THE PROSPECT OF APPLYING CAMA SYSTEM FOR RATING VALUATION IN MALAYSIA

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Abstract

Traditionally in Malaysia, the valuation of properties can conceivably be conducted using four methods including Cost method, Comparison method, Residual method, and Profit method. Of all these methods, the comparison method is the most common approach used by the appraisals. As per Local Authorities Act 1976 (Act 171), all properties are required to be valued every five years. The revaluation or valuation of the property has been carried out by manual approach. This process is very tedious, time consuming and cost effective. It also requires more manpowers and maintaining manual records is a difficult task. In practice, most of appraisals in Malaysia are using conventional system for the valuation of a property. However the countries like United Kingdom, Australia, U.S, Africa, New Zealand and Europe were systemised with the use of CAMA (i.e. computerized system) to reduce the labour cost and time. Therefore, this CAMA system is very much essential to the appraisals at local authorities in Malaysia due to the increase in quantity of properties. The technique applied in CAMA is a quantitative approach called the multiple regression analysis for analysing market data to produce a set of models for valuation purposes. Now this system is particularly used in different states of Malaysia especially in Johor and Pahang. Also GIS system is incorporated with CAMA system to identify the location of the properties. This CAMA-GIS system, developed using a combination of softwares (statistical packages, database and GIS), is menu-driven and user-friendly. The system is developed in different stages. The initial stage involves a study on the data requirement for appraisal purposes. The aim is to identify the possible variables influencing the values for model building. Once the set of determinant variables is established, the database is then designed by incorporating basic information of property such as property ownership, land area, lot number, and account number needed for the purpose of property tax administration. Moreover the analysis of user requirements and needs are carried out to provide information for the database and user-interface designs. Once completed, the system accomplishes the primary objective of arriving at the value of properties that are reliable, accurate, equitable and defensible. The system can also display the geographical information thus improves the administration of property tax.

Keywords: *Mass Appraisal, Rating Valuation, Computer Assisted, GIS, Local Authority.*

1. Introduction

Almost all governments around the world rely to some extent on property taxation. Property taxes are the main sources of revenue for municipalities in Canada, United States and Australia (Enid Slack). Similarly, it is one of the main resource for the Malaysian government as well. To evaluate the property tax, most of appraisals in Malaysia are using conventional system. As per Local Authorities Act 1976 (Act 171), all properties are required to be valued every five years. The revaluation or valuation of the property has been carried out by manual approach. This process is very tedious, time consuming and cost effective. It also requires more numbers of manpower and keeping manual records is very difficult and requires large spaces. However the countries like United Kingdom, Australia, U.S, Africa, New Zealand and Europe were systemised with the use of CAMA to reduce the labour cost and time. Therefore, this CAMA system is very much essential to the appraisals in Malaysia. The main advantage of the mass appraisal system is: the property can be manipulated repeatedly for valuation purposes (Kirkwood, 1991). In addition, to present the output visually, the geographic information system can be incorporated in the mass appraisal process. This technique has been widely accepted by local authorities all over the world. A geographic information system (GIS) is a set of computerized tools (including both hardware and software) for collecting, storing, retrieving, transforming and displaying spatial data (Castle, 1995). GIS technology can help local authorities especially in their daily operation (Budic, 1993).

The overall benefits of GIS include:

a) More credible decisions, based on incorporating more comprehensive data in the analysis, visualizing the information in two or three dimensions, and rapidly testing numerous alternatives on ways not possible with other technologies or if valuation is conducted manually;

b) Enhanced presentation of analysed results and

c) It can improve the competitive position of local authorities as well as generating greater revenues, higher profits with less cost.

