

Design of Cemetery Cadastre of Saint Vince Home of the Sisters of Charity in Csákvár

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Abstract— In this article we describe the survey of a cemetery cadastre and the construction of grave site database. The problems encountered in the creation of the database are discussed and suggestions are made for the database structure. In creating the database, we have tried to implement a structure that best fits the existing register.

The plan was to measure, map and create of a geospatial database of the cemetery plots of the Beloved Sisters of the Saint Vince Home in Csákvár. Attaching the data belonging to the corresponding individuals in the geospatial database and assigning the corresponding images. During the implementation of the task, I considered the requests of the home and relatives.

The basis of this article was my thesis, the topic of which was to create a digital cemetery cadaster, with the preparation of which I measure and map the cemetery plot of the Dear Sisters of the Saint Vince Home in Csákvár, with which I intend to pay tribute to the memory of the deceased sisters, and to provide a complex register for their living relatives, with the help of which the reconstruction of the plot may later become a simpler process.

During the survey of the cemetery, UAV drone was used for survey, and, in some places, a measuring tape was used due to the vicissitudes of the vegetation. During the implementation, my goal was to be able to provide a more accurate registration picture from the existing data thanks to GIS.

Keywords—cadaster, GIS, database

I. INTRODUCTION

As an introduction to the task, we would like to say a few words about cemeteries and registration forms in Hungary.

Humanity has been preoccupied with the relationship between life and death since the beginning, which is why burials played a significant role already in prehistoric times, which later underwent further significant developments until today. Unfortunately, burials in mass graves occurred countless times during various battles, wars, and epidemics, during which the identification of the deceased later caused significant problems.

The cemetery as a concept is defined as the place where the deceased can find eternal rest. In Hungary, two types are

distinguished: public cemeteries and those operated by the church.

Nowadays, thanks to developing technologies, a digital version of the register of cemeteries is introduced in more and more places in the form of cadaster management. If the existing data is transferred in this case, a lot of new opportunities will open for the drivers and their relatives. One such example is the fact that the identification of graves can be tracked locally and spatially, which is a huge advantage in the case of a larger cemetery. The details of the relatives will also become easier to follow, if, for example, a grave becomes obsolete, or any other problems arise in connection with it.

The relationship between geospatial informatics and records can already be linked since the appearance of the concept, since GIS software has been dealing with the management of large amounts of information into quality data from the very beginning (Dobesova, 2016, Balla et al, 2020).

This connection between the existing cemetery registration system to be implemented and the GIS software can significantly simplify the handling and management of the data, and additional functions can be introduced easily as a result (Márkus, 2009).

The paper-based register data, on which the register system can be built, in many cases complicates the processing process, because in many cases the church registers and the cemetery versions contain significant differences, and there are also many typos in them.

II. THE SURVEY

A. UAV drone measurement

The beginning, the survey was conducted on October 22, 2021. We have determined the location of the ground control points (GCP) in the field with the Leica GS18 T RTK GPS. For GCPs we used neon orange paint “X” marks so they could be clearly visible on the orthophoto. During the measurement, we used RTK (Real Time Kinematic) continuous, real-time positioning method from among the GNSS (Global Navigation Satellite System) measurement types to measure the exact location of the connection points with the aforementioned instrument (Duleba et al, 2021).

The survey was carried out in leafless vegetation conditions. We have used DJI Phantom 4 drone to take the aerial photographs and perform the flight. Before the start of the flight, we went around the affected area, and then we determined the position of the control points on the ground as described above, because they are essential for the production of the orthophoto from the aerial photos during processing.

To take the aerial photos, we set the height of the flight to 30 meters due to the tree cover of the location, and to execute the flight, we used a predetermined flight plan.

The first Figure shows the image of the flight plan during the survey process, on which the flight data can also be extracted.



1. Figure - An image of the flight plan during the process

B. Additional measurement

The second option to fix our measure is use another measure type. During the preliminary processing, it became obvious that there are points that are not visible on the orthophoto and cannot be saved from the point cloud either, because they are overgrown by evergreen vegetation. Due to the problem, we have decided that an additional measurement would be necessary, but since only a few points were missing to create the register in full, we have decided to perform an orthogonal measurement in relation to an existing point taken from an orthophoto to determine the position of the points. The supplementary measurement was carried out on March 9, 2022.

