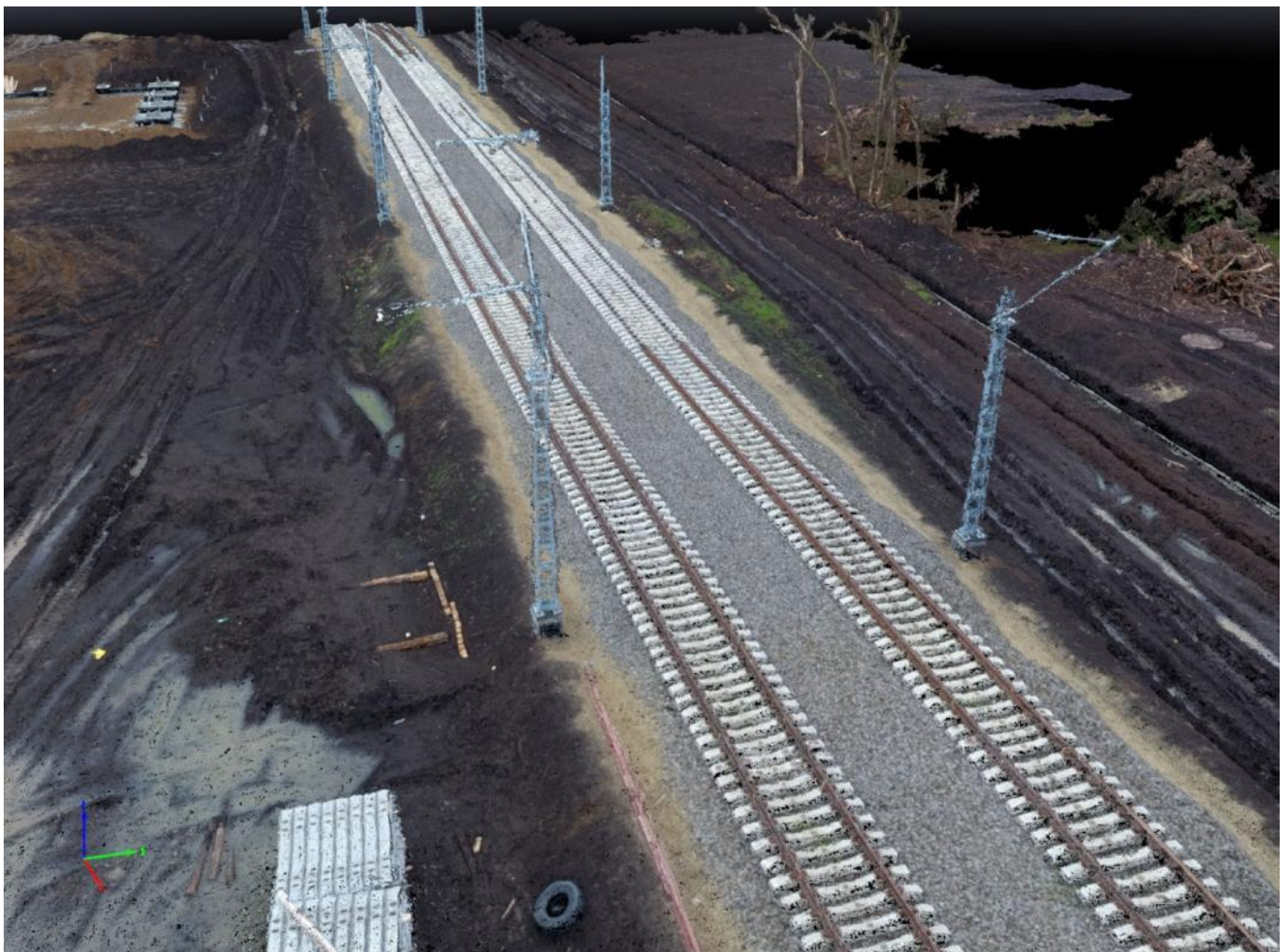




The use of modern digital techniques  
aerial photography from a UAV during the  
implementation of large construction projects to  
create a BIM system