2. Objectives of the Study

This paper aims to describe the development of Computer Assisted Mass Appraisal System for valuing the residential properties. This system was developed by integrating the spatial and aspatial information. The evaluation of the system was also conducted to assess the efficieny of the CAMA system. This investigation started with the collection of information on user requirements for the design and the development of system. This followed by development of GIS database, and finally the integration process. The capabilities of the CAMA system (includes a number of important functions to a local authority such as query, report generating, spatial analysis and mass appraisal process) shows that CAMA system provide an effective and efficient solution to the problems facing by the local authorities. Three objectives has been identified for this paper that is ; firstly, user requirement analysis for GIS and CAMA; secondly to integrate the

mass appraisal model (MRA) and GIS to produce CAMA system, and thirdly to test run the system to identify the effectiveness of the valuation result.

2.1 Area of study

To implement the developed CAMA system few areas were identified for the investigation. For this purpose part of Kuantan, Pahang under the authority of Kuantan Town Council (MPK) was selected. The phase of development from data acquisition to system integration is shown below:

2.2 Data source

The following data sets were used in this study;

- Digital topography and lot maps in DXF format for Kuantan town area with the scale of 2 chain to an inch. These were supplied by the local authority of MPK (provided by the Department of Land Surveying and Mapping of Malaysia) to support this research. The map data were classified into feature layers such as road, border, river, and lot.
- Site Inspection Datasheet of a set of properties in Kuantan for evidence and MRA analysis purposes. These were also supplied by MPK which include bedrooms, washroom, area size, etc.

2.3 Development of the valuation database

For this study, the property data obtained were structured to provide an optimal method of data analysis. The attribute database developed as part of this research contains comprehensive details for every property within the study area to use as evidence in the analysis process. Table 1 shows data required to use the CAMA system.

Table 1: Data required to use the CAMA system.

Table Name	Description
Bangunan (Bldg)	Represent the area size, rooms and location of the property
Kadar (Rate)	Represent the rate percentage
Kadaran (Ppty Tax)	Represent the current rate, monthly & annual value
Parameter	Represent the parameter value for MRA for each zone
Pemilik (Owner)	Represent the owner account number, address and race
Sempadan (Boundary)	Represent the lot number, zone name

2.4 Development of GIS

The spatial aspect of a property is a key attribute for the development of GIS. Using the digital topography map, it can be classified into different sections such as roads, lot, parcel, boundaries, zoning, river and facilities.

The GIS analysis from any GIS application must undertake the following functions:

i.   Browse – attribute information display
ii.   Map Display – digital map (land, border, road)
iii.   Query – Show certain answers from the map
iv.   Spatial Analysis – Buffer analysis, overlay

Using the DXF format data for spatial data, topology is created and classified as points, lines and polygons and is shown in Table 2.

Table 2: Types of Spatial Data in GIS

Spatial Data		
Point	Line	Polygon
Text	District Border	Residential Lot
Symbol	Lot, Border and Road	District

2.5 Interface

The database covers a very large area to facilitate effective access to the data, a mechanism is needed to provide an efficient search, extract and display the data relevant to the valuer's requirements.

The objectives of the interface are:
i)   to trigger a series of questions about the property that determine the purpose of the valuation, type of property and a general physical profile;
ii)   to collect sample properties from the database,
iii)   to adjust the values of the selected MRA parameter in order to change all the subject property value; and
iv)   to transfer the selected and adjusted properties values from the GIS system to allow spatial display and analysis of rating value.

2.6 System Integration

The integration of GIS and MRA need an interaction between these softwares to perform a task for certain purpose. The user requirements to develop CAMA system are as follows:

i.   Be able to support GIS analysis to identify property values in certain area.
ii.   The system must be easy to modify and give permission to user to change data interactively.
iii. Support query or search feature to gain information.
iv.   Provide mechanism to create report, chart and map display.

