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# Virtual reconstruction of Vernadskiy's family estate in the village of Vernadovka in Pichaievskiy district of the Tambov region

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**Abstract.** In this article, we consider the technology of creating a virtual space of memorable places associated with famous personalities who lived or worked there. It includes: analysis of various information sources and databases about the places of residence of famous people and their activities during their stay; creation of preliminary drawings and cartographic images of the territory; development of photorealistic three-dimensional models. Creating a virtual space in the form of a Virtual Museum is carried out using an open source software platform OpenSimulator, which is a server platform for 3D virtual worlds. In this study, we have made a virtual reconstruction of V I Vernadskiy's family estate in the village of Vernadovka in Pichaievskiy district of Tambov region related to objects, public and professional activities of an outstanding Russian scientist V I Vernadskiy.

## 1. Introduction

Virtual reality is a new concept of using modern computing systems and human-machine interface in order to obtain an effect of a three-dimensional environment, where users have an opportunity to interact with virtual objects, thereby creating a sense of three-dimensional presence.

The first virtual museums appeared in the 90s of the XX century, and after 15 years the number of virtual tourists has increased to the level of real museum visitors [1, 2]. In a broad sense, a virtual museum is an information resource created by the means of modern computer technologies and representing digitized versions of objects of material and intangible cultural heritage in the virtual space [3].

Today, there are many different virtual worlds, all of which have 6 common features [4, 5]:

- 1) Common space: many users are present in the world at the same time;
- 2) Graphical user interface: the space in the world is reflected virtually and varies in style from 2D "cartoon" images to more impressive 3D images;
- 3) Efficiency: communication takes place in real time;
- 4) Interactivity: the world allows participants to modify, develop, build or accept the content tailored specifically to them;
- 5) Permanence: the world exists regardless of users' presence in the system;



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6) Communication: the world enables and promotes formation of social groups within the world, such as teams, guilds, clubs, cliques, neighborhoods, communities and so on.

Currently, there are many memorable places in Russia associated with famous personalities. Unfortunately, many places are in poor conditions, and some objects are completely or partially lost.

Therefore, the aims of this work are to develop a technology for creating virtual models of memorable places and a virtual reconstruction of the estate of the family of Vernadskiy in the village of Vernadovka in Pichsevskiy district of the Tambov region related to objects, public and professional activities of an outstanding Russian scientist V I Vernadskiy.

## **2. Vladimir Ivanovich Vernadskiy – a historical reference**

Vladimir Ivanovich Vernadskiy (1863-1945) – a natural scientist, a mastermind and a public figure. Vernadskiy's life was connected with the Tambov region almost by chance, but his role in the history of the region is difficult to be overestimated. The estate, later called Vernadovka, was the dowry of the first wife of his father. The son from his first marriage had died before, so the farm Shigaevskaya, among other property items, was inherited by V I Vernadskiy. Since that time, Vernadskiy had been actively involved in social and economic life of the Tambov province: he became the member of the town council of Morshansk and Tambov provincial council, dealt with healthcare and education issues, organized canteens for starving peasants, and rebuilt the manor house, promoted railway construction from Penza to Ryazhsk and construction of the railway station [6].

Vernadovkiy's manor, once a masterpiece, is almost completely lost nowadays. Some farm buildings, a cascade of ponds, some elements of the irrigation system, a park with century-old trees and remnants of alleys have been preserved. The house itself and outbuildings are completely lost: houses are erected in their place. Despite restoration and reconstruction of a number of objects, a complete reconstruction of the estate as a monument of historical and cultural heritage of Federal importance is possible only in the virtual form.

