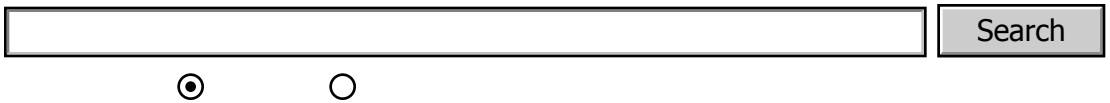
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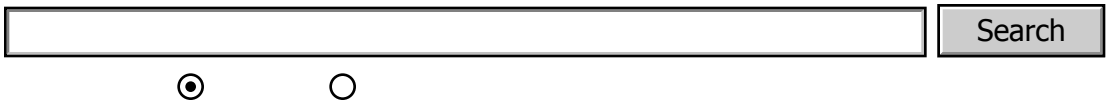
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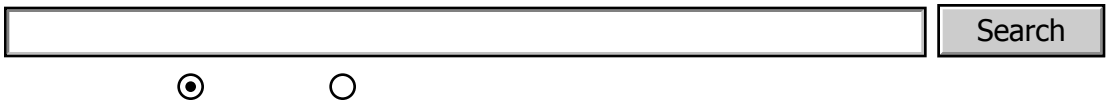
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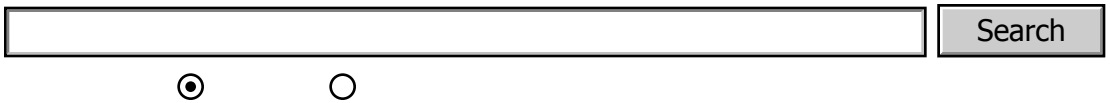
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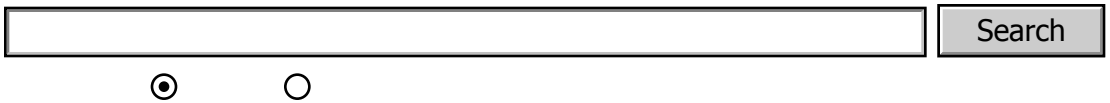
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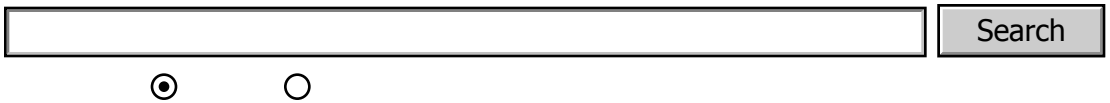
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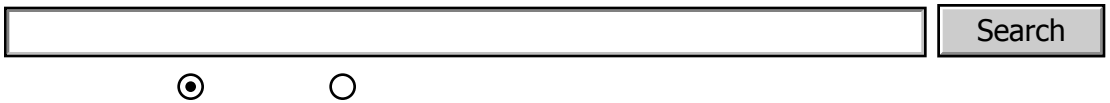
