

WEB-BASED REAL ESTATE DATABASE INQUIRY AND DISPLAY WITH EMBEDDED GOOGLE EARTH/MAPS

Jin-Tsong Hwang

Associate Professor, Department of Real Estate and Built Environment

National Taipei University, Taiwan

Tel: +886225009155 Fax +886225074266

E-mail: jthwang@mail.ntpu.edu.tw

Huang-Chen Liu

Graduate Student, Department of Real Estate and Built Environment

National Taipei University, Taiwan;

Tel: +886225009896 Fax +886225074266

E-mail: a4376@ms31.hinet.net

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ABSTRACT: To acquire various and abundant information of real estate for sale is the same goal for the consumers and the brokerages. Therefore, before looking at the property, it is important to get all pertinent information possible. Most of the brokerage sites are aware of utilizes Internet as form of media for publicity however; the contents are limited to specific property itself and the functions of query are mostly just provided searching by condition. This paper proposes a query interface on website which gives function of query by condition and query by zone. The zones were generated by performing an overlay analysis over many of raster layers, for instance, the price, proximity to the park, and to the market, etc. The approach of overlay analysis is developing an user-friendly interface with ArcObjects in VB6, especially for non-GIS users. The inquiry results can be shown on the web page which Google Earth COM API and Google Maps API embedded in it. Therefore, the website shows the query results in a webpage with two-dimensional of Google Maps and three-dimensional of Google Earth styles. In addition, the display of inquiry results will give the multimedia present way which includes the Virtual Reality scene of house, panorama of interior of building and so on.

1. INTRODUCTION

The brokers in the intermediary housing market have provided well-designed videos or service on their website which is aimed at the demand of their potential consumers. Regarding the indoor arrangement, the brokers provide vivid views that combined 360 degree panoramic photographs from continual pictures by way of specialized software on their website (SinYi Realty, 2007; YungChin Realty, 2007). But occasionally the information of the location, environment or surrounding services on the website is restricted to short bits of text, two-dimensional maps, and façade pictures. They also sometimes lack satellite images. Overall the brokers have greatly improved the space and content available on websites.

The ability to choose the zone of the real estate by spatial analysis has already become a tendency of the GIS application. For non-GIS specialized customers, they can also apply the function of GIS when they choose the real estate zone. Because ArcGIS is developed based on the ArcObjects system, the ArcGIS users still prefer to use ArcObjects as their first choice. Moreover, ArcObjects cannot function well once it is separated from ArcGIS. ArcObjects only functions on a computer on

which the ArcGIS system is installed (ESRI, 2005). Therefore, the inquiry function of spatial analysis was also relatively restricted in this article.

This article takes the real estate information as data processed from National Taipei University. The interface is established on inquiry of traditional conditions and inquiry with GIS application of spatial analysis by ASP. This function of GIS applications of spatial analysis was based on Visual Basic 6.0 and ArcObjects. Because there are many users who are not GIS professionals, providing spatial solutions by developing a user-friendly platform with spatial analysis to non-GIS users is worthwhile. The inquiry results could be shown on a website that was designed with embedded Google Maps/Earth API on it. The result of inquiry may be indicated on maps, and one may further inquire about each related bit of information, as well as view additional images; for example, panorama of interior of the house, virtual reality, pictures of the façade and so on. In addition, the demonstration of inquiry result may show on Google earth and see three-dimensional representations of the all around environment, and verify that each vital service. In addition, the function of synchronization between Google Maps and Earth was implemented.

2. PAPER REVIEW

Google Maps, a free interactive mapping and visualization service providing direct access to zoomable maps or satellite views of the entire planet. Google Maps/Earth have a widespread application potential. This allows the user to use global maps and to develop an application system integrated with self-made data (Google Maps, 2007; Google Earth, 2007). There are more map service providers that become involved and release their API for free. They are Yahoo!Maps (Yahoo! Map, 2007) and MSN Windows Live Local (MSN, 2007). Google Maps is the most often used among them in Taiwan. Functionally, it offers some great advances over conventional map websites. The user can pan and zoom and change location without the page being reloaded. After the API is released, it is possible that GIS is integrated with website for local service use (Garrett, J. J., 2005).

