



UUK:528.7

USE OF MODERN PHOTOGRAMMETRY DATA IN VARIOUS FIELDS.

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Annotation: *This article provides detailed information about aerial photogrammetry and ground photogrammetry and discusses the advantages and some limitations of photogrammetry today, and their effective and promising use in various fields.*

Key words: *aerial photogrammetry, ground photogrammetry, aerial photography, aerspeed. Photogrammetry, aircraft, aircraft, camera, drone.*

Enter. Currently, while science and technology are constantly developing, issues such as photogrammetry materials, remote sensing, and the use of photogrammetry materials in different fields and for different purposes, which are entering almost all fields, indicate the need for representatives of all these fields to use more advanced technologies. First of all, if we define the concept of "photogrammetry", this word means to measure records using light.

Photogrammetry is an important method for taking measurements and creating 3D models used in a variety of fields, from engineering to sports. It is an inexpensive 3D scanning technique suitable for scanning both small objects and large buildings. The official definition of photogrammetry is "the use of photography in surveying and mapping to determine measurements between objects". Simply put, it is the science of taking measurements from photographs.

Digital photogrammetry originated in 1984 when Ian Dowman proposed it as a method of topography or land mapping using satellite images. However, the origins of his theory can be traced back to Leonardo da Vinci, who in 1480 wrote how to introduce perspective into illustrations by making vanishing points appear smaller and objects formed from them appear larger. They are designed to be closer to the viewer's eyes.

Photogrammetry works by taking a series of photographs of an object, structure or landscape from different points or angles. While different methods were used to process images in past decades, photogrammetrists today process images in photogrammetry software. This software calculates measurements in a desktop software or photogrammetry application and creates 3D renderings using the images.

For example, if you are a surveyor who wants to map a landscape, you can mount a camera on an airplane flying over the landscape and take pictures every few meters. You can then feed these photos into photogrammetry software, which triangulates all the captured points to create an accurate 2D or 3D map of the landscape and distances between points to scale.



There are two main types of photogrammetry - aerial photogrammetry and ground photogrammetry. If we touch on each of them separately, we can define them as follows.

Aerophotogrammetry

As the name suggests, in aerial photogrammetry, a camera is mounted on an aircraft or drone and is usually pointed vertically at the ground. Drones are currently used in aerial photogrammetry, but fixed-wing manned ships and unmanned aerial vehicles (UAVs) have been used in the past. Due to the widespread use of drones in aerial photogrammetry, it is sometimes referred to simply as drone photogrammetry.

As the aircraft or drone flies along the flight path, several identical photos are taken. Previously, these photos were processed on stereo-plotters—devices that allowed users to view two photos simultaneously in stereo, but now they are usually processed using photogrammetry software.

Earth photogrammetry

Terrestrial photogrammetry, also known as close-range photogrammetry, uses a ground-based, tripod-mounted or hand-held photogrammetry camera. This type of photogrammetry is typically non-topographic, meaning it is used to create drawings, 3D models, measurements, and point clouds rather than topographic products such as terrain models or maps.

Terrestrial photogrammetry can be done with an everyday camera, such as the camera on your smartphone. It can be used for modeling and measurement in a wide range of industries including architecture, engineering, forensics, mining, archaeology, entertainment and many more.

In addition to being used by professionals, terrestrial photogrammetry is a popular method among amateurs. It can be used as a 3D scanning app to scan common objects, people's faces and small objects around your home, workshop or business using only your smartphone camera and free photogrammetry software.

We learned from their description that both types of photogrammetry have very wide possibilities. Let's talk about the advantages of photogrammetry here.

- clear records;
- ease, speed and cheapness;
- 3D scanning;
- access to difficult places;
- low distortion;
- simple analysis.

Although the use of photogrammetry is a technique with many advantages, we cannot say that it does not have its drawbacks.

Disadvantages of photogrammetry:

- Effects of Weather - One of the main disadvantages of photogrammetry is its susceptibility to bad weather conditions. Rain, fog, and wind can affect image quality, and dense vegetation can also obscure the camera's line of sight.

-Environmental Constraints - The nature of the terrain and built environment can limit the flight altitude required to achieve high resolution and image clarity.



-Difficulty matching points - It can be difficult to transfer points between images with low-contrast or uniformly textured surfaces such as sand, pools of water, and short grass.

Photogrammetry has a wide range of applications. Originally used primarily for topographic mapping, it is now used in a variety of fields, from surveying and engineering to forensics and entertainment. Below we consider the most popular applications of photogrammetry.

- Land surveying;
- Engineering;
- Forensic medicine;
- Real estate;
- Film and entertainment;
- Military intelligence.

Today, photogrammetry is used in a wide range of fields and has a wide range of possibilities, which leads to its rapid development.

Although photogrammetry has a few minor limitations, it is capable of producing high-resolution data, 3D models, and a true, permanent record of a landscape or object much easier, faster, and cheaper than traditional methods.

The best photogrammetry software is an essential tool for architects, surveyors and engineers to create real-world based topographic maps, grids and point clouds. It's also the easiest way to do 3D scanning without expensive kit, so photogrammetry software is used to scan small objects and even other people's faces for small models.

To sum up, today the possibilities of photogrammetry, its advantages and fields of application are very wide. Representatives of almost all industries today feel the need for photogrammetry materials. Photogrammetry is a technique used in a wide range of industries to obtain measurements and 3D models from photographs. It works by taking overlapping photos and feeding them into photogrammetry software, then extracting 2D information about landscapes and objects and using it to flatten, texture and mesh the images to create a 3D model.

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