

### 3D Atlas of Ann Arbor, 3rd Edition

Editor and Principal Author, [Sandra Lach Arlinghaus, Ph.D.](#)  
with [Lauren Leigh Hoffman](#), [Juan Sergio Ponce de Leon](#), [Andrew Walton](#).  
With support from [Lars Schumann](#), Manager, 3D Laboratory, Duderstadt Center, The University of Michigan.  
Also, see credits at bottom of homepage.  
Copyright 2007, Institute of Mathematical Geography or by authors of documents.

This edition of the **3D Atlas of Ann Arbor** contains virtual reality models for the entire city of Ann Arbor that are geo-referenced to work with Google Earth® and rest in relation to the underlying terrain in that software. There is geometry for just under 25,000 structures and there are many textured models. The models run in real time and may all be loaded simultaneously (given good hardware) to have a view of the broad context of the entire city while navigating different elements of the virtual Ann Arbor. The user of this Atlas should have, at least, downloaded a free, current version of Google Earth® and have it running on his/her computer desktop. Then, all that is required to launch the models in Google Earth® is to click on the links to various .kmz files throughout the Atlas. Readers are shown static screen shots of the dynamic files so they can get a rough idea of what should come up. Please, however, do not assume that the static image says it all--think of it as a picture on a cereal box---as a mere indication of what is inside!

- All University of Michigan buildings are included
  - All buildings have roof textures
  - All buildings have basements so there is no "floating" of buildings
  - 56 buildings are fully-textured
  - The remaining partially textured buildings are split into components in relation to a textured anchor building and these are labeled using placemarks so the reader knows the names of buildings while navigating the scene.
  - There are features present in addition to buildings: songs (music files), vegetation, golf course, insertion of files from the Google 3D Warehouse.
- All buildings in the Downtown Development Authority (DDA) are included:
  - All buildings have height set in accordance with information from the Planning Department of the City of Ann Arbor.
  - 24 blocks have fully-textured buildings
  - A tailored DDA file is present so that the 24 textured blocks fit correctly within the full non-textured (but with correct height) DDA.
- All footprints of buildings outside the university and outside the DDA have been extruded to an arbitrary height and have been geo-referenced and set properly against terrain in Google Earth®.







Image created by S. Arlinghaus using Google Earth Pro®

#### ...THE THIRD EDITION...

- **Arlinghaus** is Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment, The University of Michigan, Ann Arbor; also, a member of the Board of Trustees and of the Executive Committee of Community Systems Foundation, Ann Arbor, MI; also, President, Arlinghaus Enterprises, Ann Arbor, MI; and, Director, Institute of Mathematical Geography. Arlinghaus stands in front of the Horace H. Rackham School of Graduate Studies (from which she graduated years earlier).
- **Hoffman** is a graduate student working on a Master's degree in Landscape Architecture in the School of Natural Resources and Environment at The University of Michigan in Ann Arbor. Hoffman stands in the middle of her virtual vegetation.
- **Ponce de Leon** is an undergraduate student in the Program in the Environment in the College of Literature, Science, and the Arts at The University of Michigan in Ann Arbor.
- **Walton** is a graduate student working on a Master's degree in Urban Planning in the Taubman College of Architecture and Urban Planning at The University of Michigan in Ann Arbor. As an undergraduate at UM, he was a star of the university golf team and has three times (including the past two summers) been City of Ann Arbor Men's Champion. Walton's photo shows him on his virtual golf course.
- **Schumann** is Manager of the 3D Laboratory of the Duderstadt Center at The University of Michigan. He stands before an image of it.

#### CREDITS:

##### ...the second edition.

- Greatest thanks go to Prof. Klaus-Peter Beier, Ph.D., Director of the 3D Laboratory in the Duderstadt Center of The University of Michigan, for his ongoing advice and support associated with various projects related to this one. The staff of the 3D lab, Lars Schumann, Scott Hamm, Brett Lyons, Eric Maslowski, and Steffen Heise have been helpful in so many ways:
  - Peter Beier's remarkably clear and beautifully-conceived lectures in Engineering 477 taught the author concepts in 3D modeling that transcended individual software packages making it feasible for her to leverage a wide range of changing software to follow paths of interest. His graduate student instructors, particularly Thana Chiripawat and Bonnie Bao, graciously aided her in learning to master the intricacies of modeling both in high-end graphics packages and in underlying source code (vrm) that later proved of great value in merging files created for the Google Earth® displays in this book.
  - Lars Schumann offered wise suggestions concerning the display of the entire set of buildings. Not only did he initiate such suggestions but also followed through with the testing of their implementation. In addition he kept the author and others informed, through his constant monitoring of the Google Earth® site, of latest developments. Both he and Matthew Naud originally suggested to the author their interest in placing the existing 3D models into Google Earth®.
  - Scott Hamm offered expert advice on giving demonstrations on the large size display screens available in the 3D Laboratory.

Without this group, this atlas would not be possible in its present form.

- Kris Oswalt, President of Community Systems Foundation, also helped to make the current work possible with his support of software. The importance of having Google SketchUp Pro® and Google Earth Pro® permitted the transition from GIS files to Google Earth Pro® and Google SketchUp Pro® files in a seamless manner using the GIS database to extrude sets of buildings from data appearing in the First Edition.
- Matthew Naud supplied files from the City of Ann Arbor and has been a constant participant in this project from its outset to its present form. His advice and support have been invaluable. Both he and Lars Schumann originally suggested to the author their interest in placing the existing 3D models into Google Earth®.
- Files generously supplied by IT folks, initially for the First Edition but which also play into the Second Edition:
  - Merle Johnson of the City of Ann Arbor ITS Department and Chandra Hurd (later Gochanour) of the City of Ann Arbor Planning Department both contributed maps and data: the former was generous in sharing aeriels and maps from City of Ann Arbor files and the latter was helpful in sharing her expertise in analyzing city data and in checking selected files.
  - Donald T. Uchman, Coordinator of Space Graphics, Space Information and Planning, Plant Extension--AEC, The University of Michigan, generously shared official University map files on locations and sizes of buildings.
- Current files, and their immediate predecessors, were shown to, or discussed with, various groups to elicit feedback during 2006:
  - Community Systems Foundation Annual Conference
  - Eric Lipson (Vice-Chair, City of Ann Arbor Planning Commission) and Vince Caruso (Chair, Allen Creek Watershed Group).
  - City of Ann Arbor Planning Commission
  - Matthew Naud, City of Ann Arbor Environmental Coordinator
  - Community Systems Foundation group: John Nystuen, Gwen Nystuen, Fred Goodman, Barton Burkhalter, Ann Larimore
  - Board of Directors of local League of Women Voters (Shirley Axon, Judith Mich, and others).
  - Tracy Davis (Ann Arbor News), Vivienne Armentrout (Ann Arbor Observer)
  - Group including folks from the City and from the University.
- Many thanks to Prof. Michael Batty, Ph.D., of University College London (Director, Centre for Advanced Spatial Analysis) for his continuing encouragement in working with Google Earth®<sup>AE</sup>, both as a participant and as a co-author on related projects.
- Software and hardware used:
  - Google Earth Pro®
  - Google SketchUp Pro®
  - Adobe PhotoShop®
  - Adobe ImageReady®
  - ESRI software: ArcView® GIS with Spatial Analyst® and 3D Analyst® (various editions)
  - Microsoft Office®
  - Windows XP®
  - Hewlett-Packard Pavilion® with Intel Pentium 4 Processor®

Finally, thanks to reviewers for constructive comment, to many others who have observed the development of this project, and to my family: husband, William C. Arlinghaus; son, William E. Arlinghaus; and, daughter-in-law, Kari Sufel Arlinghaus. Their patience and kindness have been critical to the development of these materials.