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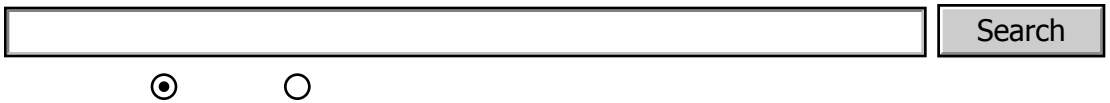
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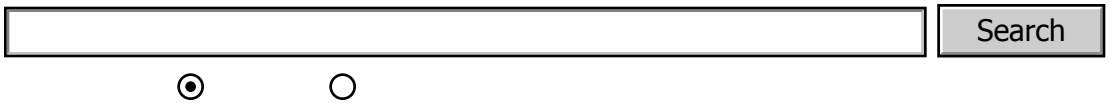
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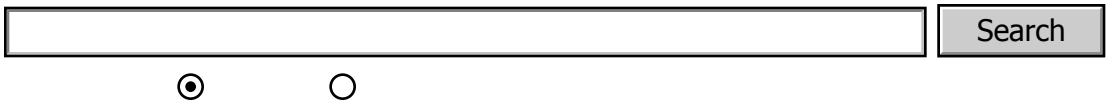
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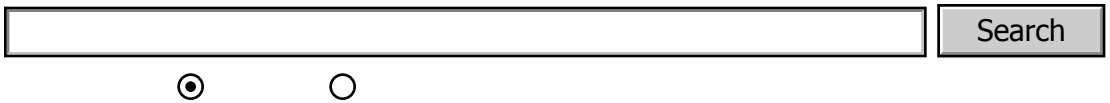
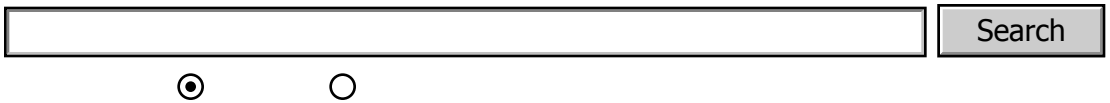
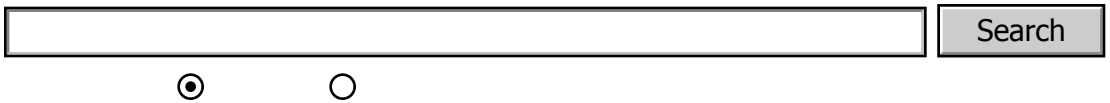
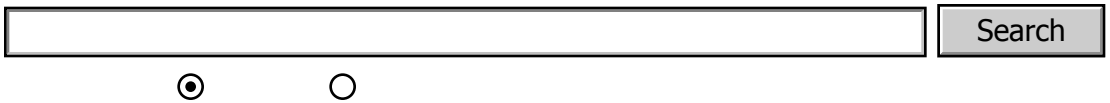
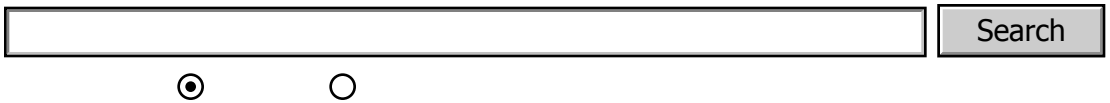
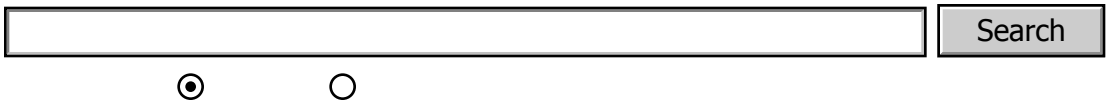