The CAMA system developed, also have the capability to support Structured Query Language (SQL) to get feedback or answers from the database effectively. Examples of the SQL are as follows:

    SELECT Nama_Pemilik, Alamat
        FROM Pemilik
    WHERE Pemilik.Nama_Pemilik = "A*"

The system design is shown in DFD (Data Flow Diagram) where it produce the logical model for the system. Figure 1 shows the DFD for the CAMA system using Easy CASE software before the database system process begins.
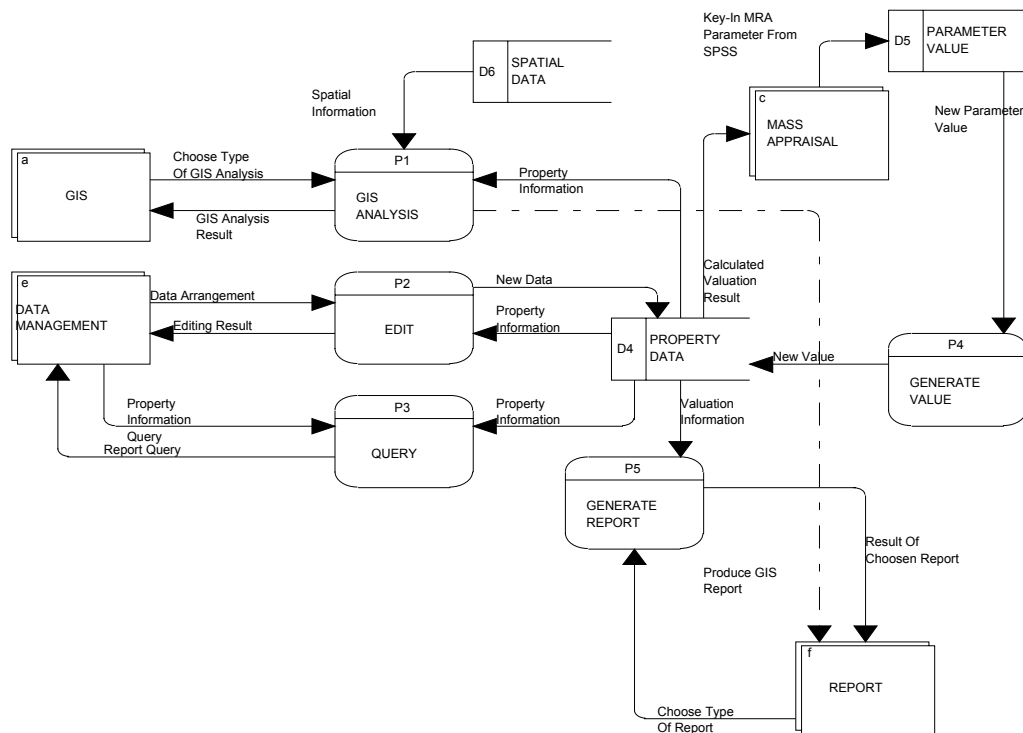
Fig. 1: System design using Data Flow Diagram (DFD) perspective

2.7 General Feature of CAMA system

The Data Management can be carried out by the following steps:

      (a) Key in new Data
            (i) General Information
            (ii) Land information
            (iii) Building Details
            (iv) Owner's Details
            (v) Tenant's Details
            (vi) Valuation Details

      (b) Data Search
            (i) Name
            (ii) Account Number
            (iii) Owner's ID
            (iv) Lot Number
            (v) Title Number
            (vi) or any combination

      (c) Valuation Process
            (i) Mass Appraisal on the whole area
            (ii) Mass Appraisal on selected area
            (iii) Individual Valuation
            (iv) Report and Statistics

3.0 Mass appraisal

This method is used to valuae each property in a given area. This valuation is carried out by applying Multiple Regression Analysis (MRA) using SPSS software. MRA is used to generate a valuation model in the form of an equation where many factors affecting values called variables are considered. The following equation is formulated for the local authorities who use **annual value** as the base of tax.

$$Y = b_o + b_1 x_1 + b_2 x_2 + \ldots b_k x_k$$

Where,

      Y = dependent variable
      b_o = constant
      b_1 - b_k = coefficients of determinants (variables)
      x_1 - x_k = independent Variables

