

Geospatial Information – modern tool for an efficient administration of cemeteries in Timișoara

Carmen GRECEA PhD, Associate Professor at the University “Politehnica” of Timișoara, Faculty of Civil Engineering, Speciality Land Measurements and Cadastre, carmen.grecea@ct.upt.ro

Alina Corina BALĂ PhD, Assistant at the University “Politehnica” of Timișoara, Faculty of Civil Engineering, Speciality Land Measurements and Cadastre, alina.bala@ct.upt.ro

Huba MARTON, Eng., Director of S.C. Geotop S.R.L, Odorheiu Secuiesc, huba@geotop.ro

Abstract: *TIMCIM- Cadastre of the Cemeteries, for the City of Timișoara represents a complex project designed in order to be able to keep the records of all entities –as parts of the cemetery system, and also to monitor their status, for an efficient local administration.*

The main purpose of the project is the generation and elaboration of a cemetery data base which will include: type of the cemetery, parcels, graves and also possible connections between these entities. In the same data base there can be stored even present-day information regarding entity and any operation applied to it. Initial data will be saved in archives with the possibility of being accessed at any moment.

The project started in 2008 and is to be carried out for almost 3 years being collaboration between the “Politehnica” University of Timișoara, Geotop Company, and Timișoara City Hall, as the beneficiary.

Keywords: *data base, TIMCIM- Cemetery Cadastre, GIS, ortophotoplans*

1. Introduction

The process of setting up a data base and a data bank specific to the cemetery administration receives an increased importance in the context of the tendencies manifested nationally, i.e. the informatisation and automation of all the activities managed by the public administration sector.

Thus, the geospatial information is developed on digital maps and satellite images or coloured ortophotoplans.

An eloquent example is the information system TIMCIM - *Cemetery Cadastre* – implemented within the City Hall of Timișoara, the capital city of Timis County.

Geographic Information System (GIS) is an assembly of people, equipment (hardware), programs (software), algorithms and procedures (methods) which ensure the processing, management, manipulation, analysis, modelling and visualisation of spatial data in view of solving some complex problems regarding planning and territory management.

TIMCIM keeps the record of all the entities which belong to the cemetery system and allows certain administrative and calculus operations, thus contributing to the efficiency of all the applications of this type. The main purpose of this system is to generate and to set up of a cemetery data base, which will contain information, like this: cemetery, parcel, grave, and the links between these entities. In the same data base, there are going to be stored information regarding the exact moment and the type of operations made on the entities. Before any action that can imply data modification, the initial information is to be saved in archives. Thus it will be possible to record the history and all the changes made in time, for each and every entity in the data base.

The entity position is to be made according to the information given by the Geographic Administration System of the capital city Timișoara, (TIMSIG); the digital plan having a scale of 1:500 and it is continuously updated. The update of the digital plan is made on the basis of the

photogrammetric plan at a scale of 1:500 by using the existing records, parcelling projects, urbanism certificates, documentations available in the archives, documents on land retrocession, and modifications on the street scanning as a consequence of systematization and of the governmental ordinance: H.G. 834 of 1991. In the process of updating the information, the technology for the use of digital ortophotoplans and of GPS measurements was elaborated. The update of the digital plan was made on the basis of the coloured ortophotoplans, made in 2008, with a special resolution of 11cm and by using high precision GPS measurements.

2. The GIS system proposed

The data base staging is conceived for a computer network with on-line access to the data, includes the basic functions for the server and WEB client, in order to manage the cemetery administration activities.

The system has a client-server general architecture, being made of two main components:

- Map management and the management of the primary alphanumeric attributes;
- Management of the complex alphanumeric attributes.

These two components will function integrated in the GIS system. The information administered by the system will be kept in data banks under the form of well defined entities.

