Universal Geo-database Connector Interface Component (UG-CIC) for Virtual Web-base GIS Server Essential for Real Estate Industry Uses

Jad JARROUSH and Kobi ZAID, Israel

Key words: Access to Land, Geo-Information/GI, Real Estate Development, Valuation, GIS, Virtual GIS Web Server, Automatic Dynamic Web-Base GIS, Real Estate Price List

SUMMARY

Geographic Information Systems (GIS) technology is leading to increased productivity, greater accuracy and timeliness of information in many industry operations and for both professionals and the general public. One of the main fields that widely involve GIS's useful functions is the Real Estate Assessment.

The ultimate goal for the Real Estate commercial companies is to execute strategic movements in the market to increase the assessment value of their property. This includes: selling the property, buying its neighbor's property as well as establishing buildings etc…

The values of the Real Estate assessments are influenced by several environmental elements such as roads, railways, and alteration of real estate objects. Important information related to the Real Estate is usually obtained from zoning, and town planning committees. A benefit of the GIS technology, specially the use of Web-Base GIS applications, is its ability to connect geographical databases of Real Estate companies with the town's geographical data plans.

Real estate companies generally have historical geographical data of their properties. These data are normally saved in different simple database formats, such as: Microsoft Access files, Microsoft Excel files, Alpha Numeric Arbitrary, and in the best case GIS software formatted files.

This paper discusses the needs for universal geo-database connector interface that provides a virtual GIS server through the web. This will be useful for bridging the gap between the town planning dynamic geo-databases and the real estate companies' databases.

A similar interface component called RADIUS is proposed, developed by Zaid Orniv Company L.T.D, which uses the Microsoft Internet Information Server (IIS) for applying different spatial queries. These queries consider different environmental elements that provide useful tools for assessing the values of the real estate companies' properties.

Universal Geo-database Connector Interface Component (UG-CIC) for Virtual Web-base GIS Server Essential for Real Estate Industry Uses

Jad JARROUSH and Kobi ZAID, Israel

1. INTRODUCTION

Geographic Information Systems (GIS) technology is leading to increased productivity, greater accuracy and timeliness of information in many industry operations and for both professionals and the general public.

One of the main fields that widely involve GIS's useful functions is the Real Estate Assessment. GIS software could be easily used for automatic highlighting of geographical areas in digital maps through basic GIS query. Such as Real Estate properties related to a specific company. Fortunately, GIS capabilities meet the requirements for much more advanced needs, especially those involved in automatic GIS queries as well as spatial analysis.

The ultimate goal for the Real Estate Commercial companies (REC) is to execute strategic movements in the market to increase the assessment value of their property. This includes: selling the property, buying its neighbor's property as well as establishing buildings etc…

Unfortunately, using GIS services for Real Estate Companies' services involve several technical and professional difficulties. Such difficulties are a result of the way of the REC managing their properties' data as well as the way of specific governmental bodies (such as Town Planning Committees) publishing their data. In the coming paragraphs we will detail some of difficulties in order to highlight the significance of web-base RADIUS GIS component system for overcoming these difficulties, as recommended by this paper.

2. REAL ESTATE COMPANY DATA SPECIFICATIONS

Real Estate Company's (REC) usually deal with properties. They identify a property by its address or by the juridical cadastral name; number of block and number of parcel. If the property is part of a condominium then the part number of the condominium could be added for better identification.

Every REC monitors their properties by managing records and information useful for the property evaluation (or assessment) as well as for taxation needs. Table 2.1 to Table 2.4; illustrate how REC's managed cadastral parcels real estate in Israel when the blocks and the parcels names are not true:

Table 2.1: Properties' Identifications Details

Party ID #	Block #	Parcel #	Legal Cadastral Area [sqm]	Existed Area [sqm]	Town	Street	Number	Building Part
1	16533	5	4013	3978	TSIPORY	-	-	-
2	16749	53	1215	1256	NAZARETH	Polos 6	13	Empty
3	10212	17	2800	28104	YAGOUR	Hatikva	25	Farm
..	..	..	..	..	..			..

