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A Simplified Geographical Information System (GIS) for the Valuation Profession

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Abstract

Geographical Information Systems have been available in various forms for several decades but their use by the appraisal/valuation profession has tended to be concentrated in the field of mass appraisal and utilised almost exclusively by government instrumentalities. Such implementations have tended to be costly in terms of capital equipment, software licenses, database construction and licensing and staff training. The use of such systems for general valuation work has at best been spasmodic. Recent innovations in the availability of internet resources for both mapping and database access and management have opened opportunities for the deployment of low cost, easily maintained and operational effective systems. This paper describes and illustrates such a Simplified Geographical Information System (SGIS) for potential use by the valuation profession for both the auditing of Mass Appraisals and Automated Valuation Models (AVMs)

Key words: Geographic Information Systems, GIS, Valuation, Appraisal, Mapping, Automated Valuation Models

Introduction

Geographical Information Systems (GIS) are now firmly established as an essential tool in urban planning, cartography, resource management, environmental impact assessment, sales and marketing. The definition of what constitutes a GIS tends to vary according to its intended purpose but the essentials are adequately summarised by National Centre of Geographic Information and Analysis where it is stated that

> "a GIS is a system of hardware, software and procedures to facilitate the management, manipulation, analysis, modelling, representation and display of georeferenced data to solve complex problems regarding planning and management of resources."

Other definitions recognise that to many people GIS is both esoteric by nature and requires highly specialised and sophisticated training and has high associated infrastructure costs.

NASAGIS (2007) states that

> "GIS is an integrated system of computer hardware, software, and trained personnel linking topographic, demographic, utility, facility, image and other resource data that is geographically referenced."

And Burrough et al (1998) suggest that GIS is

> "…a powerful set of tools for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes"

GIS has tended for the most part to be utilised by government instrumentalities, universities and major commercial/industrial entities and ignored completely by the private practice valuers and appraisers where the high establishment, training and maintenance costs are not considered justifiable.

This paper provides a brief history of GIS followed by a discussion of the minimum requirements for a system that would support the work of a valuer and concludes with illustrations of such a simplified GIS.

History

Whilst cartography has been in existence for over a millennium it took until 1854 for the efficacy of spatial identification of clustering to be illustrated by John Snow when he correctly identified the source of a cholera outbreak by plotting the location of each case on a map of London. See Figure 1.

Figure 1-Map of Soho, London showing cholera cases.

Snow illustrated to great effect the use of overlays of georeferenced data to solve complex problems. The advent of computers and raster output encouraged much experimentation and after a slow start in 1962 the Canada Geographic Information System was established following a long a costly gestation period. GIS in its modern sense had arrived and was used extensively to ascertain farming land capability. Over the next two decades GIS became more sophisticated with the ability to add digital imagery as an overlay to vector graphics. By the 1990s many of these capabilities had been replicated on personal computers and within the last five years open source GIS software has become freely available. Prior to 2005 GIS was based upon vector graphics whereby polygon data held in databases was rendered to the screen by drawing vectors and other georeferenced data added by additional layers.

Figure 2- Traditional polygon vector output. Source: authors

Unfortunately the total cost of ownership (TCO) for systems suitable for use by valuers and appraisers was outside break-even parameters for all except governmental instrumentalities until 2005 when Google Maps launched was launched. This facility allows easy access to an underlying Digital Cadastre Database (DCDB), street mapping and aerial photography. It has two very important attributes that make it suitable for smaller valuations firms: it is free with no licensing fees and the code is open source. The balance of this paper illustrates possible scenarios for integration of this simplified GIS into valuation work.

A Simplified Geographical Information System (SGIS) for the Valuation Profession

Google Maps is a web service that provides mapping and other data services to all popular web browsers and can be integrated with other web services that provide data and is designed to be used in mashups (an agglomeration of feeds from disparate web services). Real estate data is now a commodity and details of properties for sale, detailed sales records of properties that have been sold, photographs, aerial maps and census data are available from a large selection of data brokers at a modest cost.

In addition Google Maps can be integrated into non-browser based applications and simultaneously access data from web service providers and the users own data storage media including CD-ROM, hard drive and USB drive thus providing full data integration. In such a scenario data can be manipulated, displayed, printed and exported. The ability to display census data, analyses of sales data and aerial maps contributes to the viability and accuracy of Automated Valuation Models (AVMs) and permits the easy identification of outliers and missing attributes. For those involved in mass appraisal for taxation purposes the ability to easily plot property characteristics and their decomposition into rates per square metre should help to improve the accuracy of the underlying models.