In this system, the value of the constant and independent variables will be determined through the multiple regression analysis before using the mass appraisal. In the case of Kuantan, MRA parameter values are calculated for each zone. The zones are Alor Akar, Pelindong, Galing, Tanjung Api, Sri Kuantan, Bukit Ubi, Semambu, Air Putih and Bukit Sekilau. By using the SPSS software, the MRA model can be easily regressed with 50 to 100 samples from each zone. For instance, the results of MRA for sri kuantan zone are tabulated as follows:

Model	Coefficients
Constant	48.467
Luas Utama – *Main Floor Area* (MFA)	1.341
Luas Sokongan – *Ancillary Floor Area* (AFA)	0.860
Luas Tambahan - *Extended Floor Area*	0
Bil. Bilik Mandi – *No. of Bath Rooms*	38.738
Bil. Bilik Tidur – *No. of Bed rooms*	13.757
Lot Tepi – *Corner Lot*	85.905
Lot Tengah – *Intermediate Lot*	65.818
Lot Hujung – *End Lot*	0

Area : Sri Kuantan
Data Sample : 95
R^2 : 89%

The local authorities who use **improved value** for the valuation of property, the following equation can be used for valuation.

Improved Value =

(Land area x value/psf) + (Extra Land Area x value/psf)
+
(Main Floor Area x value/psf) + (Ancillary Floor area x value/psf)
+
Qulaity of Building Material (%) + Less Depreciation (%)
+
Other Improvements (e.g. fencing)

Subsequently, the obtained results must be used as input data for the CAMA system. Figure 2 shows the menu of the mass appraisal system. This appraisal system can be operated using EXECUTE button. After this operation, the suggested rates ranging between 2 to 10 will be shown in right hand table (see Figure 2). This facilitates the user to make decision to find a suitable rate for the appropriate property in the given area. Consequently, the UPDATE button has to be operated to change the current rate with the adjusted rates. The updated rate value is shown in the left hand side table of Figure 2. The valuation data output for the zone is shown in Figure 3.

Fig. 2: Mass Appraisal Menu

Fig. 3: Valuation Data for Sri Kuantan Zone

4.0 The Geographical display of property values

Geographical display was attained by using value maps. The purpose of GIS value map is: not to be a static display but need to perform more analytical process. In the CAMA system, GIS menu will be popped up for the user to do some tasks such as open and view map and query. Some of the function like View Zone to view map according to the zone area is shown in Figure 4.
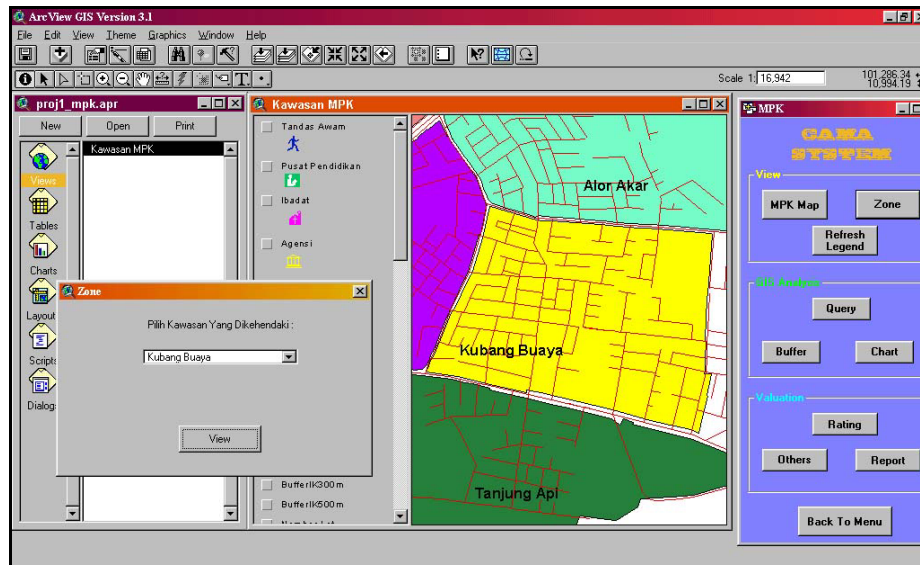
Fig. 4: GIS View using View Zone function