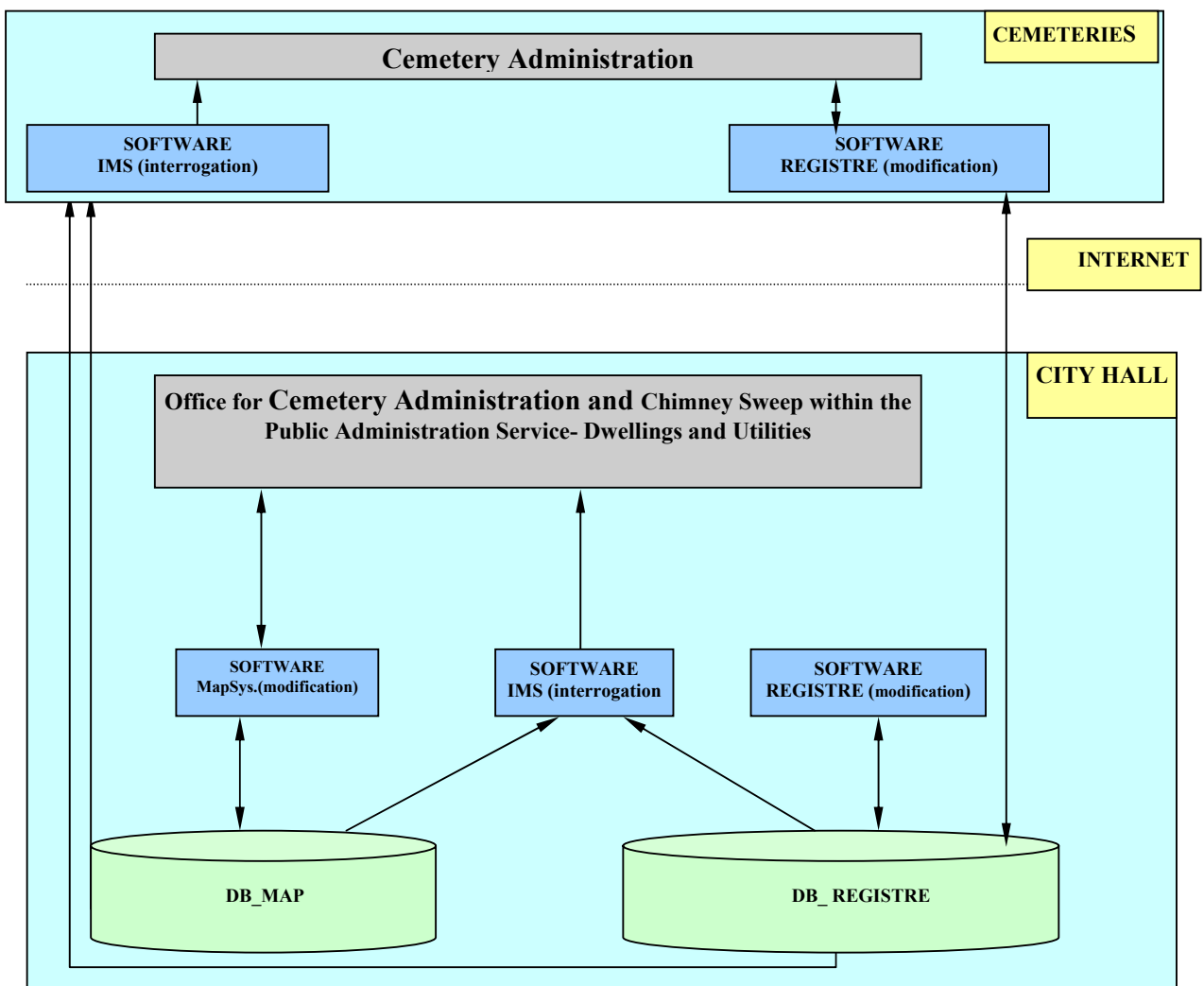


Fig. 1. The logical schema of the system proposed

The data bank is composed of two logical components:

DB_MAP (*Data Bank-Map*) contains information from the maps and the primary attributes associated;

DB_REGISTER (*Data Bank - Register*) contains data from the registers kept in cemeteries.

The basic digital plan is the Cadastre Plan at a scale of 1:500, designed within the project TIMSIG, being permanently updated at the level of the specialised service within the Timisoara City Hall.