Each layer may be superimposed with any degree of opacity to allow features to show through and in common with Google Earth the scene may be zoomed or panned and details shown or hidden.

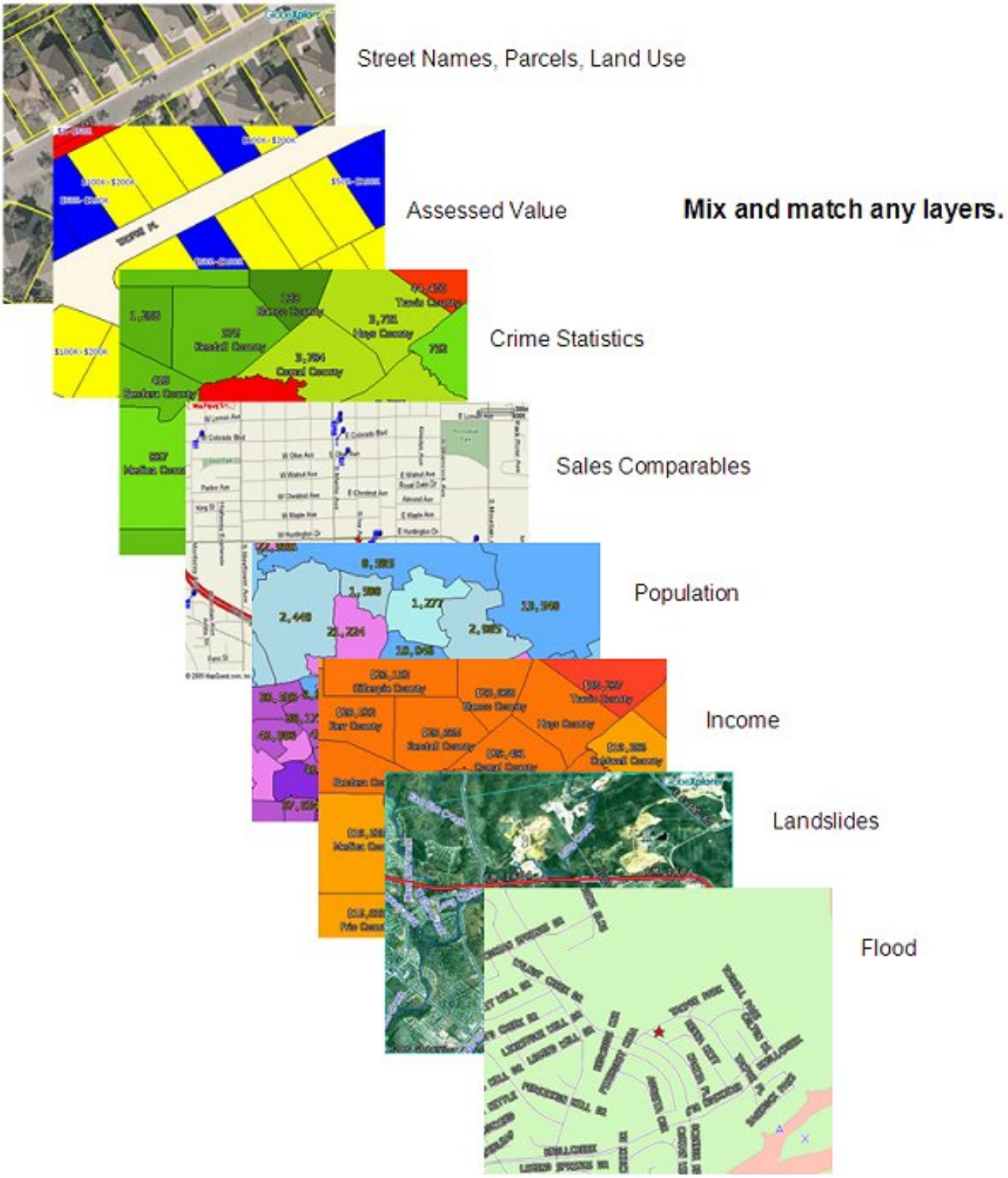
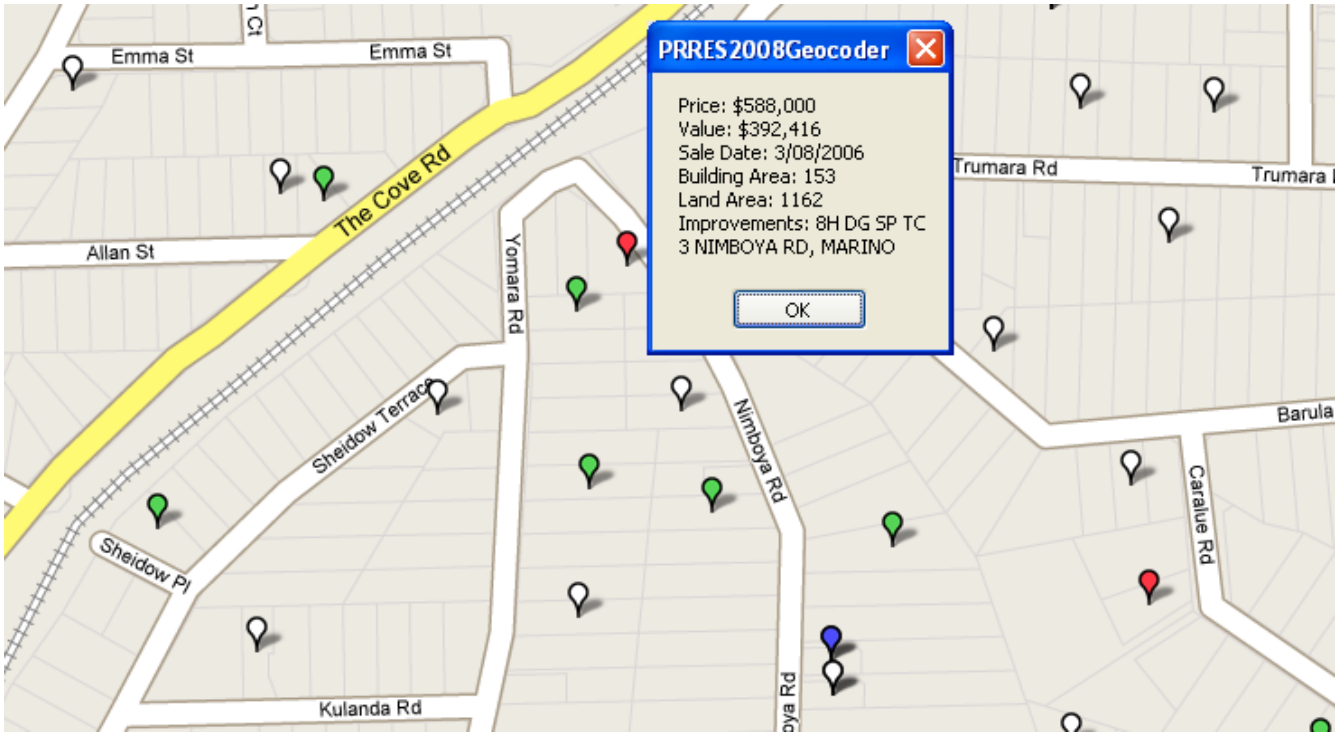