Because map data and development platform of websites are available, electronic maps may be carried on integrated applications with other domains industries. For instance, Google Maps has joined with Craigslist's real estate listings to create a tool that lets people find housing simply by looking at a map in America (Housingmaps, 2007). A Colorado search engine gives the ability to search property listings in Metro Denver, Boulder and Northern Colorado (Coloradofuture, 2007). The search engine provides a description of each house for sale, including photos, virtual tours, and satellite images. Trulia search engine provides real estate information at the local level to help users make better decisions in the process (Trulia, 2007). With all of them, the searches just focus on the USA and only provide conditional queries. In Taiwan, the computer center GIS team at Academia Sinica also aimed at Google Maps and Google Earth and has completed some tests (Sinica, 2007).

3. THEORY

3.1 ArcObjects

ArcGIS is constructed by a Component Object Model (COM) that is based on ArcObjects module. Using this module we can develop corresponding professional GIS functions. Developers can also create extensions for ArcView using ArcObjects in standard development environments such as Visual Basic, C++, or Delphi. ArcObjects is the development platform for the ArcGIS family of

applications, such as ArcMap, ArcCatalog, and ArcScene (ESRI, 2005). Most developers use Visual Basic to create a COM component that works with ArcMap. In Visual Basic we can develop functions of spatial analysis and then build a COM component that will work with ArcMap by creating an ActiveX DLL and then call those same functions from ASP Scripts. To access ArcObjects we must have ArcGIS installed on our computer. Although, we are developing an application, to run that application the computer must have ArcGIS installed on the hard drive.

3.2 Active Server Page, ASP

The ASP provides an environment for server to execute the script. The application development by ASP may be easily developed and then revised. There are limitations on using ASP. According to network safety consideration, the ASP does not allow to call the out-process objects or program, and therefore many of ActiveX objects built in VB were unable to be used on the ASP web pages. So, many of basic functions have to be newly developed. ASP cannot call out-process program, meaning that it is unable to use the executable files which had already developed. In order to overcome the limitation of ASP and to integrate the query function with the ASP web pages, the program based on VB with ArcObjects will be compiled into DLL file format in this article.

4. EXPERIMENT DATA

The dataset in this article is the real estate database processed from National Taipei University in 2003. There are seven sub-databases, and the title and content of sub-databases are shown as Table 1. Because the Court Auction House in Taipei kept more detailed information and has a high successive percentage of geocoding by address, the sub-database of Court Auction House is used in this article. We investigated and collected related images of houses in addition to enriching the real estate information content. In this article, these collected data included facade of house, interior room arrangement, public facility, and function for daily life, etc. The full path and file name of house photos needs to be built in real estate database for display after query. These photos of interior arrangement of room were processed in panorama style by Photo Vista and Virtual Realty files by Photomodeler Pro 5 (Eos, 2004). Public facility and function for daily living was transferred into KML file format and loaded into Google Earth as one of layers.

Table 1. Contents of Real Estate Database

Sub-Database	Quantity	Region of Collection	Collection Period
Public land	About 5000	Taipei, Taichung and Kaohsiung City	Since 1993
Readily available house	About 30000	Taipei City and Taipei County	Since 1993
Presale house	About 1500	Taipei City and Taipei County	Since 1993
House for rent	About 3000	Taipei and Kaohsiung City	Since 1993
Court Auction House	About 20000	Taiwan	Since 2000
Office for rent	About 5000	Taipei City	Since 1993
Valuation of Real Estate	About 20000	Taiwan	Since 1998

5. RESULTS AND ANALYSIS

5.1 The Query Interface

There are three sections of web pages developed by ASP on this site. On the top-left of the web page with query function are two types of query, one is query by conditions and the other is query by zone. The bottom-left page shows the results of query by listing five items per page. The demonstration inquiry results contain a smaller sized picture of the house, which got the file name from database, address, area, the highest number of floors, etc. Clicking on the smaller picture, a panorama of the inside of the house would be shown in a new window. Clicking on the address item, many of parameters would be passed to the right page, which were embedded with Google Maps/Earth COM API then placed a mark on the map. Clicking on the mark will get more information about the house, including extra photos of the house, the price, etc. The control of pan and zooming on the Google Maps will be synchronized between Maps and Earth.