The entities with graphic part within the Data Bank-Map are the following:

- **cemetery**: cemetery boundary;
 - are represented by polygons; all these entities having a unique identifier, the cemeteries being divided into parcels.

Parcel: parcel boundary within the cemetery;

- are represented by polygons; all these entities having a unique identifier. The parcels are divided in rows and graves.

- **Building**: building boundary within the cemetery;

- are represented by polygons; all those that have a unique identifier.

- **Grave**: grave limit;

- are represented by polygons; which have a unique identifier.

The attributes of these entities are:

-
- **Cemetery**
 - Cadastral Number
 - Name
 - Cemetery Code
 - Surface
 - Perimeter
 - **Parcel**
 - Cadastral Number
 - Parcel Code
 - Category (burial place, vacant place, alley, etc.)
 - Surface
-
- Perimeter
 - **Building**
 - Cadastral Number
 - Category (Monument, chapel, etc.)
 - Surface
 - Perimeter
 - **Grave**
 - Cadastral Number
 - Surface
 - Perimeter

Table 1. Layers Distribution

Name	Description	Type
1. Grave	Grave Limit	Line
2. Parcel	Parcel Limit	Line
3. Cemetery	Cemetery Limit	Line
4. Constructions	Construction Limit	Line
5. Grave Code	Grave Code	Text
6. Grave Cat.	Grave Category	Text
7. Park Code	Parcel Code	Text
8. Park Cat.	Parcel Category	Text

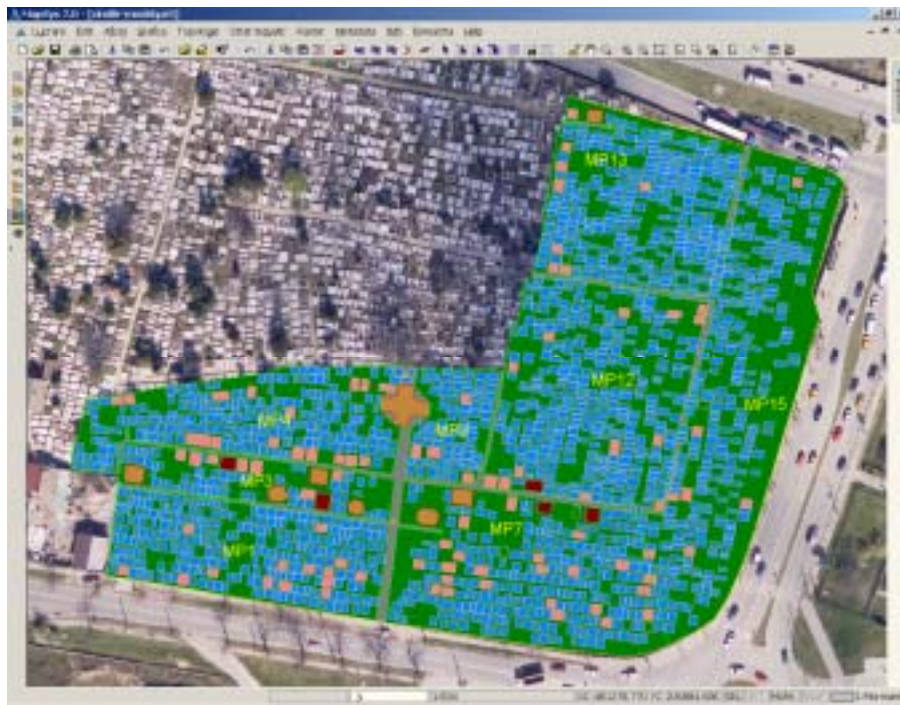
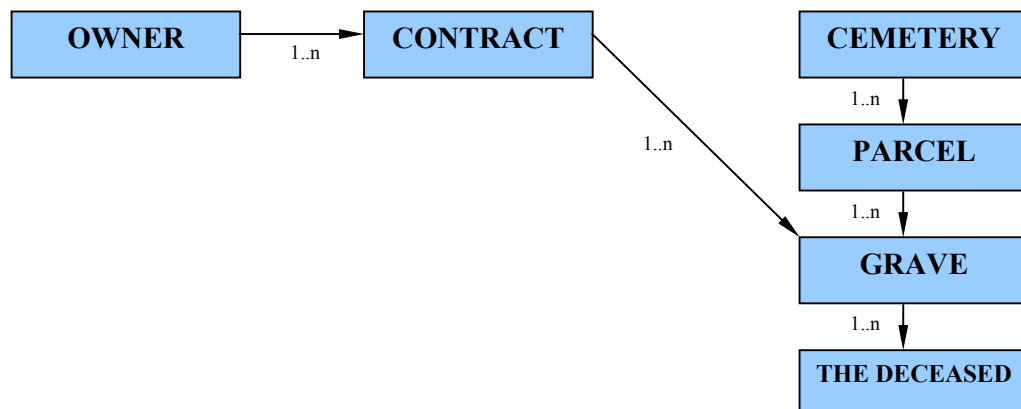