Please note the following caution--while donations of digital material were all current at one time, there is a lag in creating materials from them. Regular updating of material continues.

To all of the individuals mentioned here, as well as to those mentioned in the 1st Edition, goes deep appreciation. Remaining errors are those of the editor and principal author alone.

...*the first edition*

In addition to those above, there are a number of individuals who were either important in the development or the use of the First Edition:

- Development--students from Prof. Beier's course, Engineering 477, Virtual Reality, Fall 2005, 2004, and 2003:
  - 2005: A. Domzal, U. S. Hwang, K. J. Walters, Jr..
  - 2004: R. Ramesh, I. Shani, and N. Nolan.
  - 2003: T. Kwon, A. Lazzaro, P. Oppenheim, and A. Rosenblum

- Use--application employed by the Downtown Residential Taskforce:

Douglas S. Kelbaugh (Dean, Taubman College of Architecture and Urban Planning, The University of Michigan), Fred J. Beal (President, J. C. Beal Construction, Ann Arbor), Susan Pollay (Executive Director, Downtown Development Authority), Karen Hart (Planning Director, City of Ann Arbor), Jean Carlberg (City Council), Wendy Woods (City Council), Steve Thorp (Chair, Planning Commission), Frances Todoro (Mayor's Office), Robert Gillett, and William D. Kinley. Their thoughtful comments have helped, in various ways, to shape selected images. Brian Barrick and Peter Pollack, both of Pollack Designs, followed this work with interest, as did Ray Detter, DDA Citizens Advisory Committee.

The [First Edition](#), itself, is the best source of notation of other individuals who have participated in various ways over the past 6 years.

---

Copyright, 2007, All rights reserved. Contact [arlinghaus@gmail.com](mailto:arlinghaus@gmail.com) for permissions issues.

## ***INTRODUCTION: Focus on Transformations.***

The First and Second Editions of the *3D Atlas of Ann Arbor* captured seven years of work on this topic prior to June, 2007. While the earlier files in that work are important to understand the development of the project and also to track how technological and planning development did or did not mesh, the more recent files in it appear of greater interest to most. The [file](#) that contains a great deal of detail of a few blocks of downtown Ann Arbor, coupled with music to make points that were, at the time, difficult to capture otherwise, seem of particular interest (to display this file, one needs to have installed some browser free plug-in to interact with the virtual reality--[Cortona](#) is one option). That file is actually three linked files and it was designed to suggest possible flooding/ponding scenarios in the downtown using a sort of "theatrical" approach. It also incorporated links on buildings, in the spirit of suggesting directions for various emergency management applications. At the time, it was very difficult to create a model of the entire creek floodplain; hence, only a few blocks were shown.

The advent of good aerials of Ann Arbor in Google Earth®, in September of 2006, made it possible to overcome such difficulty. The earlier strategy of lifting a plane through modeled topography could now be employed on the existing terrain in Google Earth®. Terrain no longer needed to be modeled; previously, a Triangulated Irregular Network had been created from contour maps in GIS software and then imported to high-end graphics software. The resulting files were very large and precluded any possibility of showing a vast expanse of terrain. Still, Google Earth® did not become really useful until good aerials of Ann Arbor appeared already installed in Google Earth®. Then, the matter of pulling a plane through various elevations to simulate how contours fill with water became a strategy that could make some sense: one could at least have an aerial view of the urban context in which such filling was taking place. Beyond the general aerial context, showing considerable detail for the entire city, one might wish also to have 3D buildings modeled so that when one drives laterally through the city, the buildings appear upright and in fact might show, when coupled with the planes representing water, the elevation to which the water would reach on buildings.

In Google Earth® one has simultaneously a browser, a 3D navigational tool, and more. Thus, it is important to attempt to capture all of the previous 3D Atlas work within the Google Earth® context and it was to that task that the Second Edition of the 3D Atlas of Ann Arbor was devoted. This third edition greatly expands the base of buildings with textures, including many on the campus of The University of Michigan. Indeed, in this volume, one can view the buildings of the university in the context of 3D models of all of Ann Arbor. Thus, the entire city is modeled. The models in this book also appear in the Google 3D Warehouse: in the Google Picks section, under Featured Modelers (Arlinghaus is "Archimedes" in the 3D Warehouse world) as well as in the "Cities in Development" section and in the "Help Model a City" section. In the latter, readers are invited to put textures on existing models in order to create a larger virtual Ann Arbor. The hope is also that readers of this book will consider participation in that effort, as well! The reader of this book will need to download a free version of Google Earth® in order to understand the content. It is highly recommended that the reader do so right now, before proceeding with the remainder of the work.

As Google Earth® and Google SketchUp® have both broadened and facilitated the technological 3D modeling scene, deeper reflection on the pair in an academic context is interesting, as well. When thinking of making models, one might think only of making them in Google SketchUp®. There, numerous tutorials walk the user through the intricacies of making highly detailed, realistic models of buildings, furniture, or whatever else one might imagine. As long as the models are only for

**Google SketchUp®**, the enthusiastic user tends to get more and more involved in making "accurate" representations of objects. When these models are also to be uploaded into **Google Earth®**, and viewed at a variety of geographical scales, perhaps in conjunction with many other models, a host of other issues enters the picture. Now, both the worlds of art and of mathematics enter -- at the theoretical level. From the standpoint of art, realism may not be as important in the **Google Earth®** setting as is "impressionism"--create the correct impression of the building and use very few textures, keeping file size small. As Renoir painted a red hat in detail on the woman in "Sur la Terrace," while leaving the background vague, the careful modeler may focus on a block M on a golf course clubhouse chimney seen from a busy street rather than on "accurate" textures of all sides. The recognition of the building in **Google Earth®** comes from selecting features that people relate to and recognize quickly: that is the art in moving across the Google interface from **SketchUp®** to **Earth®**. Indeed, it is that interface itself, or transformation from one software package to another, that is of critical importance to successful modeling. Perhaps it is not surprising that the 3D modeling environment came to recognize that fact, much as 20th century mathematics came, in the last half of that century, to focus on the transformations themselves rather than on acquisition of knowledge about the objects linked by those transformations. The **Google SketchUp®/Earth®** pairing, and the associated transformation it represents, is a bold step in moving forward: now, the focus in the virtual world, as well as in the mathematical world, is on transformations.

Sandra Lach Arlinghaus,  
June 1, 2007, Ann Arbor, MI.

[Link to Google Earth®](#).

Copyright, 2007. All rights reserved. Institute of Mathematical Geography.

# ATLAS

The previous edition (2nd) of the *3D Atlas of Ann Arbor* offered detailed listings of plates of the Downtown Development Authority (DDA) and only listed buildings of The University of Michigan as a context within which to view various blocks of the DDA. In this edition, we reverse that strategy and offer a detailed set of plates showing university buildings. They are presented within the broader context of the textured and non-textured DDA as well as the 24,000+ buildings outside the DDA and UM. Thus, the entire city comes alive as a 3D model. Interested individuals and groups might pick up on the Google 3D Warehouse to finish putting textures on the city: all the geometry is available, free to download from the [Google 3D Warehouse](#), in Google Picks, "Help Model A City." Download photos from Picasa as they become available and put them on the existing geometry; this exercise is a great way to learn to model buildings and it helps an existing municipality: truly a win-win situation that Google has created!