5.2 Query by Spatial Analysis

On top-left of the web page, the query function was designed besides traditional conditional query, moreover the demand zone query function was proposed in this paper. For instance, the demand zone means that the user may query by the demand of finding the zone where the amount of time driving a car to the park is less than 30 minutes and to the market is 10 minutes. The optional demand items include school, market, park, and reasonable house price in this article. Although spatial analysis can be processed with GIS software, developing a user-friendly interface with ArcObjects is needed because many of users are not GIS professionals. One problem is that an EXE type of file cannot be processed in ASP. Compiling the file with function of spatial analysis to DLL in VB6 is the one of solutions. The polygon in figure 1 shows zone of spatial analysis of school, park, market, and price layers. The point features show the data of real estate for sale in Taipei. Figure 1(a) shows the results before overlay processing between zone and house for sale while Figure 1(b) shows the results after overlap processing.

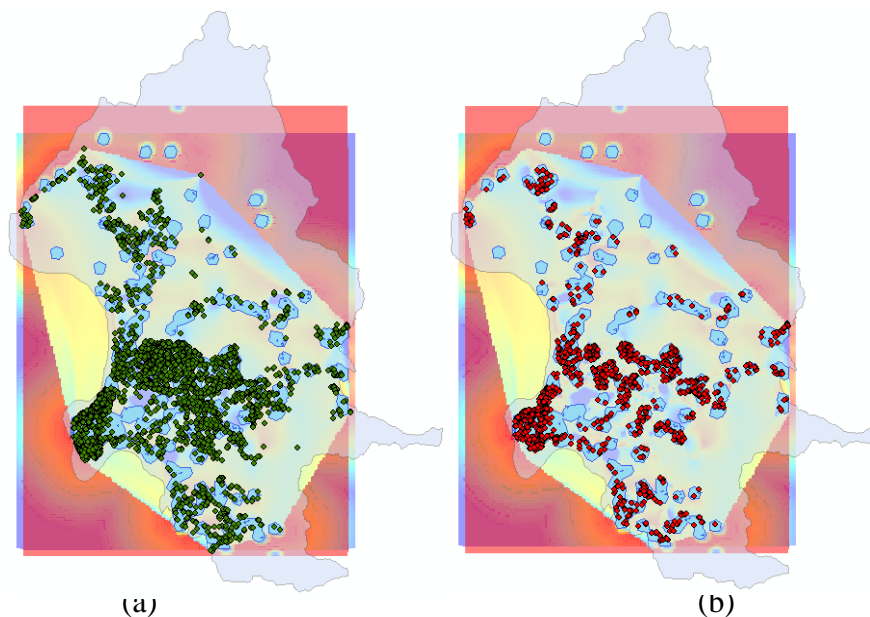


Figure 1. (a) Shows the Results before Overlay Processing Between Zone and House for Sale; (b) Shows the Results after Overlap Processing.

5.3 Google Maps/Earth Embedded and Synchronization

In this paper, Google Maps and Google Earth were embedded in one webpage. We've used the GoogleEarthAirlines plugin, in combination with a little extra javascript, to try and make navigating the various layers more intuitive and make two of systems synchronization(GoogleearthAirlines, 2007). The procedures of plugin IE Browser are shown below:

1. include geapi.js which is supported by GoogleEarthAirlines in your web page

```
<script type="text/javascript" src="/.js/geapi.js"></script>
```

2. use ApplicationGE.Plugin("content ") to instantiate plug by javascript

```
<div id="content" class="contentarea" >
<script> ApplicationGE.Plugin("content"); </script>
</div>
```

3. refer to <http://earth.google.com/comapi/> to get a reference to the classes and methods implemented in geapi.js

In addition, in order to shows the query results in a webpage with two-dimensional of Google Maps and three-dimensional of Google Earth, the function of synchronization between Google Maps and Earth is needed. The addListener() is one of APIs of Google Maps which is the function of detecting the event of map “moveend”. The Google Maps center’s coordinates and zooming factor were stored and then passed to the function of SetCameraParams() which is one of COM APIs of Google Earth.

```
GEvent.addListener(map,'moveend', function() {
var center=map.getCenter();
var zoomLevel = map.getZoom();
synchronization (center.y, center.x,zoomLevel); });
```

Results of query will place a mark on the Google Maps and then clicking the mark will create an information window showing the detailed information of the real estate. Pan and zooming on Google Maps can lead to synchronize with Google Earth. There is much of pre-collected and pre-located information shown around the “Target”. The query result was placed on the Google Map and Earth with function for daily life information as shown in Figure 2.