Fig. 2. Graphic Data Bank - Rusu Sirianu Cemetery, Timișoara

In the *Data bank Register* (DB_REGISTER) we have the following structure:



3. Data acquisition and data processing

In order to set up a data base, valid and up- to- date, all the information regarding the graves, the parcels and the cemeteries are to be collected on site, on printed forms. The topographic support for this stage is the digital cadastre plan, scale 1:500, provided by the Timisoara City Hall. This basic digital plan is continuously upgraded on the basis of the coloured ortophotoplans made in 2008, with a spatial resolution of 11cm, using high precision GPS measurements. The digital cadastre plan can be continuously updated since it contains ortophoto images and GPS measurements.

A file of the MapSys application is taken from this digital plan, containing the following elements:

- Parcel limit;
- Street limit;
- Segment, street, crossroads limit;
- Building;
- Street name;
- Post number;
- Name, parcel inscription;
- Name, building inscription.

After the file in MapSys application is made, we divide the cemeteries under the Timisoara City Hall administration, on plan sheets. The plan sheets will have an A1 format and scales from 1:100 up to 1:200, and as background the coloured ortophotoplans made in 2008.



Fig. 3. Ortophotoplans with graves identified-Cemetery Rusu Sirianu

After the A1 plan sheets are generated the following stage is printing. This has two stages:

- To generate PDF files, separately for each plan sheet (a PDF is generated);
- To print the PDF files, in colour, with a plotter.

Data on the site are collected with the help of the plan sheets and the printed forms (see Fig.4). Each grave is recorded.

On the plan sheet the position of the grave is identified and marked, and then it is given an identification number. It consists of the number of the grave and the number of the row where it is located. For example G15 R3 (grave 15 row 3- Fig.3). The identification data and the grave attributes are recorded on the printed form.

When the data collection operation is completed we continue with the next stage: to insert the data into the computer. The graphic data, marked on the plan sheets are inserted in the MapSys application. The alphanumeric data are inserted the data base, using the information written on the printed forms