Another important feature of this 3rd edition of the *3D Atlas of Ann Arbor* is that all models are georeferenced. Earlier models show detail with fidelity equivalent to that shown here, but most of them are not properly georeferenced with respect to latitude and longitude on the surface of the earth-sphere. Models that are not so referenced may have interesting applications of various sorts. When evaluation of models comes into play, however, as it does in most municipal applications, then it is necessary to have some absolute standard against which to test model location. Current 3d modeling software is so easy to use that anyone with a spare hour or two can use free software to build a realistic-looking city model that runs in real-time. Thus, for example, a planning commissioner using a 3d model to consider a proposed project must know where that project lies in relation to the streets and to other buildings. Streets created as part of the modeling process itself are insufficient for use as such a standard. It is far too easy for an unscrupulous petitioner to manipulate boundaries to suit his or her own project needs. Aerials compiled by government agencies offer an independent and absolute referencing system and when these aerials are cast as 3d models themselves, then they can be used in conjunction with 3d models placed upon them, to show a complete, verifiable, and replicable picture. This crucial capability is the capability offered in the linkage of Google SketchUp® to Google Earth® and it is the capability employed throughout this atlas for models of buildings, landscapes, and other objects in the city of Ann Arbor, Michigan.

The layout of the information below is influenced by the submission form for the Campus Competition conducted by the Google 3D Warehouse. A team of students participated in that competition; participation was led by Arlinghaus as Faculty Advisor with support from Lars Schumann in the 3D Laboratory of the Duderstadt Center of The University of Michigan. The participating "department" of the university was the School of Natural Resources and Environment. The heart of that entry and of this Atlas is the set of individual building files for the campus of The University of Michigan in Ann Arbor that work, together with existing context files, to create a virtual Ann Arbor. A number of files are heavily textured. We have chosen to group textured files so they are evident, and also, to select buildings and groups of buildings that are relatively well-known. Thus, we include the buildings of the "Diag," the central campus quadrangle, adjacent well-known buildings and blocks, as well as buildings on the south campus such as the Crisler Arena (basketball stadium), Yost Ice Arena (ice hockey stadium), and Michigan Stadium (football stadium, also known as "The Big House"). Some of the files have more than buildings. Thus, the file for the Diag contains vegetation in relation to the aerial -- the trees on the Diag serve to define that space almost as much as do the buildings on its perimeter. Lauren Leigh Hoffman is a Master's of Landscape Architecture student in the School of Natural Resources and Environment (SNRE) with special interest in trees. She created the Dana Building (home of SNRE) and Diag files and shares her expertise on trees with all of us. Farther south, the file for the clubhouse of The University of Michigan golf course contains not only the clubhouse but also

flagsticks modeled in SketchUp for each of the 18 holes. Andrew Walton created these files and took charge of pin placements for this event. He also shares his thorough knowledge of this course in his hole-by-hole commentary and tour. Currently, Walton is a Master's of Urban Planning student, but as an undergraduate was a star of The University of Michigan golf team and also winner of the citywide City of Ann Arbor Men's Golf Championship. Hoffman aided with her insight on golf course vegetation and was in charge of tree placements on the course. Juan Sergio Ponce de Leon is a student in the Program in the Environment in the College of Literature, Science, and the Arts. He combines his interest in the natural and built environments with his long-time family interest in linking environmental concern to real-estate development as he/they continue to explore new frontiers. Generally, students were encouraged to incorporate the new software experience into the realms of academic endeavor they already knew: to make a win-win situation in mastery of software, comfort-level in dealing with new software, and sharing their own expertise with others. The interactive linkage between Google SketchUp® and Google Earth® mirrored this interdisciplinary context.

Indeed, the collaboration of Walton and Hoffman, in creating the actual, virtual University of Michigan golf course, suggests possible future directions for municipalities not only to preserve golf courses as fine sports venues but also as environmental laboratories for best practices in managing various features in the local urban or rural landscape. Thus, a water hazard on the course, might double as a model for retention or detention pond management for a local planning department: from the mowing of grasses at varying lengths around the pond to manage rate of sheet flow runoff, to the use of aeration equipment in the pond, to the management of invasive pond plants, and so forth. The "rough" areas of the course might serve as a laboratory for planners to study different styles of grasses that do well locally and to see how they actually look when planted and maintained professionally. The fairways and greens could offer a chance to study the variety of indigenous grasses available that can offer residents a "cut" look to their front lawns when well-cared for in a sensitive manner. The steep slopes of the course might offer local officials a chance to study erosion control over time. And, of course, the wooded areas, when planted with a mixture of trees, could serve as a model for woodland preservation independent of local disease prevalence. Interesting environmental management ideas, such as rainwater gardens, might create new golfing hazards. Even a low, flat clubhouse might have a roof suited to a "green" planting strategy. Virtual remodeling of an existing course could offer a municipality an opportunity to visualize how small changes in tree selection, water hazard management, and so forth, carried out over time, could reap large rewards for the entire community--for the sports community as well as for the broader planning and environmental communities. Municipal authorities might study such change over time as they reflect on local ordinance changes. These are all exciting directions that the virtual world can offer for envisioning a better tomorrow: golf courses are large tracts of landscaped area that can serve not only as recreational opportunity for local citizens but also as an outdoor laboratory for them to study as they manage their own property and for municipal authorities and policy makers to study as they reflect on environmental management strategy and its implementation at the local level.

The models are grouped, for ease in reference, by category. Click on a building name or suitable link in the left-hand column to see a static image of the model, shown alone and only in the flat context of an aerial. Click on the .kmz file on the right to launch that model in Google Earth® (the .skp files open in Google SketchUp®). Load multiple kmz files to build the campus yourself!

Building Information	Associated URL	Google SketchUp® file	Google Earth® file
<b>CENTRAL CAMPUS, THE UNIVERSITY OF MICHIGAN</b>			
<a href="#">Angell Hall.</a>	<a href="http://www.si.umich.edu/umarch/bldgs/angell/index.html">http://www.si.umich.edu/umarch/bldgs/angell/index.html</a>	<a href="#">skp</a>	<a href="#">kmz</a>



Angell Hall dominates the view of the central campus from State Street. The stately columns often serve as a landmark to characterize the university; 435 S.State St Ann Arbor, MI 48109-1003.