Search

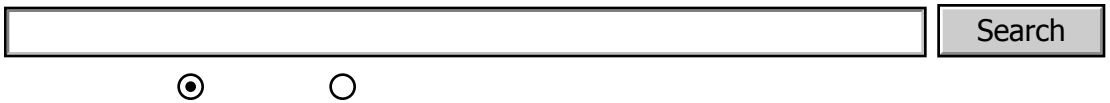

Search

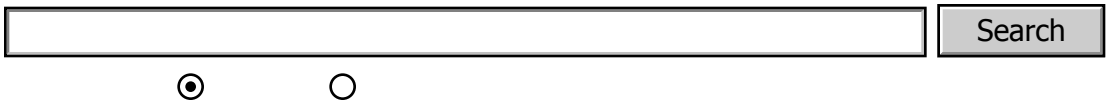

Search

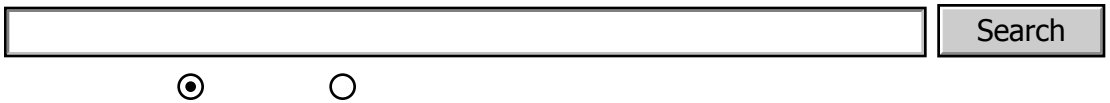

Search

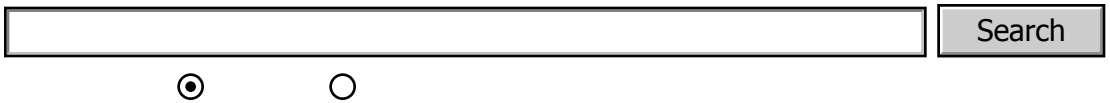

Search

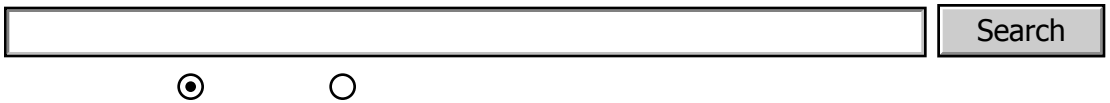

Search

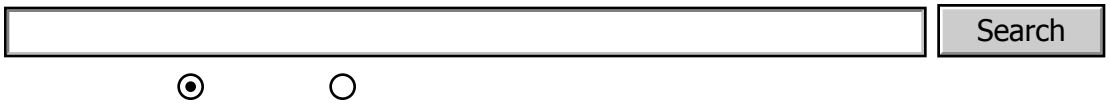

Search

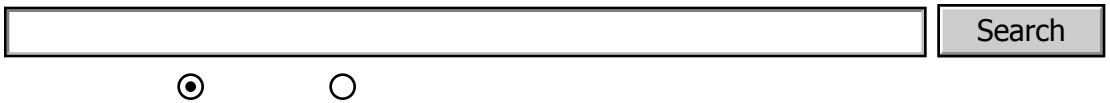

Search

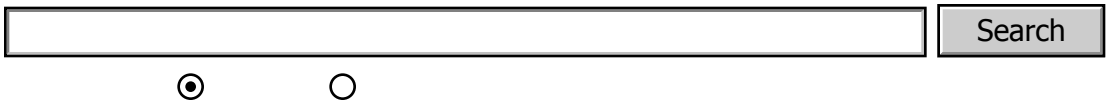

Search

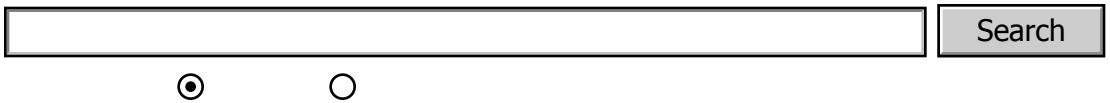

Search