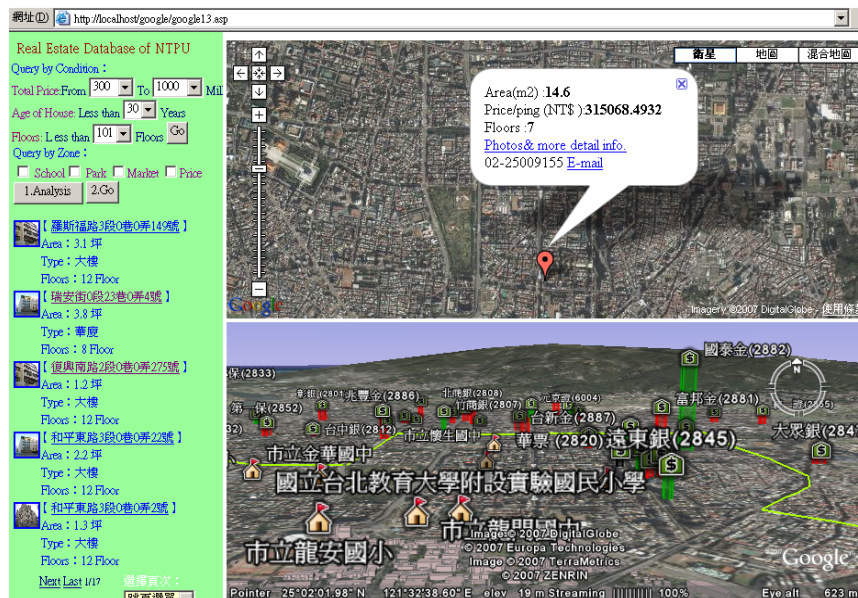


Figure 2. The Demonstration of Query Result with Function for Daily Life in Google Earth

6. CONCLUSION

GIS not only may used as data management tools, they may provide policy-making reference based on the result of spatial analysis. This article proposes two types of query to find out the zone that satisfies customer's demand and then checks the location of real estate for sale. These two types of query include the traditional condition query, and query by zone which resulted from spatial analysis that developed in VB with ArcObjects. Results of query were demonstrated on the web pages that had embedded Google Maps and Earth API. In this paper, the demonstration platform has the function of two-dimensions of Google Maps and three-dimensions of Google Earth. There are many of conclusions shown below:

- (1)The resources of dataset of images and electric map, and development platform for developer were already supported by Google Maps at no cost. Developer can easily integrate database with map display by developing web pages and Script functions. Because is easy to combine with web page, it is more convenient to use than GIS. But, the API of Google Maps do still not support the function of spatial analysis. The limitation of using API of Google for application already exists.
- (2)Google Earth is running for site-based, in this paper, we proposal an web-based approach of embed Google Maps and Earth in a single webpage. We can check the query results of Real Estate in two-dimensional and three-dimensional view from client site.
- (3)The method of COM was adopted in this article. Although users can choose either ArcObjects or MapObject, the latter has a more limited function. For example, it cannot be used with MS Access databases. If we are working with geodatabases, we obviously are using ArcGIS. Because ArcGIS is developed based on the ArcObjects system, the ArcGIS users still prefer to use ArcObjects as their first choice. Moreover, ArcObjects cannot function well once it is separated from ArcGIS.

References

- Coloradofuture, 2007. <http://www.coloradofuture.com/>.
- Eos System Inc., 2004. PhotoModeler Pro 5 User Manual, pp.107-236.
- ESRI, ESRI Developer Online, 2005. <http://edndoc.esri.com/arcobjects/9.0/>.
- Garrett, J. J., 2005. <http://adaptivepath.com/publications/essays/archives/000385.php>.
- Google Earth, 2007. <http://earth.google.com/comapi/>.
- Google Maps, 2007. <http://maps.google.com/>.
- GoogleEarthairlines, 2007. <http://www.googleearthlines.com/>.
- Housingmaps, 2007. <http://www.housingmaps.com/>.
- MSN Windows Live Local, 2007. <http://local.live.com/>.
- Sinica, 2007. <http://gis.ascc.net/googlemap/>.
- SinYi Realty Inc., 2007. <http://www.sinyi.com.tw>.
- Trulia, 2007. <http://www.trulia.com/>.
- Yahoo! Maps, 2007. <http://maps.yahoo.com/>.
- YungChin Realty Inc., 2007. <http://www.yungching.com.tw/>.