'Refresh Legend' will update the spatial legend when there is a change in value from mass appraisal menu. While the 'Query' button brings out the query dialog box where user can query range of rateable values and view the result in Table and map (see Figure 5).
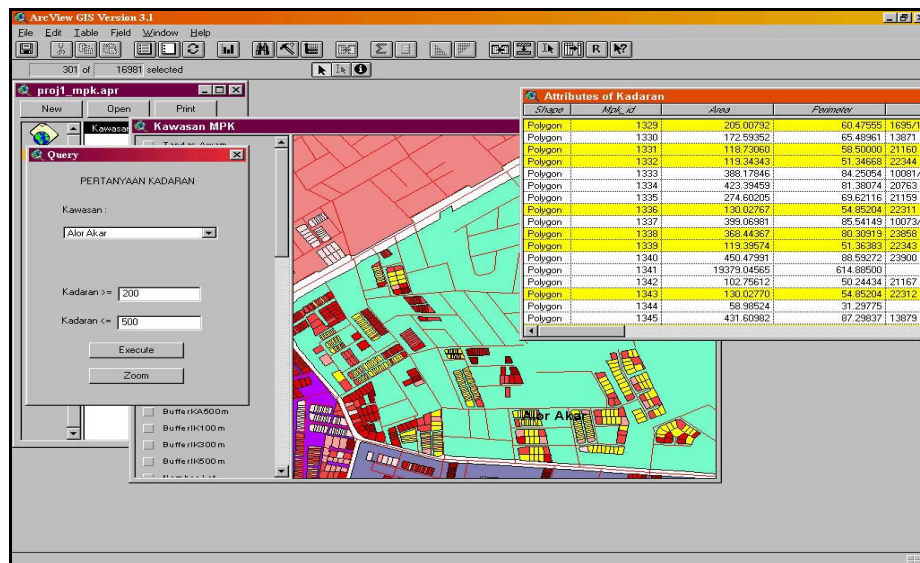
Fig. 5: GIS view using query dialog

9

The 'Buffer' will bring out the buffer menu to view the range of properties inside the buffering range of centers such as public facilities, business, tourism and government institute (Figure 6). There are 3 types of buffer ranges, that is 100m, 300m and 500m. Other functions can be also done using GIS such as land usage view, chart view, layout view and print report.
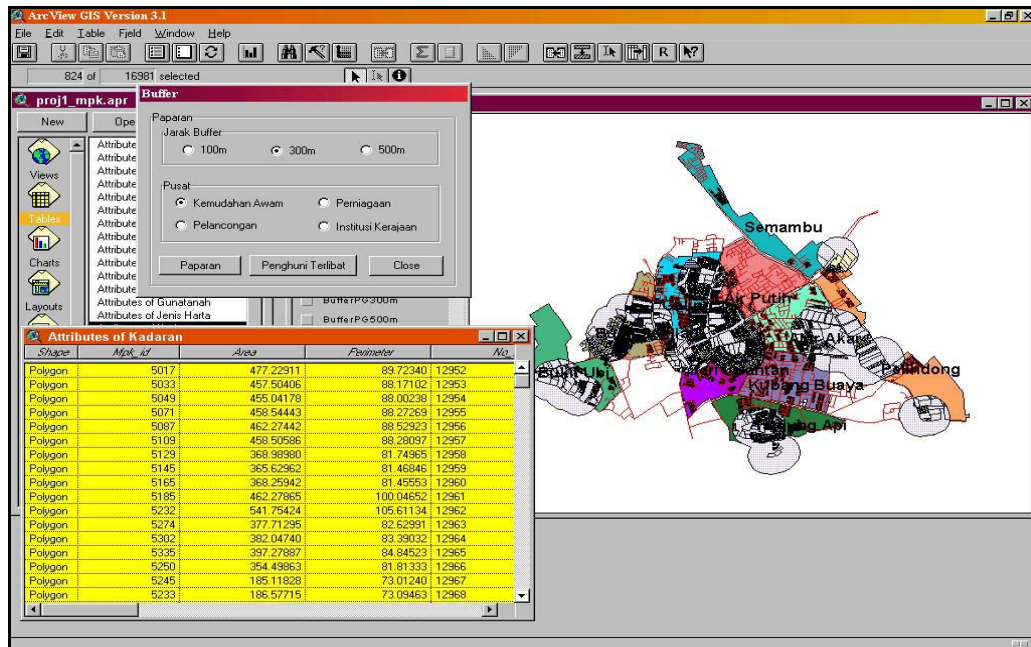
Fig. 6: GIS view using Buffer function