The crosses were located entirely in one row, so the ordinate values were zero for all points. During the measurement, we have kept measurement notes on the affected areas.

We took photographs on the day of the survey, which appear as hyperlinks in the database. The order of the images and thus the numbering of the crosses were also numbered according to the direction of the flight plan. Photographs were attached to the database attribute table as displayed hyperlinks and additional descriptive data for the crosses.

For the photographing a Huawei P30 Lite smartphone was used. we did the serial numbering of the photographs on the spot in order to speed up the subsequent work process.

III. PROCESSING

The process of office processing consisted of several steps. The processing began with the selection of the mass of analog data collected by the staff of the Loving Home.

After the successful systematization, we have selected the most suitable software to complete the task.

After all this, the orthophoto was created from the aerial photos, which served as the graphical basis of the database. Once this was completed, the construction of the database began, followed by the replacement of the missing, difficult-to-extract parts that emerged later from the additional measurements.

A. Data selection

The data was sent to us broken down into employee orders of the Szent Vince Otthon of the Catholic Charity Service in Csákvár, which included a total of 19 orders, which were as follows:

- Civilians
- Congregation of the Daughter of the Divine Redeemer
- Daughters of Charity of St. Vincent de Paul Sisters of Mercy
- Kalocsai School Sisters
- Society of Sisters of Christ the King
- Anunciata Sisters
- Sisters of the Poor named after Our Lady, Szeged
- Orsolyaite Sisters of the Order of St. Orsolya
- Franciscan Sisters of the Daughter of St. Francis of Assisi
- Hungarian Congregation of Servite Sisters
- Sisters of the Cross
- Congregation of the Sisters of St. Dominic, Dominican Sisters
- Premontre Women's Order of Canons
- Congregation of Our Lady of Angers, Named for the Love of the Good Shepherd Good Shepherd Sisters
- Sisters of Mercy of Szatmári
- Order of Saint Elizabeth
- English Misses
- Eternal worshipper
- Society of Daughters of the Heart of Jesus

Over a long period of time, after several reviews, we have paired the data with the data set we have recorded in the cemetery, thus creating a table of attachable attribute data. During the selection and organization of the data, our work was significantly influenced by the fact that there were matching names and corresponding dates of death in the set. Another problem was that the missing plates could be clearly found in several places in the cemetery, which also caused data loss. One of the main problems was caused by name variations, which are also part of the attribute data table. This problem caused the greatest difficulties during the sorting process. The reason is that the names of the given persons

were recorded differently in the various registers at different periods of time.

B. Database building

We have designed and created the geodatabase in ArcMap program of the ArcGIS software package distributed by ESRI. As a first step, we have created a File Geodatabase, then the different layers within it. During the selection of the layers, we created a polygonal surface in which the parcels are demarcated per row, and then a point layer, which marks the center of the crosses. we assigned the various attribute data to the point interface, which were as follows:

- age
- parcel id
- line number
- serial number
- name
- passed away
- lived (x years)
- image

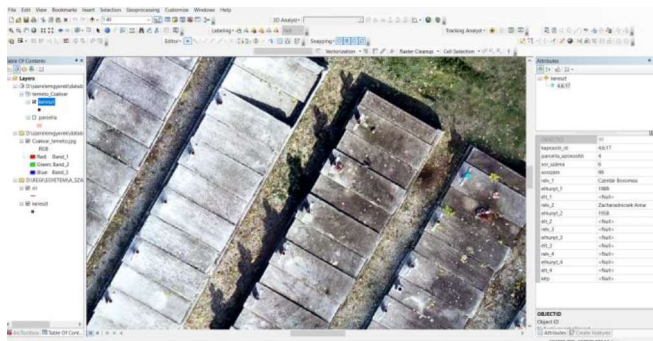
If several elements belong to a point, in those cases these columns are multiplied, usually one or two deceased people belong to a point, but there are cases when four.

Among the data types of the descriptive data, we used text type for the switch element, name, and image columns, using different lengths. We set the width of the four name and image columns to 50, and the switch element to 15. It was necessary to use the text data format in the id column because the numbers of the switch elements are separated by periods (for example, in the case of the first individual, the switch element is: 4.1.1), so text was the most appropriate choice for the program to handle this as well.