Mason Hall.  
This building is part of the Angell Hall Complex and is best when viewed with the files for Angell Hall, Tisch Hall, and Haven Hall. 432 S. State Street, Ann Arbor, MI, 48109-1329

Tisch Hall.  
Building in the Angell Hall Complex that fills in between older buildings. This file is best viewed in conjunction with the files for Angell Hall, Mason Hall, and Haven Hall. 435 S. State St., Ann Arbor, MI 48109-1003

Haven Hall.  
This building is part of the Angell Hall Complex and is best when viewed in

<http://bentley.umich.edu/bhl/BentleyMap/HTML/Text/OldMason.intro.html>

[skp](#)

[kmz](#)

[http://www.umich.edu/~urecord/9697/Jan07\\_97/artcl02.htm](http://www.umich.edu/~urecord/9697/Jan07_97/artcl02.htm)

[skp](#)

[kmz](#)

<http://www.aec.bf.umich.edu/projects/MasonHaven/photos.html>

[skp](#)

[kmz](#)

<p>conjunction with files for Angell Hall, Mason Hall, and Tisch Hall. 505 South State Street Ann Arbor, MI 48109-1045</p>			
<p><u><a href="#">Hatcher Library North</a></u>. The Hatcher Library is often called simply the "Graduate Library." It is composed of two connected parts: the north part is substantially older than the south part. 920 North University, Ann Arbor, MI 48109-1205</p>	<p><u><a href="http://www.lib.umich.edu/grad/">http://www.lib.umich.edu/grad/</a></u></p>	<p><u><a href="#">skp</a></u></p>	<p><u><a href="#">kmz</a></u></p>
<p><u><a href="#">Hatcher Library South</a></u>. The Hatcher Library is often called simply the "Graduate Library." It is composed of two connected parts: the north part is substantially older than the south part. 920 North University, Ann Arbor, MI 48109-1205</p>	<p><u><a href="http://www.lib.umich.edu/grad/">http://www.lib.umich.edu/grad/</a></u></p>	<p><u><a href="#">skp</a></u></p>	<p><u><a href="#">kmz</a></u></p>
<p><u><a href="#">Shapiro Library</a></u>. The Shapiro Undergraduate Library is often called the "UGLI"--not for</p>	<p><u><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=139">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=139</a></u></p>	<p><u><a href="#">skp</a></u></p>	<p><u><a href="#">kmz</a></u></p>

<p>its appearance (nor as a description of desire to study) but simply as an acronym for "UnderGraduate Library." 919 South University, Ann Arbor, MI 48109-1185</p>			
<p><b>Museum of Art.</b> Changing exhibits have delighted and educated generations of Michigan students and their families as well as the larger Ann Arbor and midwestern community, and beyond. 525 S. State St., Ann Arbor, MI 48109</p>	<p><a href="http://www.umma.umich.edu/">http://www.umma.umich.edu/</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><b>Tappan Hall.</b> This building at the south edge of the "Diag" is named for the first president of the university.</p>	<p><a href="http://www.umich.edu/pres/history/markers/tappan.html">http://www.umich.edu/pres/history/markers/tappan.html</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><b>President's House.</b> This campus home for the sitting President of The University of Michigan, currently Mary Sue Coleman, sits at the southern edge of the "Diag" on South University. The northern edge</p>	<p><a href="http://umhistory.org/history/publications/memories/">http://umhistory.org/history/publications/memories/</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>

of the "Diag" lies on North University and the eastern edge lies along bot President's House, South University Ave., Ann Arbor, MI 48109

Clements Library.

Located on the South edge of the Diag, this building houses a wide variety of rare and unusual book collections. 909 S. University, Ann Arbor, MI 48109

<http://www.clements.umich.edu/>

[skp](#)

[kmz](#)

West Hall. This building at the southeast corner of the "Diag" serves as a portal (through its arched passageway) to the commercial strip along South University Avenue just to the east. 1085 S. University Ave., Ann Arbor, MI 48109-1107

<http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=163>

[skp](#)

[kmz](#)

Randall Laboratory.

Located on the east side of the "Diag." 450 Church Street, Ann Arbor, MI 48109-1040

<http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=133>

[skp](#)

[kmz](#)

<p><u><a href="#">Dana Building.</a></u>  Model by Lauren Leigh Hoffman. This building houses the School of Natural Resources and Environment. It is located near the northeast corner of the Diag. 440 Church Street, Ann Arbor, MI 48109-1041</p>	<p><a href="http://www.snre.umich.edu/">http://www.snre.umich.edu/</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u><a href="#">Diag Trees.</a></u>  Model by Lauren Leigh Hoffman. The trees in the interior of the Diag work together with the buildings to define this space.</p>	<p><a href="http://www.iso.umich.edu/lresources/resources/reserving.the.diag.html">http://www.iso.umich.edu/lresources/resources/reserving.the.diag.html</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u><a href="#">Chemistry Building.</a></u> Large single building near the northeast corner of the Diag. It has had substantial additions tacked on over the years. 930 N. University, Ann Arbor, MI 48109-1055. Photos by Andrew Walton.</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=34">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=34</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u><a href="#">Kraus Natural Science Building.</a></u>  Generations of botany students fondly recall classes in the greenhouse</p>	<p><a href="http://bentley.umich.edu/bhl/BentleyMap/HTML/Text/NatSci.intro.html">http://bentley.umich.edu/bhl/BentleyMap/HTML/Text/NatSci.intro.html</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>

<p>perched on the northern edge of the "Diag" that is attached to the "Nat. Sci." building. 830 North University, Ann Arbor, MI 48109</p>			
<p><u>C. C. Little Building.</u> Classroom, office, and laboratory building at the northeast edge of the Diag. 1100 N. University Ave., Ann Arbor, MI 48109-1005</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=28">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=28</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u>Dennison Building.</u> The connected high rise and low rise components form this building, often referred to as the Physics and Astronomy building. 500 Church Street, Ann Arbor, MI 48109-1042</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=47">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=47</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u>Pharmacy College.</u> This building is best when viewed in conjunction with the file for the Dennison Building, to which it is attached. 428 Church Street, Ann Arbor, MI 48109-1065</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=130">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=130</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u>East Hall.</u> Formerly known</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=53">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=53</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>

<p>as East Engineering, a modernized version now houses a variety of departments. 530 Church Street, Ann Arbor, MI 48109-1043</p>			
<p><u>Michigan League.</u> Conference center just to the north of the Diag. Often it is called "The League." 911 N. University Ann Arbor, MI 48109-1265</p>	<p><a href="http://www.umich.edu/pres/history/markers/league.html">http://www.umich.edu/pres/history/markers/league.html</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u>Hill Auditorium.</u> This centrally-located auditorium is located just to the north of the Diag. It serves not only as the principal theater for the university but also as a venue for special university events such as graduation ceremonies. 825 N.University. Ann Arbor,MI 48109</p>	<p><a href="http://www.umich.edu/pres/history/markers/hillaud.html">http://www.umich.edu/pres/history/markers/hillaud.html</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u>Burton Memorial Tower.</u> Carillon tower with clock is a highly visible landmark on central campus and</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=25">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=25</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>

also for the entire city of Ann Arbor. 881 North University, Ann Arbor, MI 48109-1270

**Modern Language Building.** As its name suggests, this building serves as home to several departments concerned with modern languages. Often, however, it is referred to as MLB. Burton Tower sits between this building and Hill Auditorium. 812 East Washington, Ann Arbor, MI 48109-1275

**Alumni Center.** This building is the heart of the Alumni Association of The University of Michigan. This Association is the largest such in the world. 200 Fletcher Street, Ann Arbor, MI 48109

**Horace H. Rackham Building.** Rackham is the School of Graduate Studies whose administrative

<http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=111>

<http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=10>

<http://www.umich.edu/pres/history/markers/rackham.html>

skp

skp

skp

kmz

kmz

kmz



<p>hurdles many have successfully cleared. The building also serves the entire community with its amphitheater and auditorium. 915 E. Washington Ann Arbor, MI 48109-1070</p>			
<p><u><a href="#">Biomedical Science Research Building</a></u>. This building on Central Campus is modeled and textured. It serves as the anchor building for the broader region of nearby buildings also found in this file. 109 Zina Pitcher Place, Ann Arbor, MI 48109-2200</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=509">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=509</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u><a href="#">Frieze Building</a></u>. This former Central Campus building is modeled and textured (2007 has seen its destruction--the photo textures indicate the beginnings of such). It serves as the anchor building (as a memorial to its grandeur) for the broader region of nearby buildings. 105</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=61">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=61</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>