Figure 3- GIS Typology

Source: http://www.globexplorer.com/products/imagebuilder-suite.shtml



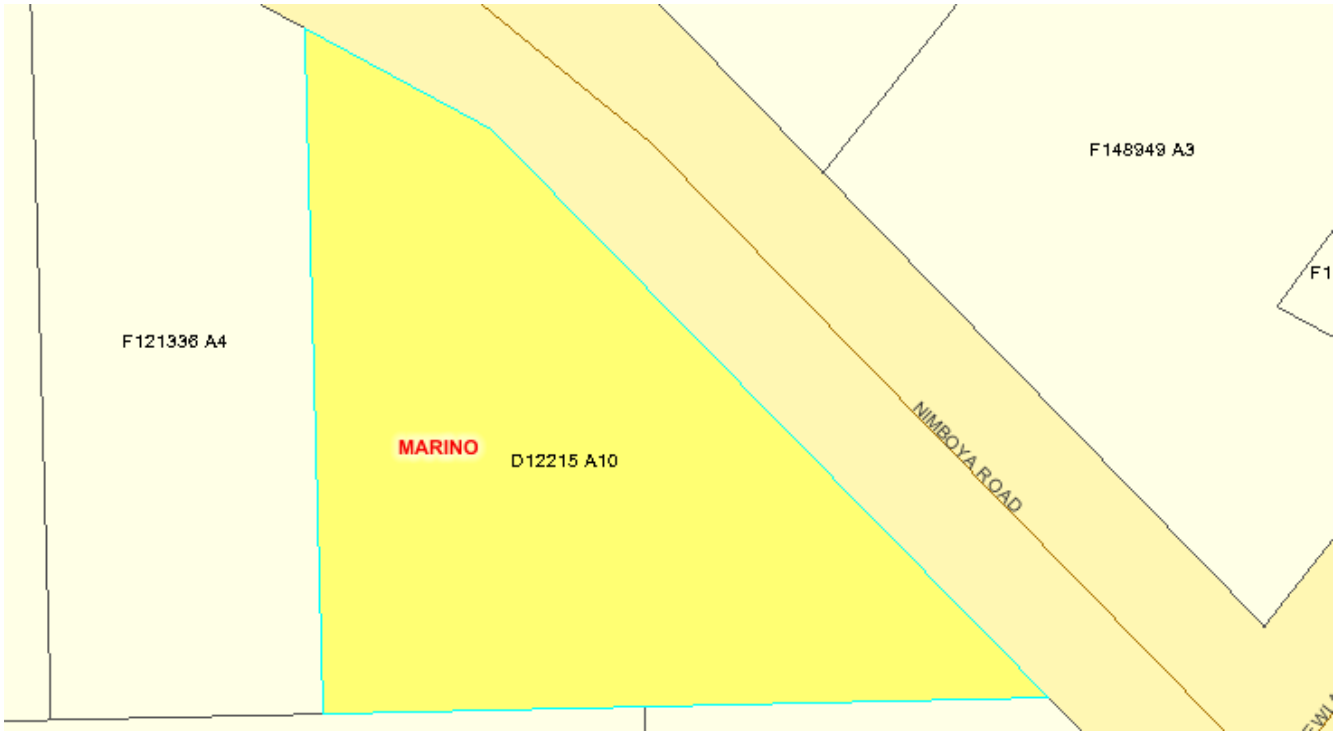
White markers = Sales; Green = assessed value within +/- 20%; Red = undervalued; Blue = overvalued.

Clicking on a marker displays a subset of the data held in the assessment database. It can be seen that the property has both a tennis court and a swimming pool which were ignored in the model

Changing to an aerial photographic view clearly shows the swimming pool and accessing an alternative source of photograph that has higher resolution also shows the tennis court.

The general availability of aerial photography also allows property attributes to be catalogued without the need for a physical inspection.

The area of the main building may also be captured with a sufficient degree of accuracy to permit its incorporation into AVMs.



Data from other web services can also show more detailed site plans of sufficient detail that site areas can easily be calculated where these are not otherwise available.

Some jurisdictions have rich datasets concerning real estate sales and access to this data is readily available via commercial subscription web services. Any data that is available via the internet can easily be incorporated into a simplified GIS.

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Search: LOCATION= Suburb, MARINO, STREET: NIMB, DATE: Jan 2006 to Dec 2007, Year From open to 2006, Date Printed: 4/12

Parameters | Brief details | Full details

Address	3 NIMBOYA RD, MARINO, 5049				
Price	$588,000	Sale Date	03-08-06	Record Date	18-08-06
UBD	164 E2	Sale Type		Valuation #	1028919056
Improvements	8H DG SP TC	Equiv Area	153	Rooms	8
Style	CONTEMP	Wall	RENDERED	Roof	GALV/IRON
Year Built	1968	Condition	7	En Suite	
Land Use	1100	Multistorey	2	Clearance	
Zone	R(F)	Land Area	0.1162	Frontage	IRREG
Title Ref.	CT 5196-904	Transfer Doc.	T10517157	Plan Ref.	D12215
Indicators		Map Refer.	6627-1-R	Allotment #	10
Ref. Sec.		LGA	MARION	Hundred	NOARLUNGA
Capital Value	475000	Site Value	315000	Valuation Date	01-01-06
Ext. Database		Ratio	123.80%		
Vendor	Private:				
Purchaser	Private:				

8H DG SP TC = "eight roomed house double garage swimming pool tennis court"

Aerial Mapping | Explain | Goto Brief | Tag | Previous | Next

The screenshot below shows the distribution of assessed rate per square metre of site value from which anomalous assessment can be easily detected and investigated.

Discussion

Traditional GIS requires highly trained staff, expensive infrastructure and high ongoing maintenance costs. A simplified GIS as described here produces similar output but without the above drawbacks. What such a system lacks in sophistication and speed are amply compensated for by its simplicity of operation and relatively low cost.

Conclusion

A simplified GIS is now possible and we are confident that many offerings will shortly be commercially available. The feature set will expand very quickly and the pricing should be such that the valuation profession will be able to afford it. Whilst adhering on a different paradigm with the underlying data being held remotely the zero maintenance costs and minimal staff training requirements should provide sufficient incentive for its speedy acceptance as an essential analytical tool.

References

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