Table 2.2: Properties' Town Planning Usage Details in Time

Party ID #	Legal Cadastral area [sqm]	Existed Area [sqm]	Use Specifications as Town Planning Plans	Building Percentage [%]	Maximum Building Height [m]	Information Time	..
1	4013	3978	Industrial	450%	39	14/03/1992	..
2	1215	1256	dwelling	160%	13	29/11/1996	..
3	2800	28104	agricultural	20%	8	02/08/1998	...
..	..	..	..	..	..	..	..

Table 2.3: Existed Exploitation Details

Party ID #	Building Percentage [%]	Remaining Building Percentage [%]	Building Height [m]	Remaining Height [m]	Own Used/Leasing	Use specifications as Town Planning Plans	..
1	150%	300%	12	27	Leasing	Industrial	..
2	0%	160%	0	16	Own	dwelling	..
3	5%	15%	4	4	Leasing	agricultural	...
..	..		..			..	..

Table 2.4: Properties' Evaluation (or Assessment) Details

Party ID #	Acquisition Cost [$]	Date of Acquisition	1 $ in NIS	Integrated Index Val.
1	35000	14/03/1992	2.384	99.12
2	180000	29/11/1996	3.253	101.56
3	1150000	02/08/1998	3.650	101.99
..	..	..	..	..

The above tables are possible examples to the data types that could be managed by REC in the private and in the governmental sectors. The connection between these data and the GIS is done in Table 2.1, when, algorithmically, the GIS must know the appropriate polygon in its geo-database according to the address or the juridical block and parcel numbers if they exist. Several researches could be found in order to understand the needs of the GIS as an analysis tool for the Real Estate market sector especially for assessments, such as Fryrear et al., 2001, Weber, 1990 and 2001, and German, 1999.

In order to benefit from the GIS, REC has to recognize factors that impact the value of their properties with warning signals useful for enlarging the incomings of the company. Thus,

creating a location map of the properties will not be adequate for that purpose since it is not the only factor affects the incomings. The GIS must support other data, useful for executing market movements concerning the REC properties, in order to increase its incomings or its wealth value.

Therefore, GIS in the beginning has to identify the spatial place of the property in the country in order to produce a map. This map might contain other layers and spatial data useful for fulfilling the main task. Moreover, in advanced GIS application, Online Analytical Processing (OLAP) is needed for online useful guidance (Weber, 2001).

3. USEFUL DATA FOR REAL ESTATE COMPANY

According to the Real Estate Assessment Science, there are several factors that affect the value of the property. Wachs, in 1978, by discussing the need for implementation of Computerized Real Estate Assessment, Williamson in 1994, Carn et. Al., 1988, Fanning et. al, 1994 as well as Pollakowski, in 1995, by discussing the data sources for measuring house price changes, counted number of factors and data effective for real estate assessment. Authors try to summarize the most important factors that may contribute to the REC taking decisions to increase their profits:

1. The position of the property; the town (or the village) which the property is related to, the distance from other spatial entities such as roads, governmental or municipal buildings, commercial and industrial entities etc.
2. Deposit Town Planning plans.
3. Licensed Town planning plans.
4. Building and development projects.
5. Building licenses.
6. Property mortgages.
7. The quality of the property workmanship especially the building construction, performance and the quality of the material in the building. If the property is an agricultural parcel, they look at the quality of the cultivations in it etc…
8. The Juridical Registration Status. For example: Is the property is settlement legally or not?! Or has the property only one or several owners.
9. The Cadastral Status identifies the parcels according to the digital cadastre registration or analogical cadastre.
10. Neighbor Real Estate transactions and mortgages. For example: to whom the neighbor property had been sold or leased or mortgaged, how much, how, etc...
11. Announcements for selling, leasing or renting of neighbor real estate properties.
12. Taxation values.
13. Information about the inhabitants of the community, such as age, religion etc…
14. The health quality of real estate environment such as degree of contamination.