We used short integer data format in the parcel identifier, row number, row number, deceased and alive columns, because in these the descriptive data is just a single number.

In the names of the records of the attribute table, we made sure that they did not contain accents anywhere so that the program could handle them, so as a solution to the explanation, we filled in the alias column in every case for easier understanding.

The second figure illustrates the editing of the database, where you can view the filling of the attribute data while displaying the position of the points on the map.



2. Figure - Editing the location of crosses and filling in descriptive data

After that, I attached the Excel of the pre-selected, organized attribute data to the previously given table using the Relate command using the linking id.

Over a long period of time, after several reviews, I paired the data with the data set I recorded in the cemetery, thus creating a table of attachable attribute data. During the selection and organization of the data, my work was significantly influenced by the fact that there were matching names and corresponding dates of death in the set. Another problem was that the missing plates could be clearly found in several places in the cemetery, which caused data loss. One of the main problems was caused by name variations, which are also part of the descriptive data table. This problem caused the greatest difficulties during the sorting process. The reason is that the names of the given persons were recorded differently in the various registers at the given moments in time.

The elements of the table of attachable descriptive data are as follows:

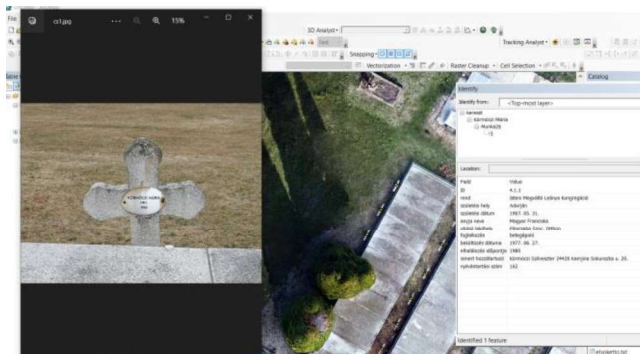
- ID
- name
- order
- Place of birth
- Date of birth
- His mother's name
- last place of residence
- occupation
- date of moving in
- date of death
- known relative
- registration number

IV. RESULT

The result of the project can be considered a fresh, up-to-date, correct database, easily transparent and editable at any time, with an expandable map base, which can provide an excellent basis for the relatives and the staff of the charity home for the reconstruction of the existing cemetery.

Thanks to the displayed images, the current state of the graves can be viewed, as well as information about the individuals found in the cemetery.

The third figure shows the result of the project. Explaining how the database stores the attribute data of the individuals and how the associated images are displayed.



3. Figure - The result of the project

V. CONCLUSION

Nowadays, digital cemetery cadastres designed, created, and managed in GIS software contain a lot of advantages and opportunities for users, and they can also be implemented in several designs to meet the desired needs.

Databases manage data easily and more transparently than their paper-based predecessors, in addition they offer many options to simplify the register, they can provide an up-to-date picture of the different statutes of limitations, however, if they become available to the living relatives, then finding the graves in the cemetery it also becomes easier for them.

Nowadays, a web page can easily be built from the created database after saving the appropriate file format, which makes it available to anyone to track the status of the final resting place of their deceased relative.

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REFERENCES

- [1] Balla, D., Zichar, M., Tóth, R., Kiss, E., Karancsi, G., & Mester, T. (2020). Geovisualization techniques of spatial environmental data using different visualization tools. *Applied Sciences*, 10(19), 6701. J. Clerk Maxwell, *A Treatise on Electricity and Magnetism*, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
- [2] Dobesova, Z. (2016). Teaching database systems using a practical example. *Earth Science Informatics*, 9(2), 215-224. K. Elissa, "Title of paper if known," unpublished.
- [3] Duleba E ; László, G. Tóth, Z.: Establishment of GNSS calibration network. In: Csuka, Ildikó; Simon, Gyula (szerk.) AIS 2021-16th International Symposium on Applied Informatics and Related Areas – Proceedings Székesfehérvár, Magyarország : Óbudai Egyetem (2021) pp. 93-96. , 4 p. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," *IEEE Transl. J. Magn. Japan*, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetism Japan, p. 301, 1982].
- [4] Márkus, B. (2009). *Térinformatika*, NyME GEO jegyzet.