## **3. Analysis of the source base and stages of creating a virtual model of Vernadskiy's family estate**

The first step in virtual modeling is creating drawing and cartographic images of the area where Vernadskiy's estate was located. Starting this work, the authors had tackled with objective difficulties caused by the fact that at present (since the end of the twentieth century) almost nothing of what was once the estate of Vernadskiy has survived. Of the many objects that were previously on the territory of the estate, only a water station located on the shore of one of the ponds has left. It is known [7] that in the late 80s of the XIX century V I Vernadskiy began landscaping the area adjacent to the site of the estate. Then the park with different species of trees was laid; as contemporaries recalled, only Siberian larch was represented by more than 150 seedlings. Beyond the park, towards the railway station, there was a large orchard. A special charm of the estate was created by the ponds, which, as the old-timers recalled and as noted in the notes of V I Vernadskiy, were largely his idea and were made according to his project. In the 90s of the XIX century, the plot allocated for residential and utility buildings was densely built up. The main building was the house of the owners of the estate. On the East side, the territory the yard was shortly built up by the manager's house, barns for storage of agricultural products, premises for workers, a carriage house, a bathhouse and buildings for horses, cows and fowls. At the end of the first decade of the last century, Vernadsky's estate was built according to all the rules of agricultural practice of those days, representing an agricultural object designed for comfortable living and obtaining a significant income from selling the crops gathered on the agricultural land. However, this model estate, embodying practical and theoretical scientific developments of its owner, was not destined to survive in subsequent years. Nothing has remained of household yard. The former house of the owners of the estate burned down in the 80s of the twentieth century. The pitiful remains of the once majestic Siberian larch plantings can still be found in some parts of the former park, and no more than 20% is left of the orchard as it was a hundred years ago. There is a local school in its place now. The system of cascade transportation of water in ponds was lost during the First World War. This eventually

led to a significant grinding of the largest third pond, although the two small ponds are almost preserved in their pristine shores.

On the other hand, a significant interest in the scientific and social activities of V I Vernadskiy, manifested in the post-soviet period, led to active restoration work on the territory of his former estate in the Tambov region [7, 8]. In 2000, creation of Vernadskiy's Museum began. In 2003, the former manor house was rebuilt according to the old drawings. Now there is a Museum of V I Vernadskiy. At the same time, the territory of the former park began to be planted with young seedlings of those species of trees that grew there before. The main pedestrian paths were laid and the bust of V I Vernadskiy was installed on the central path (in front of the entrance to the main manor house). Such an undertaking in museum work became crucial for collecting necessary information about the former location of nobles Vernadskiys' estate in the Tambov province.

The drawing and cartographic stage of our work was divided into several stages. First, a planned drawing of the area, where Vernadskiy's estate was located, was done. The main source of information was satellite maps on the Internet [9, 10]. Based on our experience gained at earlier similar studies, we've chosen the scale, which allows for a sufficient degree of observation in order to demonstrate all the objects of our interest, located at the village of Vernadovka.

The next step was to draw an axonometric image of the same area. This approach to obtaining preliminary view images made by pencil, will allow us to subsequently obtain the entire view base, on the basis of which we will conduct computer modeling. The only information source at this stage was the layout of the estate. Employees of the Museum of V I Vernadskiy have posted a photo of this layout on the Internet on the website "Museum of the estate of V I Vernadsky". Currently, the authors are not aware of the sources used by the museum staff in creating this layout. It was not possible to find information in archival materials from which it would be possible to draw reasonable conclusions about the buildings and the structures located on the territory of Vernadskiy's estate at the turn of XIX – XX centuries. Accuracy of the layout can be justified by the fact that the authors of the layout have mentioned the same objects as A V Kashtanov in his article " V I Vernadskiy and Vernadovka" in the book " V I Vernadskiy and the Tambov region". Unfortunately, the mentioned article does not contain any references to primary sources. However, in view of the current lack of other documentary sources on this issue, we have decided to take advantage of the above information, adopting it as a necessary starting point for our work.

#### 4. Results of virtual modelling and discussion

The authors have developed a virtual model of Vernadskiy's family estate, presented in the form of a Virtual Museum. The Museum is a virtual three-dimensional reconstruction of the estate. It is implemented using an open source software platform OpenSimulator, which is a server platform for creating three-dimensional virtual worlds.

In 3D-modeling programs (Google SketchUp, Blender) based on the known parameters (size, material) 3D models of objects of the estate (buildings, facilities, utensils, etc.) were built including both existing objects and lost or partially destroyed. Using landscape design programs (L3DT, Terragen) on the basis of available topographic information (maps, plans, diagrams, images from the space), a 3D model of the landscape was done. Based on these 3D models of objects and the landscape the virtual space was constructed in the software system for creating multi-user three-dimensional virtual worlds OpenSimulator. With the help of the specialized software client (Cool VL Viewer, Singularity) visitors of the Museum connect to the server via the Internet and control the movement of their avatars (virtual characters) inside the simulated virtual world.

A significant interest in the scientific and social activities of V I Vernadskiy, manifested in the post-soviet period, led to active restoration work on the territory of his former estate in the Tambov region. In 2000, creation of Vernadskiy's Museum began. The original building of Vernadskiy's house has not been preserved to this day, but in 2003, the former manor house was rebuilt according to the old drawings (figure1).