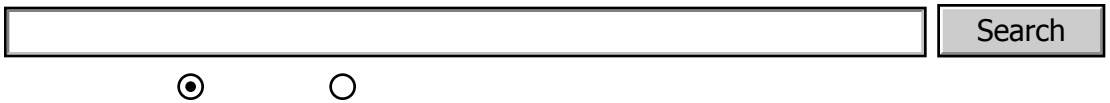

Search


Search


Search


Search

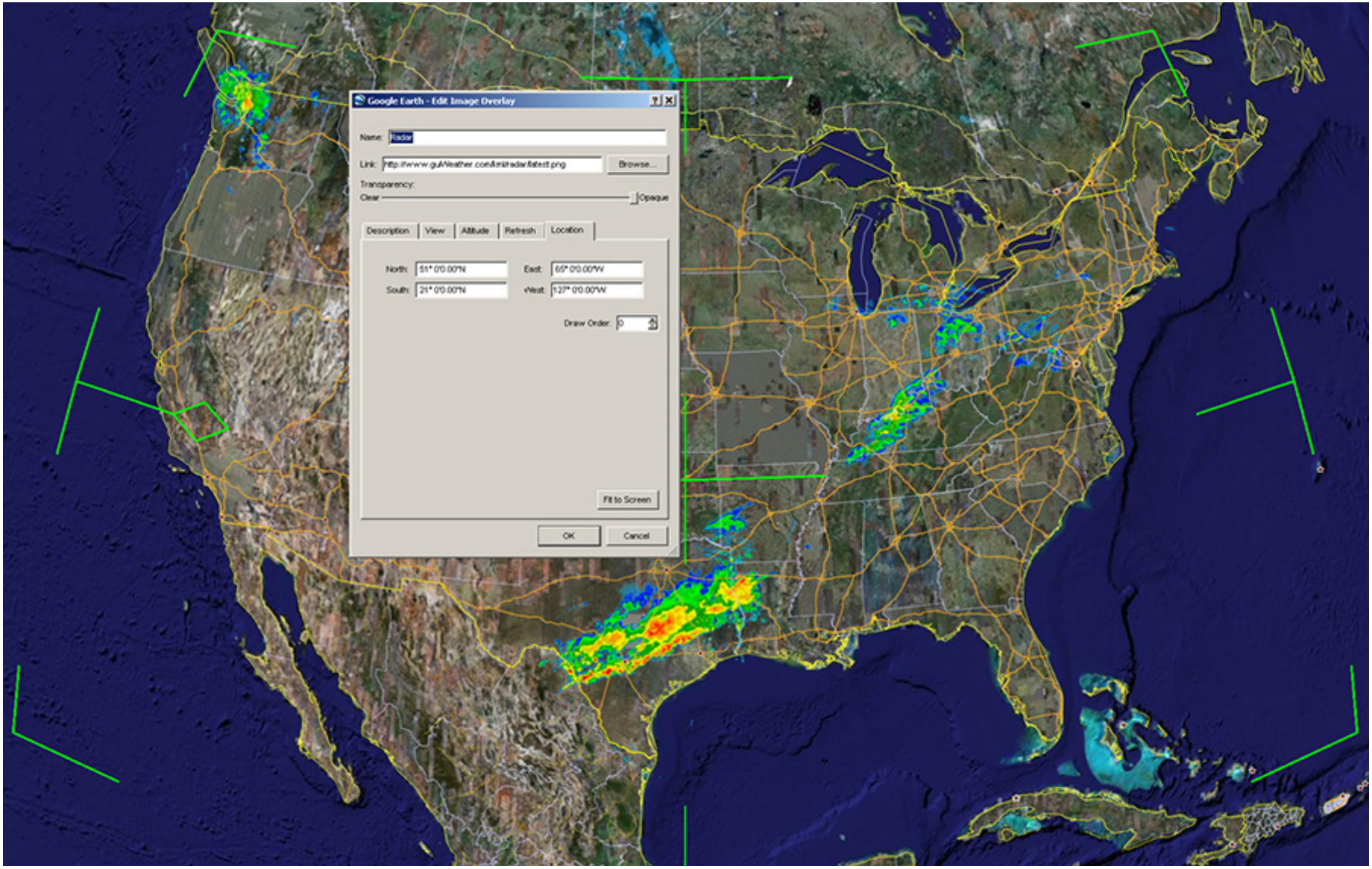

Search

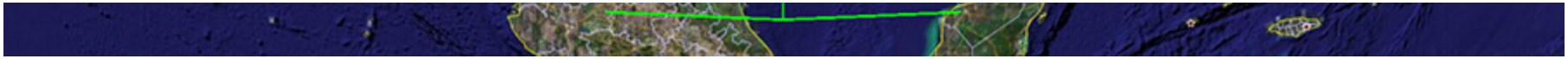

Search

**Real-time Animation Scripts for Google Earth**
**Lars Schumann**
**Manager, 3D Laboratory**
**Duderstadt Center**
**The University of Michigan**

The sequence of images below illustrates, in increasing complexity, the use of scripts to animate spatial pattern in Google Earth.