The above data could be divided into two parts: the first part consists from the first five data types which could be identified using GIS map graphical data layers. The second part consists of the other eight data types, which need alpha numeric data. Alpha numeric data

could be obtained by producing GIS thematic maps using different mapping techniques such as Symbolization Mapping, Isarithmic Mapping, and Choropleth Mapping etc. The assessment values of the properties could also be treated by means of Thematic Isarithmic maps (see figure 3.1)

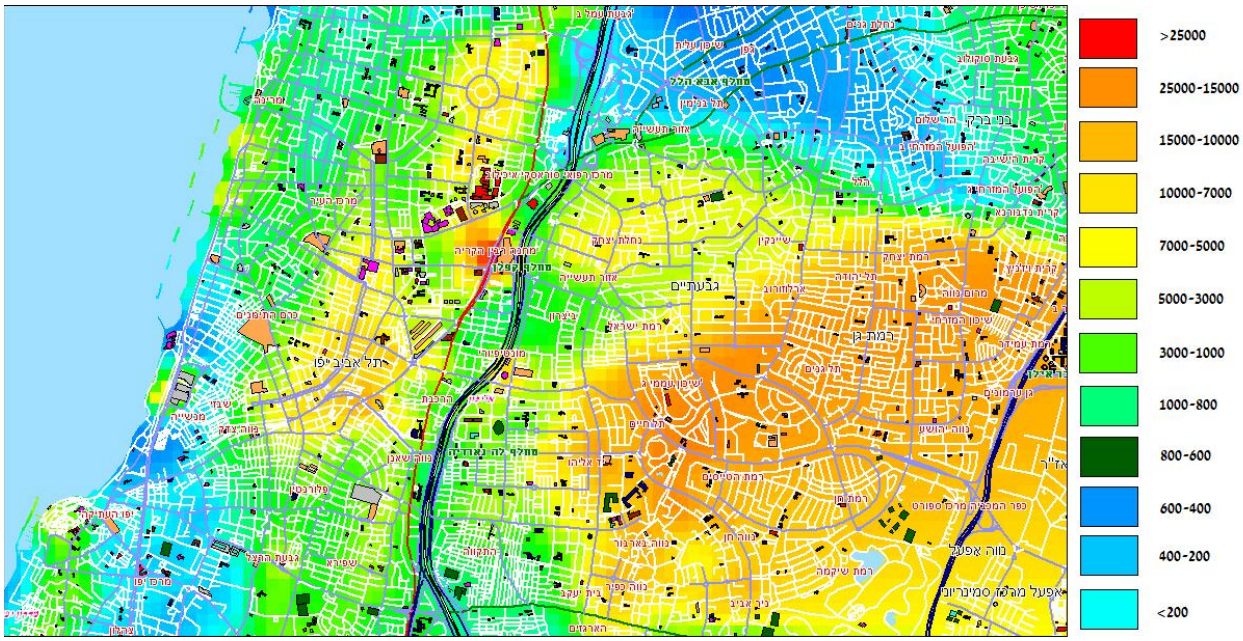

Figure 3.1: Virtual Data Map, using a Thematic Isarithmic map, presents the range of Real Estate value in units of $1000 in the centre of Israel, GUSH DAN

GIS software could be easily used for presenting all the above data. The first part provides the first data type provided by geographical CAD layers and the second part provides the second set of data type through inserting it as tables in a defined format.

Online analytical processing (OLAP) procedures could be used for evaluating the assessment values of the properties. This could be immediately after inserting all the tabular data, which may be integrated with geographical data, in order to generate the final assessment Choropleth map or the REC properties assessment. An REC officer could use this map for evaluating appropriate market movements such as: selling the property, buying its neighbor's property, leasing it as well as establishing buildings etc. An advanced system could advise users with appropriate real estate market movements. This paper will not concentrate on the OLAP procedures; it will highlight the connection issues between the above data sources and the GIS as well as the problematic availability of these data.

4. GIS SOLUTION IMPLEMENTATION ISSUES

Clearly, implementing such an ideal GIS system will not be simple. In similar to other GIS system uses, the first implementation problem is related to the data collection. Considering the first data part, especially those geographical data related to the planning committees, they

seem to be problematic, especially in Israel. The main reason for this is that planning committees have no digital GIS predefined format, nor automatic updating information systems that inform the public about new deposited town planning, licensed plans or building licenses. Similarly, the second part of the data is also not valid to the public; it resides in governmental offices such as: Taxation office related to the Ministry of Finance, Real Estate Registration offices related to the Ministry of Justice, Programs office related to the Ministry of Construction and Housing etc...