<p>S. State St., Ann Arbor, MI 48109-1285</p>			
<p><u>Literature, Science, and the Arts Building.</u> This salmon-colored post World War II brick building has served as the seat of the university's liberal arts college. Often, it is simply referred to as "LS&amp;A." It is an anchor. 500 S. State Street, Ann Arbor, MI 48109</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=87">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=87</a></p>	<p>skp</p>	<p>kmz</p>
<p><u>South Quad.</u> Model by Juan Sergio Ponce de Leon. This single building serves as a complement to the larger file above. South Quad is a residence hall near the Michigan Union. Many freshmen have lived there, including Mr. Ponce de Leon when he was a freshman.</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=141">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=141</a></p>	<p>skp</p>	<p>kmz</p>
<p><u>University Hospitals.</u> This Central Campus hospital building is modeled and textured. It serves as the anchor building for the broader</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=158">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=158</a></p>	<p>skp</p>	<p>kmz</p>

<p>region of nearby buildings also found in this file. 1500 E. Medical Center Dr., Ann Arbor, MI 48109-0199</p>			
<p><u><a href="#">Power Center for the Performing Arts</a></u>. This Central Campus glass-fronted building is modeled and textured. It serves as the anchor building for the broader region of nearby buildings also found in this file. 121 Fletcher, Ann Arbor, MI 48109-2017</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=132">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=132</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u><a href="#">School of Social Work</a></u>. This Central Campus building combines new sleek lines with the classic brick of nearby older buildings. It serves as the anchor building for the broader region of nearby buildings also found in this file. 1080 South University, Ann Arbor, MI 48109-1106</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=138">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=138</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><b>NORTH CAMPUS, THE UNIVERSITY OF MICHIGAN</b></p>			
<p><u><a href="#">Francois-Xavier Bagnoud Building</a></u>. This building in the space research</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=17">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=17</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>

part of North Campus is modeled and textured. It serves as the anchor building for the broader region of nearby buildings also found in this file.  
1320 Beal, Ann Arbor, MI  
48109-2140

[Bursley Residential Hall](#). This residence hall on the steep part of North Campus is modeled and textured. It serves as the anchor building for the broader region of nearby buildings also found in this file.  
1931 Duffield, Ann Arbor, MI  
48109-2080

[Duderstadt Center](#). This building on North Campus, home to the 3D Laboratory, is modeled and textured. It serves as the anchor building for the broader region of nearby buildings also found in this file.  
2281 Bonisteel, Ann Arbor, MI  
48109-2094

[Northwood IV apartments](#). These rustic

<http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=24>

skp

kmz

<http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=181>

skp

kmz

<http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=125>

skp

kmz

North Campus apartments fit nicely into the surrounding wooded areas. They serve as the anchor buildings for the broader region of nearby buildings also found in this file.  
2364 Bishop,  
Ann Arbor, MI  
48109

### SOUTH CAMPUS, THE UNIVERSITY OF MICHIGAN

**Crisler Arena.**  
Stadium that is home to the Michigan (Basketball) Wolverines. This large arena also serves as host to other events that require such an indoor space.  
333 E. Stadium Blvd., Ann Arbor, MI, 48109-4423

<http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=35>

skp

kmz

**Michigan Stadium;** "The Big House."  
Michigan Stadium (Memorial Stadium) is the home of the Michigan (Football) Wolverines. On occasion, it is also used as a venue for outdoor events. Often, graduation ceremonies are held here. This

<http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=503>

skp

kmz

<p>past November, it was used to hold a memorial service to 1201 S. Main Street, Ann Arbor, MI 48109</p>			
<p><u>Yost Ice Arena.</u> Model by Juan Sergio Ponce de Leon. The Yost Ice Arena is home to the University of Michigan Hockey Team. 1000 S. State Street, Ann Arbor, MI 48109</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=170">http://uuis.umich.edu/cic/buildingproject/index.cfm?buildingid=170</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u>University of Michigan Golf Course and Clubhouse.</u> Model by Andrew Walton. Open the .kmz file in Google Earth and get tips from a champion on how to play the <a href="#">course!</a></p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=64">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=64</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p>University of Michigan Golf Course, vegetation. Model by Lauren Leigh Hoffman.</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=64">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=64</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>
<p><u>Schembechler Hall.</u> This colorful (UM colors are "Maize and Blue") South Campus building is named for the late Bo</p>	<p><a href="http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=63">http://uuis.umich.edu/cic/buildingproject/index.cfm?BuildingID=63</a></p>	<p><a href="#">skp</a></p>	<p><a href="#">kmz</a></p>

Schembechler.  
It serves as the anchor building for the broader region of nearby buildings also found in this file.  
1200 South State, Ann Arbor, MI 48109-2203

### CAMPUS TOURS

**Campus Tours.**  
Use placemarks to get a view of what is available in this set. Then, use the placemarks, in conjunction with the geo-referenced 3D buildings as an aid in knowing building names.

[kmz](#)

### DOWNTOWN DEVELOPMENT AUTHORITY (DDA)

**Context: Main and Huron Streets, NE.**  
County Building

<http://www.imagenet.org/>

[skp](#)

[kmz](#)

**Context: Main and Huron Streets, NW.**  
Mixed residential and office use. Northwest corner of Main and Huron Streets. 101 North Main Street, Ann Arbor, MI 48104

<http://www.imagenet.org/>

[skp](#)

[kmz](#)

**Context: Huron and Fourth Streets, NE.**  
Hands-On Museum Block

<http://www.imagenet.org/>

[skp](#)

[kmz](#)

**Context: Huron**

<http://www.imagenet.org/>

[skp](#)

[kmz](#)

<p><u>and Fifth Streets, NE.</u> City Hall block 100 N. Fifth Ave, Ann Arbor, MI 48107</p>			
<p><u>Context: Main and Huron Streets, SE.</u> Block to the south and east of the intersection of Main and Huron Streets.</p>	<a href="http://www.imagenet.org/">http://www.imagenet.org/</a>	<a href="#">skp</a>	<a href="#">kmz</a>
<p><u>Context: Main and Huron Streets, SW.</u> Key Bank Building</p>	<a href="http://www.imagenet.org/">http://www.imagenet.org/</a>	<a href="#">skp</a>	<a href="#">kmz</a>
<p><u>Context: Huron and Fourth, SE.</u> City Center Building block</p>	<a href="http://www.imagenet.org/">http://www.imagenet.org/</a>	<a href="#">skp</a>	<a href="#">kmz</a>
<p><u>Context: Huron and Fifth Streets, SE.</u> Ann Arbor News (partial)</p>	<a href="http://www.imagenet.org/">http://www.imagenet.org/</a>	<a href="#">skp</a>	<a href="#">kmz</a>
<p><u>Context: Main and Liberty Streets, NE.</u> Textured buildings located on a block 2 blocks south of the intersection of Main and Huron Streets, and one block to the east of that intersection.</p>	<a href="http://www.imagenet.org/">http://www.imagenet.org/</a>	<a href="#">skp</a>	<a href="#">kmz</a>
<p><u>Context: Main and Liberty Streets, NW.</u> Textured buildings</p>	<a href="http://www.imagenet.org/">http://www.imagenet.org/</a>	<a href="#">skp</a>	<a href="#">kmz</a>



located on a block 2 blocks south of the intersection of Main and Huron Streets, and one block to the west of that intersection.