## Radar

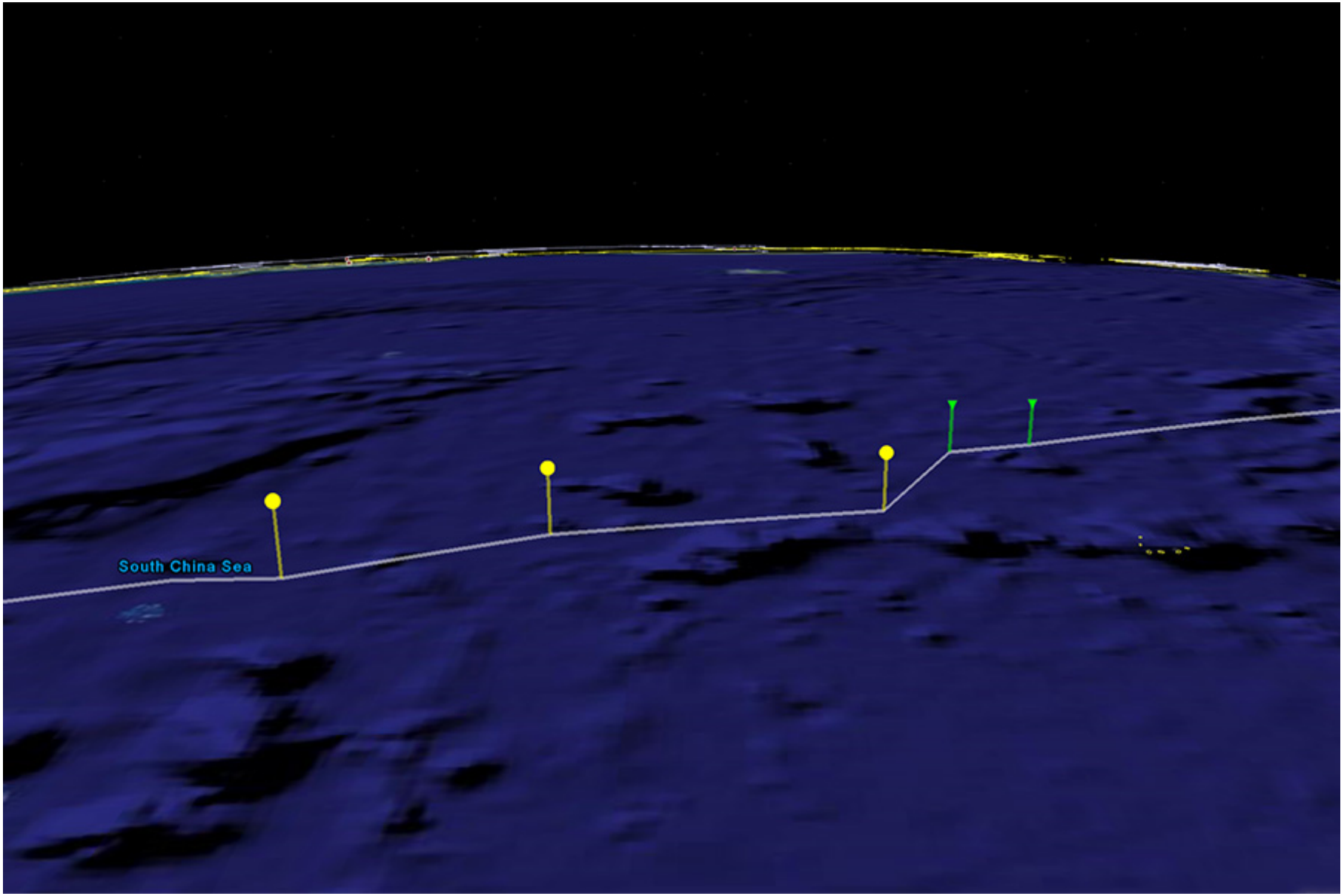




This image above is a really simple example. An image is constantly downloaded (every 60 seconds) and overlain with a rectangular area. The tags <**north**>, <**south**>, <**east**> and <**west**> refer to the bounding box, not to the units. Thus, <**east**>-65</**east**> means, that the eastern boundary of the image is 65° west of the meridian. The image has to be transparent, so .PNG is a good file format. You can check out the original image (it is large: 6200x3000). Also, here is a link to the file radar.kml. Download the free Google Earth to view it.