## INTRODUCTION

BIM (Building Information Modeling) is an approach to the full range of work on the creation of any construction object and its further support in a single information field (model). Information modeling manages the life cycle of an object at all stages of its existence. The main difference between BIM and other types of design is the collection and complex processing of the entire architectural, design, technological, economic, operational and other information about the construction object in a single environment (BIM model). Moreover, all elements of the model are interrelated and interdependent, which, in fact, gives the model a factor of realism (approximation of the real situation).

An important component of the BIM innovation approach is the possibility of visual modeling of the construction process itself, in the course of which each of the specialists participating in the project can track the implementation of the technical solutions laid by them and their interaction with the subcontractors. When modeling the construction and operation of the facility, it is possible to observe the work provided for by the project.

## SURVEYS

When designing a new linear structures must take into account the geographical features of the selected area. Basically, to solve this problem, the services of surveyors are resorted to, who study the site of upcoming work, draw up a site plan with all the details, then transfer all the accumulated information to the design specialists. Only after that you can begin design work.

With the advent of unmanned aerial vehicles, the procedure for obtaining accurate geospatial data for the design of objects has become much simpler. Now you do not have to wait long for the completion of the laborious process of instrumental geodetic surveying, you can use the UAV to get instant, accurately geopositioned images of the terrain with the smallest details, and in a short period of time collect the necessary information for design.

After the flight is complete, photogrammetry and cartographers process the data in specialized software, and the decoder gets the necessary semantic information to create topographic plans, which cannot be determined from the images. Created orthophotoplans of 1: 500 and smaller scales, 3D terrain models and digital topographic plans allow designers to solve many problems arising in the design of objects, and builders correctly select the necessary equipment and plan the implementation of certain types of linear work, taking into account rational use and environmental protection.



**The main advantages for the design are:**

**Solving the problems of shooting inaccessible places**

**Accelerating the process of obtaining topographic material (1.5 times faster than the classical survey)**

**The ability to shoot more space without increasing the cost and timing**

**The high detail of the material obtained and the accuracy of the material make it possible to obtain complete data on the objects to be surveyed, which is impossible with the classical survey methods.**

Sample data obtained for the design



The resulting materials are digital aerial photography:

- a transformed orthophotomap with reference to the MSC and a resolution of 2-3 cm by 1 pixel; This accuracy is fully comparable with the laser scanning of the terrain and has several advantages, such as:
- uniformity of coverage over the entire 3D object of a cloud of points in increments of 3-5 cm.
- save full color information about the object.



## DESIGN

The main difference of BIM from other types of design is the collection and complex processing of all architectural design, technological, economic, operational and other information about the construction site in a single information environment (BIM-model). At the same time, all elements of the model are interrelated and interdependent, which, in fact, gives the model a factor of realism (proximity to the real situation).

Information modeling technologies have an abundance of quality advantages. So, it would seem, an imperceptible change in the spatial thinking of the designer ultimately significantly reduces the risk of errors, physical and intellectual collisions. The designer has the ability and direct need to think about the construction as a holistic three-dimensional object (existing also in time), and not as a set of drawings for the examination.

For example:

The compilation of land cadastre is a complex and popular task in the design of linear structures. The use of remotely piloted aircraft allows low-cost and effective solutions for cadastral aerial photography. UAVs are often used to determine the boundaries of land plots, to estimate the cost of development. Shooting with BLPA gives the real situation of the site, on the aerial photographs all the elements are visible in relation to the nearby water resources, forests, transport arteries, Sanitary protection zone and interchanges, which allows you to quickly identify and circumvent possible problem areas. It is also effective to place construction objects and determine the required allotment of land for construction.

**No collisions in the design of related areas**

**Saving time making design decisions**

**Minimize costs or completely eliminate additional ones before filming in the process of designing linear objects.**