[Context: Main and Liberty Streets, SE.](#)

Textured buildings located on a block 3 blocks south of the intersection of Main and Huron Streets, and one block to the east of that intersection. Mulch in planter is photo of actual mulch from one of the planters. Trees are maintained by the Dean Fund.

[Context: Main and Liberty Streets, SW.](#)

Textured buildings located on a block 3 blocks south of the intersection of Main and Huron Streets, and one block to the west of that intersection. Mulch in planter is photo of actual mulch from one of the planters. Trees are maintained

<http://www.imagenet.org/>

skp

kmz

<http://www.imagenet.org/>

skp

kmz

<p>by the Dean Fund.</p>			
<p><u>Context: DDA Minus Textured Blocks.</u> Simple extruded footprints with correct heights (from City of Ann Arbor Planning Department) for the remainder of buildings in the DDA. Heights supplied by the Planning Department.</p>	<p><a href="http://www.imagenet.org/">http://www.imagenet.org/</a></p>		<p><a href="#">kmz</a></p>

ANN ARBOR, OUTSIDE THE DDA AND THE UNIVERSITY OF MICHIGAN

<p><u>Context: General Ann Arbor 3d-scape.</u> Most Ann Arbor buildings outside the DDA and UM. File exported to .kmz from ArcMap. Lines up with terrain in Google Earth. Building height set arbitrarily to 2 stories for all buildings. 2D building footprints made by Environmental Coordination Services,</p>	<p><a href="http://www.imagenet.org/">http://www.imagenet.org/</a></p>		<p><a href="#">kmz</a></p>
---	--	--	----------------------------

From the [Google 3D Warehouse](#): Google Picks--"Cities in Development"; "Help Model A City"; "Featured Modelers" (the collections of "Archimedes").

Copyright, 2007, All rights reserved. Contact [arlinghaus@gmail.com](mailto:arlinghaus@gmail.com) for permissions issues.

# REFERENCES

The references that were cited in the First and Second Editions continue to be useful and are cited, again, here. In addition, the centered list below sets forth selected references and citations particular to the Third Edition.

- **Google 3D Warehouse:** Google Picks--Cities in Development; Help Model A City; Featured Modelers (the collections of "Archimedes").
- Google "Best Practices" document, "[Modeling A City](#)".
- The 3D Laboratory in the Duderstadt Center of The University of Michigan for their advice on modeling in general and for their encouragement and support for this team in particular. Dr. Klaus-Peter Beier, Director; Lars Schumann, Manager; Steffen Heise, 3D Lab.
- Thanks for base GIS files: Donald T. Uchman, Drafting Intermediate Supervisor, Space Information, The University of Michigan
- Matthew Naud, Environmental Coordinator, City of Ann Arbor; Wendy Rampson, City of Ann Arbor.
- File for Angell Hall incorporates a "dome" SketchUp file based on one found in the 3D Warehouse. The original file is by "pat": <http://sketchup.google.com/3dwarehouse/details?mid=d9df666120fee38c7fb60589c24fde63&prevstart=12>
- File for Diag contains SketchUp trees based on ones found in the 3D Warehouse. The original files are from Google Picks, Collections...the "Trees" collection: <http://sketchup.google.com/3dwarehouse/cldetails?mid=a7b9f69d31356fbef96dfde99ac0e896>, primarily by "Surreal 3D" and "Google Guy."
- File for Football Stadium incorporates a blimp based on one found in the 3D Warehouse. The original file is by "Surreal 3D": <http://sketchup.google.com/3dwarehouse/details?mid=c29682940165845a7c81e315a70337ac&prevstart=0>
- Files for Football field and crowd modified from originals found at: <http://www-vrl.umich.edu/VRML/Field2.JPG> and <http://www-vrl.umich.edu/VRML/crowd.JPG>
- The music files appear on the link on the kmz file for the President's House: <http://bentley.umich.edu/bhl/exhibits/umosu/umsongs.htm>

Second Edition, of particular note:

- Prof. Klaus-Peter Beier (Director 3D Laboratory, Duderstadt Center), Lecture Notes, Engineering 477 (Virtual Reality), The University of Michigan, Ann Arbor.
- University College London, [Centre for Advanced Spatial Analysis](#), Prof. Michael Batty, Director
- Colorado Springs: [3D models from 3D Warehouse](#)
- Google Earth®, [online help](#)

First Edition:

- Adams, Paul C. 1998. "Network topologies and virtual place." *Annals of the Association of American Geographers*, vol. 88, no. 1 (March): 88-106.
- Arlinghaus, S. L. *Spatial Synthesis: 3D Atlas of Ann Arbor*, <http://www-personal.umich.edu/~copyright/image/solstice/win04/SpatialSynthesis/index.html>
- Arlinghaus, S. L. Summer 2003. "Ann Arbor, Michigan: Virtual Downtown Experiments." *Solstice: An Electronic Journal of Geography and Mathematics*. Vol. XIV, No. 1, <http://www-personal.umich.edu/~copyright/image/solstice/sum03/sandy/downtown.html>