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
<GroundOverlay>
  <name>Radar</name>
  <Icon>
    <href>http://www.guiWeather.com/kml/radar/latest.png</href>
    <refreshMode>onInterval</refreshMode>
    <refreshInterval>60</refreshInterval>
  </Icon>
  <LatLonBox>
    <north>51</north>
    <south>21</south>
    <east>-65</east>
    <west>-127</west>
  </LatLonBox>
</GroundOverlay>
</kml>
```

## Anim01




This example is a little more complex. I started with a text description of all the points that I want to animate. The different components are separated by commas in anim.csv.

```
2007-01-01,121.0,17.0,10000,green
2007-01-02,119.7,17.0,12000,green
2007-01-03,118.5,16.5,14000,green
2007-01-04,117.6,16.1,16000,green
2007-01-05,117.3,16.0,18000,green
```

```
2007-01-06,117.0,15.4,20000,yellow
...
```

The format is pretty simple - the columns are: "time", "longitude", "latitude", "altitude", and "status". The status can be one of these elements ["green", "yellow", "red"].

I wrote a small Perl script create_kml.pl that reads this file and creates a .KML file. You can download the result anim.kml.

It is important that you define the style of a <**Placemark**> before you use it. This is useful if the same style is needed for multiple <**Placemark**>. Here is the definition of one:

```
...
<Style id="red">
  <IconStyle>
    <scale>0.5</scale>
    <Icon>
      <href>red.png</href>
    </Icon>
  </IconStyle>
  <LabelStyle>
    <scale>0.5</scale>
  </LabelStyle>
  <LineStyle>
    <color>7f0000ff</color>
    <width>5</width>
  </LineStyle>
</Style>
...
```

The following icons are used: 

The track is just a special <**Placemark**> which uses the <**LineString**>. The <**altitudeMode**> describes if the points are relative to the ground or in absolute position. The <**coordinates**> can have the altitude as a third component and that attribute is measured in meters. The numbers have to be rather high (depending on your scale) to actually see the <**Placemark**> above the ground.

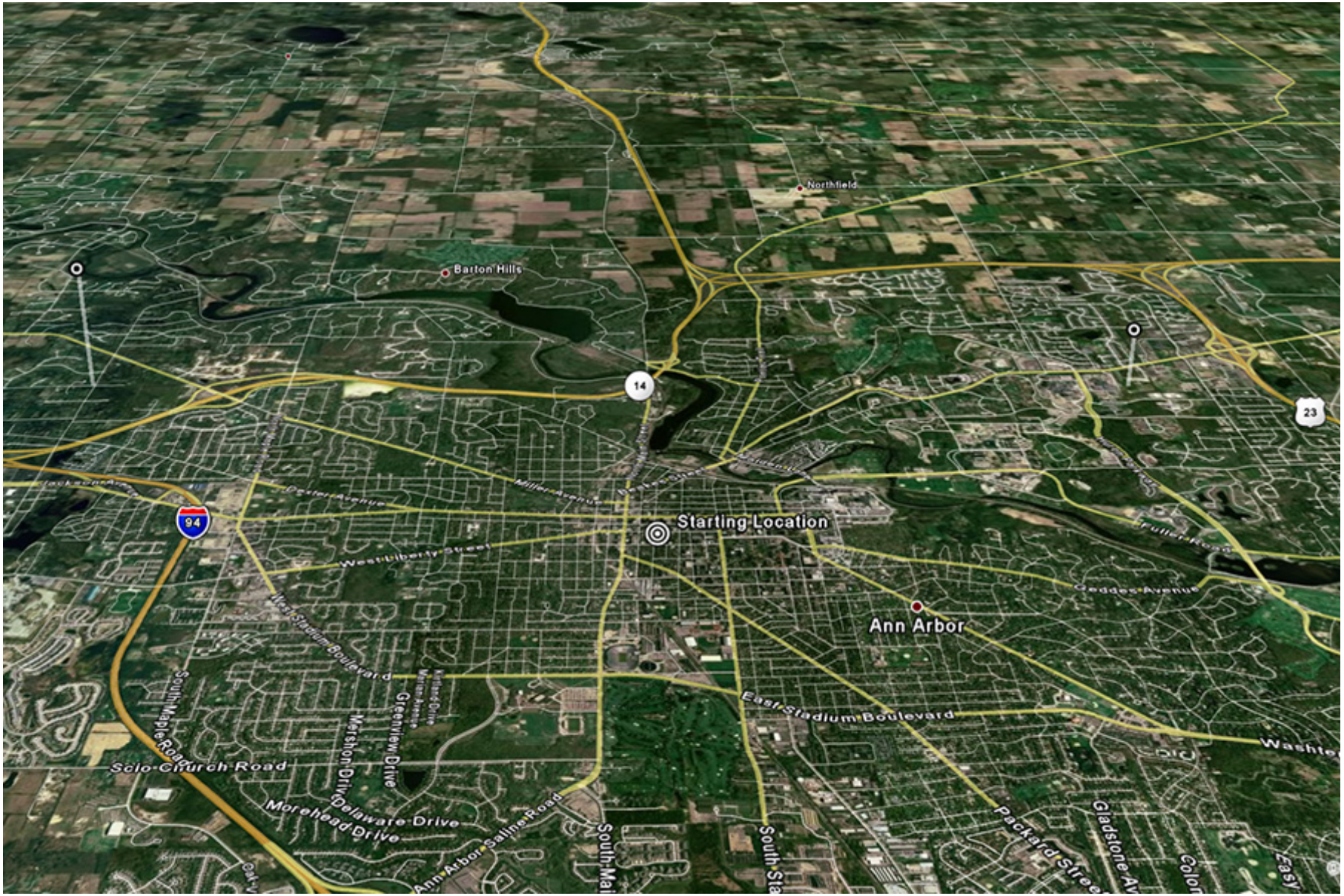
```
...
<Placemark>
  <name>Track</name>
```