5.0 Search and Report

Fig. 7: Menu Search

Beside the GIS and mass appraisal, other functions for this integration of CAMA system are data search and report printing. Data search in the system can be done using 'Search Menu' where user can key-in the account number or owner's name in the search box. Afterwards, the information for related data will be shown by operating the 'Find' button. Figure 7 shows the Search Menu view. Report generation can be done using 'Report' menu that can produce reports such as Valuation Summary Report, Tax Bill and Annual Value Report. The report samples are shown in Figure 8.

Ringkasan Senarai Nilaian
Majlis Perbandaran Kuantan

(Kawasan Keliman)

| ZON	PEGANGAN	N Tahunan	Kadar(10%)	Kadar(9%)	Kadar(8%)	Kadar(7%)	Kadar(6%)	Kadar(5%)	Kadar(4%)	Kadar(3%)	Kadar(2%)
Air Putih	390	1,610,795	161,043	144,973	128,871	112,745	96,686	80,585	64,433	48,309	32,226
Alor Akar	626	3,367,425	336,765	303,054	269,378	235,681	202,037	168,338	134,692	101,020	67,339
Bukit Sekilau	763	4,355,079	435,555	391,968	348,402	304,918	261,334	217,726	174,210	130,617	87,062
Bukit Ubi	139	1,063,774	106,393	95,720	85,103	74,476	63,839	53,173	42,546	31,925	21,286
Galing	1,339	7,437,962	743,706	669,445	594,997	520,635	446,223	372,001	297,540	223,181	148,731
Kubang Buaya	449	4,119,962	411,988	370,814	329,578	288,400	247,213	206,038	164,812	123,605	82,395
Pelindong	319	2,084,972	208,480	187,695	166,754	145,961	125,117	104,226	83,401	62,589	41,716
Semambu	174	1,082,136	108,208	97,415	86,556	75,755	64,883	54,094	43,289	32,466	21,622
Seri Kuantan	1,236	6,524,365	652,480	587,217	521,982	456,703	391,417	326,253	260,979	195,766	130,469
Tanjung Api	281	1,577,461	157,755	141,964	126,185	110,413	94,644	78,868	63,109	47,335	31,564
Jumlah :	5,706	33,223,931	3,322,343	2,990,255	2,657,806	2,325,687	1,993,393	1,661,302	1,329,011	996,813	664,410