The above difficulties will be unresolved in the near future. Therefore, such an ideal GIS system for automatic and reliable assessment of the real estate property does not seem to be implementable.

Additionally, it is not certain that such a clever GIS assessment Real Estate automatic price-list web system might reflect the real market. This clever system differs from other price-list systems, such as the price-list second hand cars system, as it has a dynamic relationship to the environment and many other features. Especially that real estate is an eternal property and has other special characteristics. Hence this system may need a special research which will not be covered by this paper.

On the other hand REC enables the use of GIS in order to obtain information useful for making market decisions. It may need minimum updated information such as zone or town planning plans, especially those plans which are deposited and have not been licensed yet. In addition, geographical data such as streets, railways and buildings with ortho-photo updated image may be available as background for all other data layers.

Most of the developed and the developing countries have Geospatial Information Portal System. In Israel this can be found at www.govmap.gov.il. These portals facilitate the generation of GIS maps with different geographical data layers by entering different data for localization. While this portal maybe useful, it is not adequate for the main REC target. The most significant data is the zoning and town planning deposited maps' data which is obviously non-existent yet. Additionally, using these portals requires everyday manual monitoring and is not able to present inner data such as those which are presented by Tables 2.1 to 2.4. Thus REC's may need their local GIS software in addition to the updated important data layers as discussed above.

5. "RADIUS" AS A POSSIBLE SOLUTION

Zaid Orniv Company L.T.D, specialists in Real Estate technology, Surveying, Geo-Information and GIS have developed a web-base GIS computer component called "RADIUS". This component uses the Microsoft Internet Information Server (IIS) for applying different spatial GIS queries. REC can open a direct connection between their tabular database and Zaid Orniv geographical zoning and town planning layer database. By sending parameters through a web address utilizing legal user name and digital address in an easy

predefined format, they are able to get their desired GIS map. RADIUS may be used as a virtual GIS in every local system when geographical database layer is integrated with tabular data. This will produce the thematic desired GIS map (see Figure 5.1 for more details). RCP can produce for itself a unique local application to be connected to RADIUS which in turn produces the desired GIS map. Common geographical data layer between the RCP and Zaid Orniv Company database geographical layers can be easily generated.

RADIUS solution enables RCP to benefit from the analysis functions developed by Zaid Orniv specialists. Such as real estate evaluations, zoning and planning monitoring as well as automatic immediate warning messages in order to make decisions concerning Real Estate Market. The features can maximize the benefits of RCP.

In fact, instead of dealing with GIS local software, RADIUS provides virtual GIS environment. This enables the capturing of local alpha-numeric data similar to those shown in Tables 2.1 to 2.4 in order to generate spatial GIS queries. Therefore, it could be considered as a universal geo-database connector or interface for a virtual web-base GIS server.