```
  <Style>
    <LineStyle>
      <color>7fffffff</color>
      <width>5</width>
    </LineStyle>
  </Style>
  <LineString>
    <tessellate>1</tessellate>
    <altitudeMode>clampToGround</altitudeMode>
    <coordinates>121.0,17.0 119.7,17.0 118.5,16.5 117.6,16.1 117.3,16.0
117.0,15.4 116.0,15.2 115.3,14.9 115.0,14.9 114.3,14.7 114.0,14.5
113.5,14.6 113.3,14.7 112.9,14.7 112.7,14.8 112.7,15.3 112.9,15.6
112.6,15.7 112.3,15.9 111.9,15.9 111.9,16.1 111.9,16.6 111.6,17.0
111.5,17.4 110.8,17.4 110.3,17.6 110.1,17.6 109.6,17.8 109.0,18.0
108.5,17.6 108.2,17.6 107.8,17.5 107.5,17.7 107.0,17.9 106.5,18.0
105.7,17.8 105.3,17.8 104.5,18.0 103.9,17.7 103.1,18.0 102.0,18.0</coordinates>
  </LineString>
</Placemark>
...
```

The animation points are pretty simple, too. Each point references a style. They also have a <**TimeStamp**> node in them, which activates Google Earth's animation slider.

```
...
<Placemark>
  <TimeStamp><when>2007-01-01</when></TimeStamp>
  <styleUrl>#green</styleUrl>
  <Point>
    <extrude>1</extrude>
    <altitudeMode>relativeToGround</altitudeMode>
    <coordinates>121.0,17.0,10000.0</coordinates>
  </Point>
</Placemark>
...
```

## Anim02




The previous example used just one point in time for each <**Placemark**> by using <**TimeStamp**>. This example uses <**TimeSpan**> which allows a duration for a <**Placemark**>. This code anim.kml is still very simple:

```
...
<TimeSpan>
  <begin>2000-01-01</begin>
  <end>2000-02-01</end>
</TimeSpan>
```

. . .

## mbus

Check out the mbus page for a real-time demonstration.

## WaterNow

Check out the small WaterNow data set.

## Scio Residents for Safe Water

Check out Scio Residents for Safe Water site for a pretty complex data set.

## Google Earth

Check out Google Earth's KML documentation introduction.

## 3D Atlas of Ann Arbor

Check out various versions of the online *3D Atlas of Ann Arbor*.

*last update: Apr 26, 2008*

*technical*

**Lars Schumann - mbus**

# mbus

3d buildings from Google Earth (Archimedes): these and more are available in the set of online *3D Atlases of Ann Arbor*.


There are two versions - the Markers & the 3D Bus. The data is pulled every 3 seconds.

## How It Works

I am pulling the mbus live feed http://mbus.pts.umich.edu/shared/location_feed.xml. The file looks like this:

```
<livefeed>
  <item>
    <id>13</id>
    <latitude>42.281379699707</latitude>
    <longitude>-83.728157043457</longitude>
    <heading>96</heading>
    <route>Commuter Northbound</route>
  </item>
  <item>
    <id>23</id>
    <latitude>42.2872886657715</latitude>
    <longitude>-83.7194595336914</longitude>
    <heading>83</heading>
    <route>Bursley-Baits</route>
  </item>
...
</livefeed>
```

I wrote two Perl scripts, one for the Markers version (mbus.pl) and one for the 3D Bus version (mbus3d.pl). The scripts pull the live feed and convert it to a .KML file. There are a few important things about these scripts. The returned .KML has to be valid. The first line has to be the mime type. I just use a statement like this:

```
print "Content-type: text/html\r\n\r\n";
```

Afterwards the script has to print some opening KML statements and at the end some closing KML statement, as in the Markers version:

```
...
print "Content-type: text/html\r\n\r\n";
print "<?xml version=\"1.0\" encoding=\"UTF-8\"?>\n";
print "<kml xmlns=\"http://earth.google.com/kml/2.2\">\n";
print "<Document>\n";
print "\t<open>1</open>\n";
print "\t<Style id=\"bus\">\n";
print "\t\t<scale>0.5</scale>\n";
print "\t\t<IconStyle>\n";
```

```
print "\t\t\t<Icon>\n";
print "\t\t\t\t<href>http://maps.google.com/mapfiles/kml/shapes/bus.png</href>\n";
print "\t\t\t</Icon>\n";
print "\t\t\t<hotSpot x=\"0.5\" y=\"0\" xunits=\"fraction\" yunits=\"fraction\"/>\n";
print "\t\t</IconStyle>\n";
print "\t\t<ListStyle>\n";
print "\t\t</ListStyle>\n";
print "\t</Style>\n";

... create <Placemark>s ...

print "</Document>";
print "</kml>\n";
```

In the center of the code all the <**Placemark**> are created, as in the Markers version:

```
...
print "<Placemark>\n";
print "\t<styleUrl>#bus</styleUrl>\n";
print "\t<name>$1</name>\n";
print "\t<description>$5 ($4deg)</description>\n";
print "\t<Point>\n";
print "\t\t<coordinates>$3,$2</coordinates>\n";
print "\t</Point>\n";
print "</Placemark>\n";
...
```

The file that is used in Google Earth just calls the script every 3 seconds - which is very simple, as in the Markers version:

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
<NetworkLink>
  <name>mbus</name>
  <Url>
    <href>http://www.larsi.org/cgi-bin/mbus.pl</href>
    <refreshMode>onInterval</refreshMode>
    <refreshInterval>3</refreshInterval>
  </Url>
</NetworkLink>
</kml>
```

*last update: Apr 20, 2008*

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
<NetworkLink>
	<name>mbus</name>
	<Url>
		<href>http://www.larsi.org/cgi-bin/mbus.pl</href>
		<refreshMode>onInterval</refreshMode>
		<refreshInterval>3</refreshInterval>
	</Url>
</NetworkLink>
</kml>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
<NetworkLink>
	<name>mbus</name>
	<Url>
		<href>http://www.larsi.org/cgi-bin/mbus3d.pl</href>
		<refreshMode>onInterval</refreshMode>
		<refreshInterval>3</refreshInterval>
	</Url>
</NetworkLink>
</kml>
```