- Arlinghaus, S. L. Winter 2003. "Ann Arbor, Michigan: Virtual Downtown Experiments, Part II." *Solstice: An Electronic Journal of Geography and Mathematics*. Vol. XIV, No. 2, <http://www-personal.umich.edu/~copyrght/image/solstice/win03/mappingheight.html>
- Arlinghaus, S. L. et al. "Kioskland: A Strategy for Linking Hierarchical Levels of Virtual Reality Maps." *Solstice: An Electronic Journal of Geography and Mathematics*, Vol. XVI, No. 1, <http://www-personal.umich.edu/~copyrght/image/solstice/sum05/VRmatt/kioskland.html>
  - Arlinghaus, S. L.; Arlinghaus, W. C.; and Harary, F. 2002. *Graph Theory and Geography: an Interactive View eBook*. New York: John Wiley and Sons.
  - Arlinghaus, S. L. and Arlinghaus, W. C. 2005 *Spatial Synthesis*. <http://www.imagenet.org/>
  - Arlinghaus, S. L.; Fred J. Beal; and, Douglas S. Kelbaugh "The View from the Top: Visualizing Downtown Ann Arbor in Three Dimensions," *Solstice: An Electronic Journal of Geography and Mathematics*, Vol. XV, No. 1, <http://www-personal.umich.edu/~copyrght/image/solstice/sum04/ddaframeset.htm>
  - Batty, Michael and Yichun Xie. 1994. "From cells to cities." *Environment and Planning B: Planning and Design*, vol. 21, Celebration Issue: 531-548.
  - Batty, Michael. 1994. "A chronicle of scientific planning: The anglo-American modeling experience." *Journal of the American Planning Association*, 60, 7-16.
  - Batty, Michael. 1994. "Using GIS for visual simulation modeling." *GIS World*, vol. 7, no. 10.
  - Batty, Michael. 1992. "Urban modeling in computer-graphic and geographic information system environments." *Environment and Planning B: Planning and Design*, vol. 19: 663-688.
  - Bay, Alan. 1994. "From map to model: the development of an urban information system." *Design Studies*, 15 (3), 366-384.
  - Beier, Klaus-Peter. 2004. "One Optimization of an Earlier Model of Virtual Downtown Ann Arbor" *Solstice: An Electronic Journal of Geography and Mathematics*, Vol. XV, No. 1, <http://www-personal.umich.edu/~copyrght/image/solstice/sum04/beieredited/beier.html>
  - Beier, Peter. 2003. "Modification of files of a downtown Ann Arbor virtual reality scene": [http://www.engin.umich.edu/class/eng477/projectsf03/MAP/vrml/downtown\\_annarbor.wrl](http://www.engin.umich.edu/class/eng477/projectsf03/MAP/vrml/downtown_annarbor.wrl)
  - Birta, Louis G. and Tuncer I. Oren. 1995. "Simulation modeling for environmental problems: a review of the current state." *Simulation*, vol. 64 (April): 280-282.
  - Bishop, I.; Dave, B. 2001. "Beyond the Moving Camera: Systems Development for Interactive Immersive Exploration of Urban Environments," *Paper for Computers in Urban Planning and Urban Management*
  - Bishop, Ian; Spring, D.; John W.; and, Potter, R. 1995. "Extending the geographic information base into the third dimension for use in the urban environment." *Journal of the Urban and Regional Information Systems Association*, 7 (1), 20-25.
  - Borkin, Harold and Turner, James A. 1978. "The Development of Three-Dimensional Spatial Modeling Techniques for the Construction Planning of Nuclear Power Plants," *SIGGRAPH*, McIntosh
  - Bosselman, Peter and K. H. Craik. 1987. "Perceptual simulations of environments." In Bechtel, R. B., et al. eds, *Methods in Environmental and Behavioral Research*, (162-190), New York: Van Nostrand and Reinhold and Company.
  - Bowman, D., Davis, E., Badre, A., & Hodges, L. 1999. "Maintaining Spatial Orientation during Travel in An Immersive Virtual Environment." *Presence: Teleoperators and Virtual Environments*, 8(6), 618-631.
  - Brail, R. K. 1990. "Integrating urban information systems and spatial models." *Environment and Planning B*, 17: 417-427.
  - Branch, Melville C. 1997. *Simulation, Planning and Society*. New York: Praeger.
  - Bressi, Todd. 1995. "The real thing? We're getting there." *Planning*, 61 (7) July, 16-20.
  - Britton, Harris. 1985. "Urban simulations models in regional science." *Journal of Regional Science*, 25 (4), 545-567.
  - Chirapiwat, Thana. 2001. "Visualization of Geographic Information using VRML".
  - Couclelis, Helen. 1997. "From cellular automata to urban models: new principles for model development and implementation." *Environment and Planning B*, vol. 24, no. 2: 165-174.

- Cruz-Neira, C., Sandin, D. J., Fanti, T. A. D., & Hart, J. C. 1992. "The Cave: Audio Visual Experience Automatic Virtual Environment." *Communications of the ACM*, V.35, 64-72.
- Daniel, T. C., & Vining, J. 1983. "Methodological Issues in the Assessment of Landscape Quality." In I. Altman & J. F. Wohlwill (Eds.), *Behavior and the Natural Environment* (pp. 39-84). New York: Plenum.
- Decision Board, 2003. <http://www.decisionboard.org/academic/zzzsubject11.asp>
- Decker, John. 1993. "Simulation methodologies for observing large-scale urban structures." *Landscape and Urban Planning*, 26, 231-250.
- Disaster Research, December, 2003. GIS and Hazards. <http://hazards.lsu.edu>
- Doyle, Simon; Dodge, Martin; and Smith, Andy. 1998. "Potential of web-based mapping and virtual reality technologies for modeling urban environments." *Computers, Environment and Urban Systems*, vol. 22, no. 2 (March): 137-155.
- Erikson, C., and W. Hundley. 1996. "Advancements in related technologies bring virtual reality to GIS." In *Proceedings of the High-Fidelity Simulation for Training, Test Support, Mission Rehearsal, and Civilian Applications*, SPIE: 14-18.
- Fedra, K. 1999. "Integrating monitoring, GIS and simulation models: Urban environmental management." *Geomatics Info Magazine*, vol. 13, no. 7: 28-31.
- Forrester, John. 1989. *Planning in the Face of Power*. Berkeley: University of California Press.
- Frueh, Christian (Prof. Avidah Zakhori). 2003. Fast, Automated 3D Model Reconstruction for Urban Environments.
- Goodchild, Michael F. 1987. "A spatial analytical perspective on geographic information systems." *International Journal of Geographical Information Systems*, 1 (4) October-December, 327-334.
- Google Earth®: <http://earth.google.com/>
- Haala, Norbert and Claus Brenner. 1999. "Extraction of buildings and trees in urban environments." *Journal of Photogrammetric Engineering and Remote Sensing*, vol. 54, no. 2: 130-137.
- Han, Seung-Hoon, 2003. Ph.D. Dissertation, December, 2003. "A Working Prototype of Distributed Collaborative Architectural Design System." University of Michigan, College of Architecture and Urban Planning.
- Hardie, Graeme J. 1988. "Community participation based on three-dimensional simulation models." *Design Studies*, 9 (1) January, 56-61.
- Hazelton, N. W. J., Leahy, F. J., and Williamson, I. P. 1992. "Integrating dynamic modeling and geographic information systems." *Journal of the Urban and Regional Information Systems Association*, 4 (2), 47-58.
- Hearnshaw, H. M. and Unwin, D. J. eds. 1994. *Visualization in Geographical Information Systems*. New York: John Wiley and Sons.
- Huang, Bo and Hui Lin. 1999. "GeoVR: a web-based tool for virtual reality presentation from 2D GIS data." *Computers and Geosciences*, vol. 25, no. 10 (December): 1167-75.
- Hutchinson, Bruce and Batty, Michael. 1986. *Advances in Urban Systems Modeling*. New York, Elsevier Science Publishing Co.
- Jepson, William. (1992). UCLA Urban Simulator. <http://www.research.ucla.edu/chal/20.htm>
- Jiang, B.; Claramunt, C.; and Batty, M. 1999. "Geometric accessibility and geographic information: Extending desktop GIS to space syntax." *Computers, Environment and Urban Systems*, vol. 23, no. 2: 127-146.
- Johnson, Glenn O. 1992. "GIS applications in emergency management." *Journal of the Urban and Regional Information Systems Association*, 4 (1), 66-72.
- Kaiser, E. J. and Godschalk, D. R. 1995. "Twentieth century land use planning : A stalwart family tree." *Journal of the American Planning Association*, 61, (3) Summer, 365-385.
- Klosterman, Richard E. 1994. "Large-scale urban models: Retrospect and prospect." *Journal of the American Planning Association*, vol. 60: 3-6.
- Kreuzeler, Matthias. 2000. "Visualization of geographically related multidimensional data in virtual 3D scenes." *Computers and Geosciences*, vol. 26, no. 1 (February): 101-108.
- Kwon, Taejung; Lazzaro, Adrien; Oppenheim, Paul J.; and Rosenblum, Aaron. Winter, 2003. "Ann