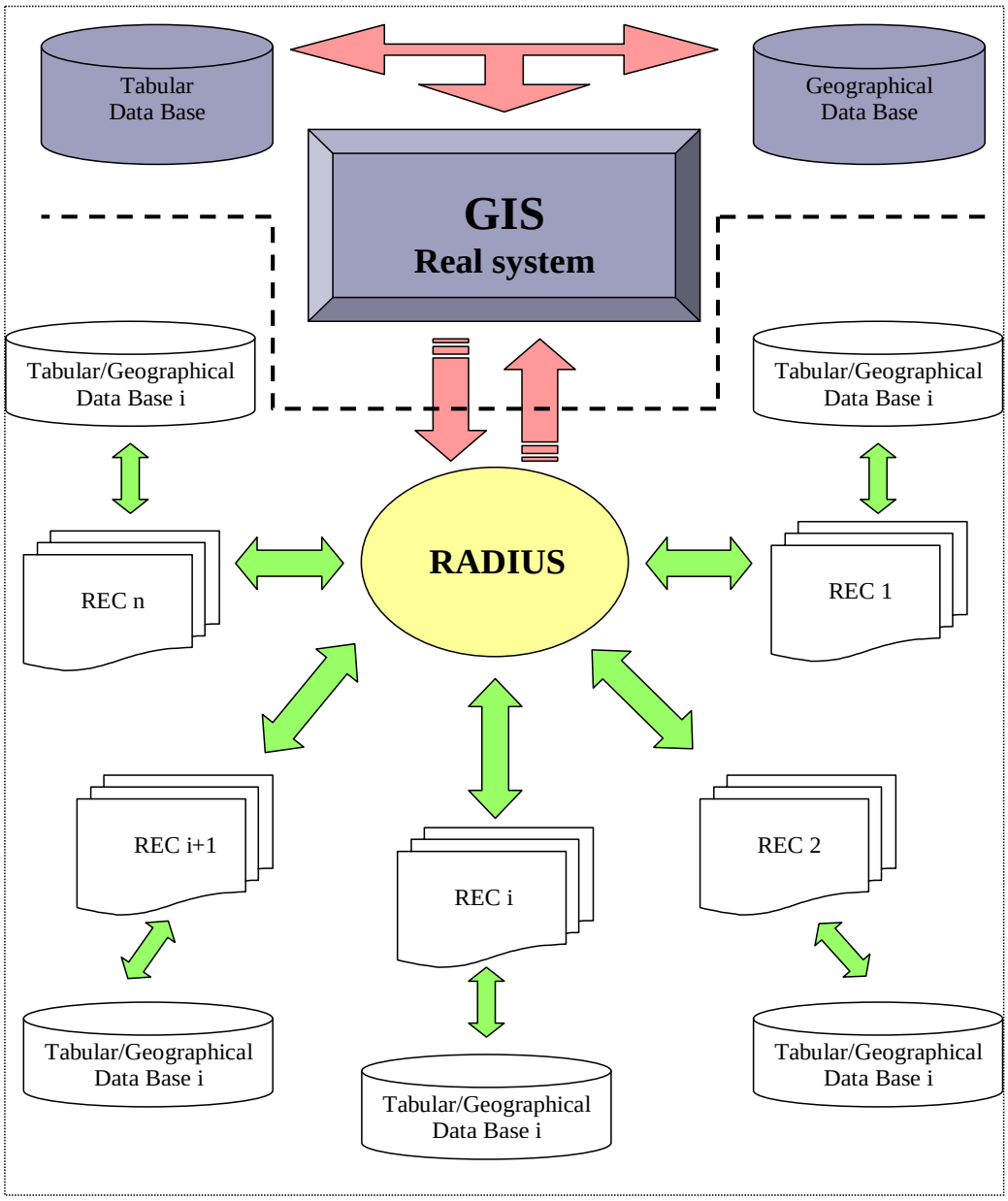

Figure 5.1: Flowchart Illustrating the RADUIS Virtual GIS Web-Base Component

6. CASE STUDY – WEB-BASE PLANNING AND MONITORING SYSTEM

For a case study, Zaid Orniv Company used RADIUS components in its Zoning and Town Planning Information Monitoring department (ZTP-IM). These were dominant components for producing daily reports for its customers when there are changes in their properties' zoning and town planning status. This reporting included any environmental changes which may impact them.

Zaid Orniv was tracking all zoning and town planning announcement plans in all newspapers. The Israeli Building and Planning law requires that every new deposited plan to be published in the newspapers in order to allow people the chance to oppose the suggested (or deposited) plan. Every day officers are tracking all newspapers for planning committees and other governmental body announcements, summarizing and entering the data to the ZTP-IM system through special system forms. The title of the announcements is a position which details: cadastral block or exact address or both of them. The position details the plans of the announcements and sends them through the web to the RADIUS component in Zaid Orniv main server. This is accomplished with special queries and tabular data, and then the system returns the appropriate GIS desired map with all the warning details which are relevant to Zaid Orniv REC specific client.