Titlu: *PRO DAIA* Data: *12.01.2011*

FRM	Decode	NA	IM	T	L	M	A	R	Observatii
1	001	022	077	01	01				
2	001	023	078	01	02				
3	001	024	079	01	03				
4	001	025	080	01	04				
5	001	026	081	01	05				
6	001	027	082	01	06				
7	001	028	083	01	07				
8	001	029	084	01	08				
9	001	030	085	01	09				
10	001	031	086	01	10				
11	001	032	087	01	11				
12	001	033	088	01	12				
13	001	034	089	01	13				
14	001	035	090	01	14				
15	001	036	091	01	15				
16	001	037	092	01	16				
17	001	038	093	01	17				
18	001	039	094	01	18				
19	001	040	095	01	19				
20	001	041	096	01	20				
21	001	042	097	01	21				
22	001	043	098	01	22				
23	001	044	099	01	23				
24	001	045	100	01	24				
25	001	046	101	01	25				
26	001	047	102	01	26				
27	001	048	103	01	27				
28	001	049	104	01	28				
29	001	050	105	01	29				
30	001	051	106	01	30				
31	001	052	107	01	31				
32	001	053	108	01	32				
33	001	054	109	01	33				
34	001	055	110	01	34				
35	001	056	111	01	35				
36	001	057	112	01	36				
37	001	058	113	01	37				
38	001	059	114	01	38				
39	001	060	115	01	39				
40	001	061	116	01	40				
41	001	062	117	01	41				
42	001	063	118	01	42				
43	001	064	119	01	43				
44	001	065	120	01	44				
45	001	066	121	01	45				
46	001	067	122	01	46				
47	001	068	123	01	47				
48	001	069	124	01	48				
49	001	070	125	01	49				
50	001	071	126	01	50				
51	001	072	127	01	51				
52	001	073	128	01	52				
53	001	074	129	01	53				
54	001	075	130	01	54				
55	001	076	131	01	55				
56	001	077	132	01	56				
57	001	078	133	01	57				
58	001	079	134	01	58				
59	001	080	135	01	59				
60	001	081	136	01	60				
61	001	082	137	01	61				
62	001	083	138	01	62				
63	001	084	139	01	63				
64	001	085	140	01	64				
65	001	086	141	01	65				
66	001	087	142	01	66				
67	001	088	143	01	67				
68	001	089	144	01	68				
69	001	090	145	01	69				
70	001	091	146	01	70				
71	001	092	147	01	71				
72	001	093	148	01	72				
73	001	094	149	01	73				
74	001	095	150	01	74				
75	001	096	151	01	75				
76	001	097	152	01	76				
77	001	098	153	01	77				
78	001	099	154	01	78				
79	001	100	155	01	79				
80	001	101	156	01	80				
81	001	102	157	01	81				
82	001	103	158	01	82				
83	001	104	159	01	83				
84	001	105	160	01	84				
85	001	106	161	01	85				
86	001	107	162	01	86				
87	001	108	163	01	87				
88	001	109	164	01	88				
89	001	110	165	01	89				
90	001	111	166	01	90				
91	001	112	167	01	91				
92	001	113	168	01	92				
93	001	114	169	01	93				
94	001	115	170	01	94				
95	001	116	171	01	95				
96	001	117	172	01	96				
97	001	118	173	01	97				
98	001	119	174	01	98				
99	001	120	175	01	99				
100	001	121	176	01	100				

Fig. 4. Printed form

For the cemeteries administrated by the Timisoara City Hall, there are special registers where records on the deceased, on the graves and on the tax payers are kept. Besides these special registers there are also charts with the parcels in cemeteries, with the distribution of rows and of the graves in these parcels. The information about cemeteries, found in registers and in charts, will be identified and correlated with the date obtained on the site.

The image shows a page from a 'Special Register of cemeteries'. It features a large grid with multiple columns and rows. The top row contains several columns with headers, likely representing different attributes of the cemetery parcels. The grid is filled with handwritten text in a cursive script, which appears to be Romanian. The text is organized into rows and columns, corresponding to the grid structure. The paper is aged and yellowed.

Fig. 5. Extract from the Special Register of cemeteries (Timișoara, 3, Rusu Șirianu)

After the completion of all the graphic and alphanumeric data, these are integrated in the data banks DB_MAP and DB_REGISTRE, which can be interrogated later with application IMS (Internet Map Server).

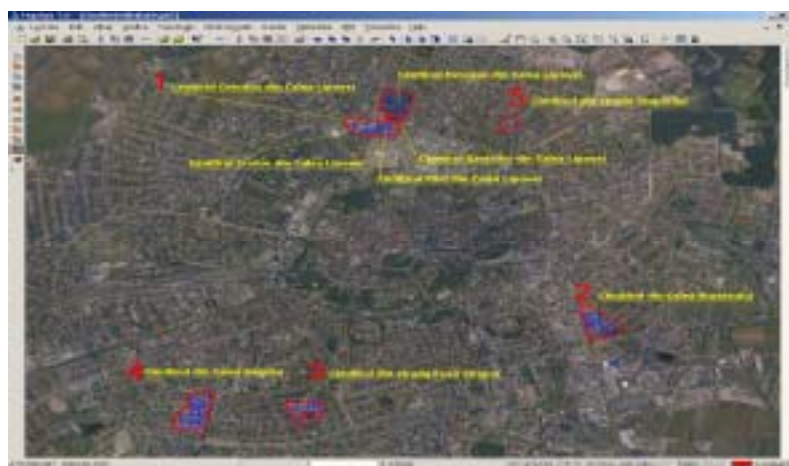


Fig. 6. Cemeteries administrate by the Timisoara City Hall

The insertion and the processing of alphanumeric data are ensured by a special software special named Cemetery Register (CR).