**Figure 1.** Reconstructed house-museum of V I Vernadskiy.

Nowadays, there is the House-museum of V I Vernadskiy. The museum exhibits a biographical exposition dedicated to the scientist, and functions as scientific and cultural Noosphere Center.

At the same time, the territory of the former park began to be planted with young seedlings of those species of trees that grew there before. The main pedestrian paths were laid and the bust of V I Vernadskiy was installed on the central path (in front of the entrance to the main manor house). Such an undertaking in museum work became crucial for collecting necessary information about the former location of nobles Vernadskiy's estate in the Tambov province.

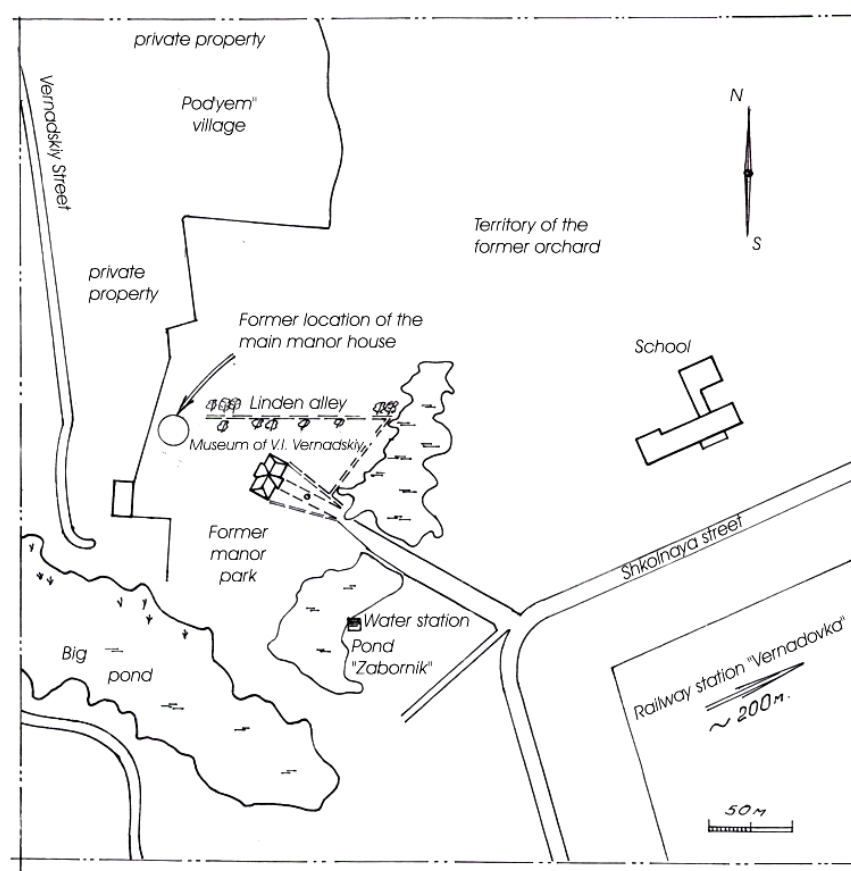
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## 5. Conclusion

A distinctive feature of this work is versatile and multifunctional amount of information related to development of particularly important memorable places of municipalities. Preference is given to visual images obtained with the help of GIS technologies for historically significant territories in the form of spatiotemporal models of objects, including: three-dimensional photorealistic images with its geographical references and various types of attributive information related to historical processes.





**Figure 2.** Plan-scheme of Vernadsky family estate.



**Figure 3.** General view of the model of Vernadsky's family estate.

The authors propose the technology for creating a virtual space of memorable places associated with famous personalities and their work. The results are presented in the form of the Virtual Museum of Vernadskiy's family estate in the village of Vernadovka in Pichaevskiy district of the Tambov region related to personal, public and professional activities of an outstanding Russian scientist V.I. Vernadskiy.



**Figure 4.** Top view of the model of Vernadskiy's family estate.



**Figure 5.** Visualization of the yard model in Vernadskiy's family estate.

Virtual museums have significant cognitive and research potential and actively contribute to preservation of cultural heritage. The use of modern information technologies allows drawing attention to objects of historical and cultural significance. The Virtual Museum developed by the authors contributes to popularization of local history and museum activities, especially among the younger generation.

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