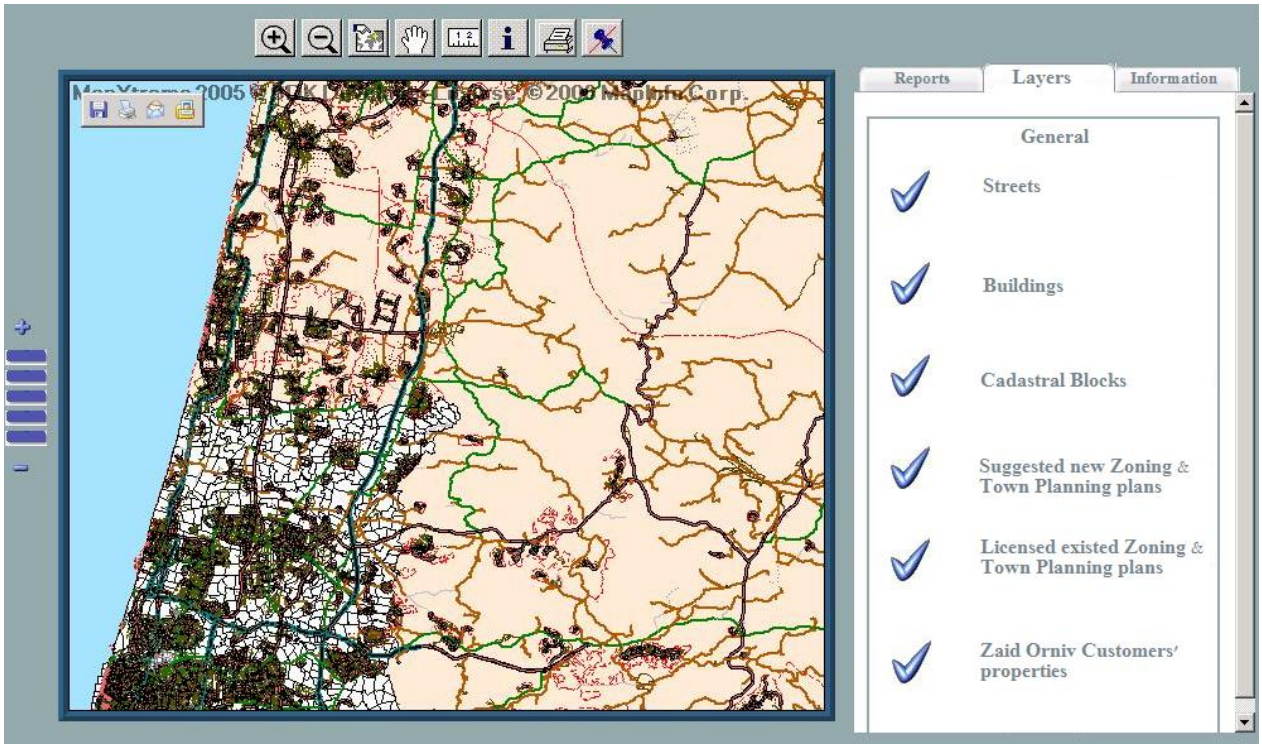

Figure 6.1: Screen Shot from the Virtual Web-Base GIS that is based on RADIUS

The ZTP-IM system also uses the RADIUS for introducing virtual web-base GIS. This system includes several CAD formatted maps of plans which were collected from the zoning and planning committees in different parts of Israel. Figure 6.1 is a screen shot from the virtual GIS where it can be seen that on the right hand side of the screen the user can set various relevant geographical layers. These layers are not existent in their local server but are available in Zaid Orniv server. The virtual GIS also provides automatic generation of different essential reports by clicking.

7. CONCLUSIONS

This paper highlighted the difficulties in using the GIS for Real Estate companies, in order to gain the maximum benefits of integrative assessment science with geographical useful data. These difficulties are part of the issues holding the development of integrated GIS & OLAP web-base system. This would otherwise provide accurate evaluations of the Real Estate through a dynamic and updated web price-list system.

Governmental bodies responsible for Real Estate have neither a digital predefined format nor a central GIS system for automatic updating information. Therefore the public in not well updated about new information that could affect their properties evaluation. For example, planning committees only announce deposited town planning, licensed plans or building license by publishing in newspapers. No digital format is published. Only if the citizen's go to the committee building can they obtain the digital format.

The RADIUS virtual GIS web-base component by the Zaid Orniv Company has been developed in order to make the connection between REC tabular data and Zaid Orniv GIS database. This contains a part of the useful data for assessments of the real estate properties. Additionally, it can be used for other GIS purposes especially when users have no geographical data layer and need to develop their own GIS system without having GIS local software.