The program *Cemetery Register* allows the insertion of the data collected on the site, regarding the graves , as well as the insertion of the data from the registers found at the cemeteries administered by the City Hall, *CR* will also allow the insertion of new information, the modification and the interrogation of the data introduced.

This software will have the following functions:

- Modification function: Cemetery, Parcel, Grave, Contract, Period Contract, Owner, The deceased;

- Interrogation Functions: Vacant places information, Occupied places, Name of the deceased, Location of the grave, Directions to the grave, Statistics.

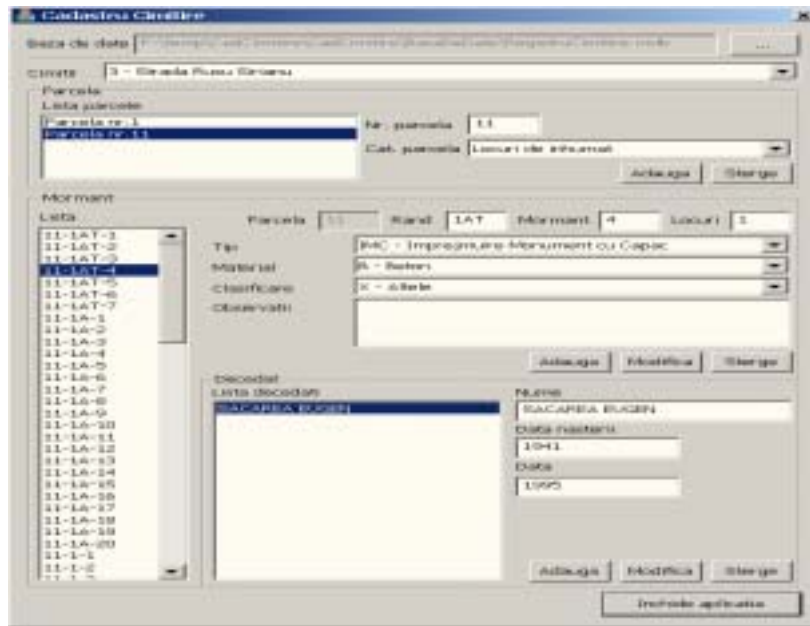


Fig. 7.Interface user software – alphanumeric data collection

4. Conclusions

The implementation of the geographic informatic system process for the management of the cemeteries administrated by the Timisoara City Hall is made in a way which unitary, controlled and structured, thus ensuring the quality and the public utility of the data.

The geographic informatic system (TIMCIM), which uses data collection and of all the associated information, is ready to generate and manage all the information kept in data banks. The data banks are kept by institutions of the public administration and are operable by software functions and interfaces.

5. References

1. Băduț M. – *GIS- Sisteme Informatice Geografice- fundamente practice*, Ed. Albastră, 2004;
2. Popovici N., Biali G. – *Sisteme Geoinformaționale- Principii generale și aplicații*, Ed.Gh. Asachi, 2000;
3. Grecea C. – *Aspects of cadastre data processing in Romania*, *Analele Universității din Craiova*, 2007;
4. Grecea C., Bălă A. et.al. – *Present experiences in Romanian Cadastre Engineering*, *GISOpen 2008*, Szekesfehervar, Ungaria
5. ***Colectiv Cadastru, UPTimisoara, *Complemente de Măsuratori Terestre*, Ed.Politehnica, Timisoara, 2009
6. *** www.primariatm.ro
7. *** *Contract de cercetare nr.674/11.06.2007*
8. *** *Contract de cercetare nr.182/11.12.2008*