- Arbor, Michigan: Virtual Downtown Experiments, Part III." *Solstice: An Electronic Journal of Geography and Mathematics*. <http://www-personal.umich.edu/~copyrght/image/solstice/win03/MAP/index.html>
- Landis, John and Zhang, M. 1998. "The second generation of the California urban futures model: Part 1: model logic and theory." *Environment and planning B: Planning and Design*, vol. 25, no. 5: 657-666.
  - Lange, Echart. 1994. "Integration of computerized visual simulation and visual assessment in environmental planning." *Landscape and Urban Planning*, 30, 99-112.
  - Liggett, R., & Jepson, W. 1995. "An integrated environment for urban simulation." *Environment and Planning B*, 22,291-305.
  - Loeb, Arthur L. 1976. *Space Structures: Their Harmony and Counterpoint*. Reading, MA: Addison-Wesley
  - Longley, Paul and Batty, Michael (eds.). 1996. *Spatial Analysis: Modelling in a GIS Environment*. New York: John Wiley and Sons.
  - Ma, Y.; Soatto, S.; Kosecka, J.; and Shastry, S. S. 2004. *An Invitation to 3-D Vision: From Images to Geometric Models*. New York, Springer Verlag, Series in Interdisciplinary Applied Mathematics.
  - Marans, R. W. and Stokols, D. 1993. *Environmental Simulation: Research and Policy Issues*. New York: Plenum Press.
  - Michigan Society of Planning. 2003 version. *Community Planning Principles*. Michigan Society of Planning, 219 S. Main Street, Ann Arbor, MI 48104.
  - Molnar, D. J. 1986. "SCEEN: An Interactive Computer Graphics Design System for Real-time Environmental Simulation." *Landscape Journal*, 5,128-134.
  - Nadeau, D. R. 1999. "Building Virtual Worlds with VRML." *IEEE Computer Graphics and Applications*, March/April 1999,18-29.
  - NASA WorldWind: <http://worldwind.arc.nasa.gov/>
  - Naud, M. LandView III, Manual for Windows. Unpublished: distributed at conferences.
  - Nystuen, J. D. 1967. "Boundary shapes and boundary problems." *Peace Research Society, Papers, VII*, Chicago Conference.
  - Nystuen, J. D. 1963. "Identification of Some Fundamental Spatial Concepts," *Papers, Michigan Academy of Letters, Sciences, and Arts*, v. 48(1963): 373-384.
  - Nystuen, J. D. 1961. with Michael F. Dacey, "A Graph Theory Interpretation of Nodal Regions," *Papers and Proceedings, Regional Science Association*, v. 7 : 29-42.
  - Nystuen, J. D. 2002. "Thunen Society, North American Division," *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XIII, Number 1, <http://www.InstituteOfMathematicalGeography.org/>
  - Nystuen, J. D. What's at Home: Shelter for the Poor in Low Income Cities, *Solstice: An Electronic Journal of Geography and Mathematics*, vol. XI no. 2 <http://www.InstituteOfMathematicalGeography.org/>
  - O'Neill, M. J. 1991. "Evaluation of a conceptual model of architectural legibility." *Environment and Behavior*, 23,259-284.
  - Palmer, Thomas C. Jr. Feb. 16, 2004 "Selling in 360 degrees," *Boston Globe*. [http://www.boston.com/business/articles/2004/02/16/selling\\_in\\_360\\_degrees/](http://www.boston.com/business/articles/2004/02/16/selling_in_360_degrees/)
  - Ranzinger, M. and Gleixner, G. 1995. "Changing the city: datasets and applications for 3D urban planning." *GIS Europe*, vol. 4, no. 2: 28-30.
  - Raper, J. (Ed.) 1989. *Three Dimensional Applications in Geographical Information Systems*. London, New York: Taylor and Francis.
  - Rycus, M. J. 2003. "Object-Oriented Programming and Chaos Modeling in Planning," Mitchell J. Rycus, in, *The Planner's Use of Information*, Dandekar, H.C., Ed., 2nd. Edition; Planners Press, American Planning Association, Chicago, IL; pp 152-153.
  - Rycus, M. J. August, 2003. "Security Planning with Risk Assessment Models," White Paper prepared for Straec Technologies, ([www.straec.com](http://www.straec.com)).

- Rycus, M. J. 2000. "Crime Reduction Strategies for Planning Departments" M. J. Rycus. *Michigan Planner*, The Michigan Society of Planning Officials; Vol. 4, No. 8; pp 1,6-7.
- Rycus, M. J. 1995-96 (Winter). "The Role of Urban Planning in Crime Reduction," *City Planning and Management News*, pp 3-4.
- Rycus, M. J. 1991. "Urban Terrorism: A Comparative Study," *Journal of Architecture and Planning Research*, 8:1-14..
- San Diego 2003. GeoWorld. [http://www.geoplance.com/gw/2001/0110/0110dv\\_1.asp](http://www.geoplance.com/gw/2001/0110/0110dv_1.asp)
- "Shed Loads" broadcast on BBC World from 17-23rd Sept 2005
- Shiffer, M. J. 1992. "Toward a Collaborative Planning System." *Environment and Behavior B: Planning and Design*. 19, 709-722.
- SimCity, <http://www.simcity.com/>
- Simpson, David M. 2001. "Virtual reality and urban simulation in planning: A literature review and topical bibliography." *Journal of Planning Literature*. Vo. 15, No. 3, Feb. 2001: 359-376.
- Smardon, et al. eds., 1999. *Foundations for Visual Project Analysis*, 115-139, New York: John Wiley and Sons.
- [http://www.giscafe.com/magazine/index.php?run\\_date=01-Sep-2003&newsletter=1](http://www.giscafe.com/magazine/index.php?run_date=01-Sep-2003&newsletter=1)
- Stokols, Daniel. 1977. *Perspectives on Environment and Behavior: Theory, Research, and Applications*. New York: Plenum.
- Thrall, Grant Ian, Ruiz, M., Sidman, C., and Elshaw-Thrall, S. 1993. "Using GIS tools to analyze and visualize spatial phenomena." *Geo Info Systems*, 3 (5) May, 59-65.
- Turner, James. 2003. "Syntax2D User's Manual." The University of Michigan.
- *University of Michigan Record*, November 17, 2003. "Grant funds disaster simulation training: Center will prepare emergency workers for attacks." Jared Wadley, byline.
- Urdang, E. and Stuart, R. 1992. "Orientation enhancement through integrated virtual reality and geographic information systems." In *Proceedings of the Virtual Reality and Persons with Disabilities*, CSUN: 55-62.
- van Veen, H. A., Distler, H. K., Braun, S. J., & Bulthoff, H. H. 1998. "Navigating through a virtual city: Using virtual reality technology to study human action and perception." *Future Generation Computer Systems*, 14, 231-242.
- Verbree, E., van Maren, G., Germs, R., Jansen, F., & Kraak, M.-J. 1999. "Interaction in virtual world views- linking 3D GIS with VR." *International Journal of Geographical Information Science*, 13(4), 385-396.
- Virtual London: <http://www.casa.ucl.ac.uk/research/virtuallondon.htm>
- Walzer, Norman. 1996. *Community Strategic Visioning Programs*. Westport, CT: Praeger Publishers.
- Yeh, A. G. O. and Batty, M. 1990. "Applications of geographic information systems in urban and regional planning." *Environment and Planning B: Planning and Design*, vol. 17 (4): 369-374.
- Zube, E. H. and Simcox, D. E. 1993. "Landscape Simulation: Review and Potential." In Marans, Robert W. and Stokols, Daniel, eds., *Environmental Simulation: Research and Policy Issues* (253-278), New York: Plenum Press.

---

Copyright, 2007, All rights reserved. Contact [arlinghaus@gmail.com](mailto:arlinghaus@gmail.com) for permissions issues.