Nilai Tahunan
Tarikh : 9/8/01
Kawasan: Alor Akar

NO AKAUN	NAMA PEMILIK	ALAMAT	Nilai Bulanan(RM)	Nilai Tahunan(RM)
102061320	PONNAM PALAM A/L RAMASAMY	I	467	5,601
102061319	ALAM TENGGARA SDN BHD	SYKT	468	5,619
102061318	LING AH HING	C	468	5,619
102061317	SOFFIAN BIN AHMAD KANSUA & FAREEN	M	468	5,619
102061316	ZURAIDAH BINTI AWANG	M	468	5,619
102061315	PERNIAGAAN ANEKA	SYKT	468	5,619
102061314	PERNIAGAAN ANEKA	SYKT	468	5,619
102061313	WAN NORHANA BINTI WAN MALEK @ WAN M	M	468	5,619
102061312	THIVAGARAM A/L SINGGARAM	I	467	5,601
102061329	SELVARAJA A/L RAMASAMY	I	618	7,418
102061328	SELVARAJA A/L RAMASAMY	I	620	7,436
102061327	CHEW FOO KEONG	C	620	7,436
102061326	CHEW FOO KEONG	C	620	7,436
102061325	THIVAAGARA MURTHY A/L PONNAM PALAM	I	620	7,436
102061324	CHAY KEE SIONG & CHEOK MEI LING	C	620	7,436
102061323	YANG CHIN SHING	C	620	7,436
102061322	KAM YOON KHONG	C	620	7,436
102061321	SINGGARAM A/L RAMASAMY	I	467	5,601
102061352	CHONG YUEN SING	C	294	3,531
102061351	ALAM TENGGARA SDN BHD	SYKT	296	3,549
102061350	GANESH A/L MUNISAMY	I	296	3,549
102061349	SIVABALAN A/L RENGANATHAN	I	296	3,549
102061348	MATHIVANAN A/L NAGAPAN	I	296	3,549
102061347	LEE YIN YAH	C	296	3,549
102061346	HENG HWA CHONG	C	296	3,549
102061345	TAN LYE POW & TAY LAI CHIN	C	296	3,549
102061344	ALAM TENGGARA SDN BHD	SYKT	296	3,549
102061343	KOK FOOK ON	C	294	3,531
102061342	SOONG YIN FAH	C	294	3,531
102061341	WONG YIT HA	C	296	3,549
102061337	PONNAM A/L RAMASAMY	I	569	6,828
102061336	LU LIH YOUN @ LEE YOUN	I	599	7,187
102061335	PERNIAGAAN ANEKA	SYKT	599	7,187
102061340	SIVALINGAM A/L GOPALKRISHAN	I	296	3,549
102061334	PERNIAGAAN ANEKA	SYKT	599	7,187
102061338	ALAM TENGGARA SDN BHD	SYKT	501	6,010
102061333	THAINAYAHI A/P RAMASAMY	I	599	7,187
102061332	WONG YIP HING	C	599	7,187

BIL CUKAI

Tarikh : 8/9/2001

NO AKAUN	TARIKH	TEMPOH/ANSURAN
102010002		

KADAR CUKAI (%)	NILAI TAHUNAN (RM)	TAKSIRAN TAHUNAN (RM)
10	5,184	518

ALAMAT	NAMA PEMILIK
C	WONG CHEE YIN DLL

TUNTUTAN	BAYARAN DIKEMASKINI SEHINGGA

JUMLAH TUNTUTAN	YANG DIPERTUA MAJLIS PERBANDARAN KUANTAN

Fig. 8: Report previews from the CAMA system

6.0 Conclusions

The development of computer assisted mass appraisal (CAMA) using combination of softwares such as Arc View GIS 3.1, MS Access 2000 and SPSS 10.01 can produce good results by showing property value. The use of programming language for integration and user interface helps the user to understand easily the function of the system. This system is suitable for the local authority to determine the value of properties for a given area with less cost and much faster. Revaluation can also be done by the local authority at any time since all the data are already available in the computer. In addition, some local authorities in Malaysia have appointed University Technology Malaysia to develop the CAMA system for their revaluation exercises such as

(i)   2001-2006 Segamat District Council (49,000 properties)
(ii)   2005-2006 Kuantan Municipal Council (80,000 properties)
(iii)   2005-2006 Maran, Rompin and Rembau District Councils (with a total of 24,000 properties).

The application of CAMA system for rating valuation is still new in Malaysia and may need further research to improve the efficiency of the system. Some of the current issues with the use of CAMA system in Malaysia are listed below:

(i)   In Malaysia, more than 140 local authorities are interested to use CAMA system. However it is unclear on who is the one authorised to certify the value produced by CAMA system.
(ii)   The involvement of public universities in helping the local authorities to carry out the revaluation exercise has been criticised by the Malaysian Board of Valuers.
(iii)   Public universities have to joint venture with the private valuation firms to get involved in the revaluation exercise for local authorities in Malaysia to avoid the no (ii) above.

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