In conclusion there is a need for a central governmental GIS portal containing all the data that affects the valuation appraisals of the real estate. Data have to be fed from all Governmental Ministry offices. It will be a real breakthrough in the real estate field transactions and in the daily life of civilian.

REFERENCES

Carn, N. J., Rabianski, R. Racster and M. Seldin, 1988, "Real Estate Market Analysis: Techniques and Applications", Englewood Cliffs, NJ: Prentice Hall, 1988.

Fanning, S. F., T. V. Grissom, and T D. Pearson, 1994, "Market Analysis for Valuation Appraisals", Chicago, IL: Appraisal Institute, 1994.

Fryrear, R. E. Prill and E. Worzala, 2001, "The Use of Geographic Information Systems by Corporate Real Estate Executives", Journal of Real Estate Research, 2001, 22:1/2, 153-64.

German, J. C., 1999, "An Introduction to Quantifying Location's Value in Real Estate Assessment Models Using Global Response Surface Techniques", Integrating GIS & CAMA Selected Papers for Professionals, 1999, 2, 66-73.

Pollakowski, H., O., 1995, "Data Source for Measuring House Price Changes", Journal of Housing Research, Vol. 6, Issue 3.,

Wachs, P., 1978, "Implementation of Computerized Real Estate Assessment", Journal of the American Planning Association, Vol. 44, Issue 1, January, pages 60-67.

Weber, B., 1990, "Application of Geographic Information Systems to Real Estate Market Analysis and Appraisal", The Appraisal Journal, January, 1990, 127-137.

Weber, B., 2001, "The use of GIS & OLAP for accurate valuation of developable land", Journal of Real Estate Porfolio Management, Jul-Sep 2001.

Williamson, P., I., 1994,"The Role of Land and Geographic Information Systems In Economic and Environmental Management", The South African Journal of Surveying and Mapping, Vol. 22, Part 5, 309-320.

BIOGRAPHICAL NOTES

Jad Jarroush received his B.Sc. in Geodetic Engineering in 2000 with honors. In 2002 he received his B.Sc. in Civil Engineering with honors and M.Sc. certificate in Geodetic Engineering from the Technion Institute. He is currently a graduate student at the Faculty of Civil and Environmental Engineering, Division of Transportation and Geo-Information Engineering as a Candidate for Ph.D. degree in Mapping and Geo-Information Engineering. He is also the main scientist and consultant of Zaid Orniv Company L.T.D specialist in Real Estate Technology as well as in "Zeibak & Sabbagh" Company L.T.D a surveying company. He is a licensed surveyor according to the Israeli law. His main fields of expertise include: Cadastre, 3D Cadastre, Dynamic Cadastre, Legal Digital Cadastre, Real Estate, GPS RTK, VRS GPS, VRS RTK GPS and 3D infrastructure presentation models.

Dr. Kobi Zaid is the general manager of Zaid Orniv Company L.T.D specialist in real estate technology, which has about 100 workers and has been established more than 40 years ago. He is a licensed surveyor according to the Israeli law. He is lieutenant colonel in the I.D.F. He has second degree in business administrations science and third degree in geographical science.

Elected studies which have been prepared by Dr Kobi Zaid:

- A research about new industrial areas in future peace borders between Israel and its neighbours.
- A research about industrial areas development which is based on a survey in 52 cities in Israel.
- Establishing a payments model for nature dammaged areas, which is based on data from over 300 settlements in the agricultural sector.
- A research about quarries location as a part of North Israel development.
- A GIS module for ground data inserting to energy projects.
- Modules establishment in the computerization and GIS field, which process real estate information.
- Establishing prices data pools to industrial, trading and retailing areas.

CONTACTS

Jad Jarroush
Mapping and Geo-Information Engineering,
Faculty of Civil and Environmental Engineering
Technion Institute of Technology,
Haifa 32000,
ISRAEL
E-mail: jad@tx.technion.ac.il
Tel: + 972-4-6562232
Fax: +972-50-8974127

Kobi Zaid
Zaid Orniv Company L.T.D
Ramat Gan 5206
Bet Ouz
Aba Helel Silva Str. 14
ISRAEL
Tel. + 972-3-7511818, Fax. +972-37511551
Email: kobi_z@zaidorniv.co.il
Web site: www.zaidorniv.co.il