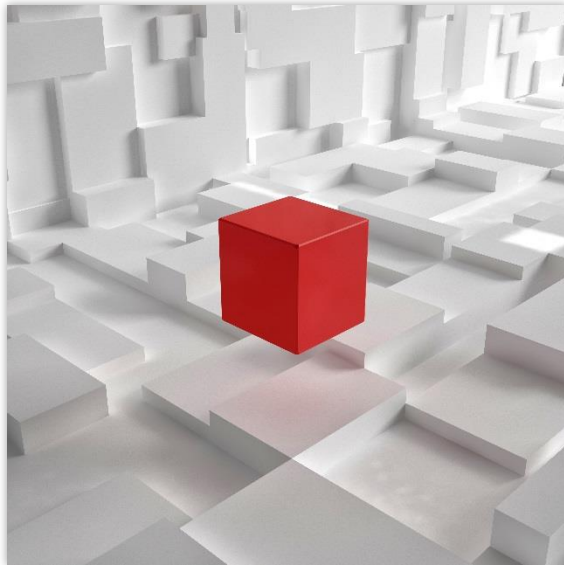


Three-dimensional scanning device, system and method

Abstract

The devices made for copying the external surface of an object take the name of three-dimensional scanners and are used in all these sectors where it is necessary to acquire digital copies of a physical object, also of complex shape. This technology generates highly accurate and quick results, since it uses a laser beam for capturing digital information about the shape of any object without the use of reference points arranged on the surface.



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three-dimensional scanning

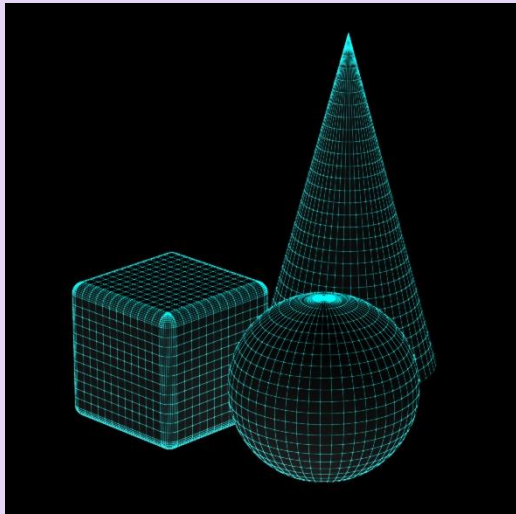
optical sensor

shape measurement

laser

motion tracking

Three-dimensional scanning device, system and method



Description

The methods for three-dimensional scanning may require the utilisation of several technologies with specific limitations, advantages and costs. A typical classification divides them into two categories: contact and contactless systems.

The first ones probe the external surface of the object through physical contact. The second ones use optical systems through a light source - a laser or luminous pattern - and represent the most employed solution on the market. The presented device, which

falls within the second family, is able to entirely measure the desired shape without using any reference point arranged on the object or systems to track the measuring heads. A three-dimensional scanning is performed through the detection of its own movement, by scrolling the device on the external surface of the object and combining two different types of information: data relating to the orientation of the device and those acquired by an optical sensor allowing to define its movements.

Applications

This technology is well suited for complex geometries that require a high degree of precision and it is widely adopted in various industry verticals, such as healthcare, manufacturing, aerospace, forensic and power generation. Moreover, the applications in the archaeological and architectural fields are of particular interest. Since the sensors used are available in a number of smartphones, it is possible to implement the presented technology on a different hardware equipment.

Advantages

The invention entails low costs, it prescind from the placement of any reference arranged on the object, allowing the acquisition of its entire shape without the subsequent merger operations of individual measurements, which are usually very demanding in terms of time and generate inaccuracies.

The possibility of not using markers ensures a greater automation and accuracy. Such a solution for three-dimensional scanning is innovative, given that it eliminates both the physical

constraints of the robotic arms and the presence of markers on the surface. The invention is able to exactly determine its own position through the merger of orientation data provided by the device and by using the distance covered on the object. In addition, the presented technique allows to perform a three-dimensional scanning of an object directly on-site, reducing the effects of noise and of drift on position measurements in order to obtain a better approximation of the image to be acquired.