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Advanced Technology possibilities of 3D scanning

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Abstract

The object digitalization creation or more precisely relevant areas, pass through progressive periods, and the technological equipment development is rapidly progressing. Nowadays, we have the possibility to use devices that can scan small products in detail. These products are usually of various and hardly accessible sizes. This form of digitalization is used as a base for modelling or so-called post processing. The advantage is mainly the shortened period, the possibility of further model configuration etc. The article presents one particular technology and various others that are disposable and their reciprocal potential will be a contribution not only for the research purposes, but also to for practical purposes.

Keywords: Laser, scanning, digitalization.

Introduction

The University of Zilina has established a unique workplace for research and development. University Science Park (USP) is located in Zilina at the University of Zilina and it has been open for less than a year. USP has already brought value and success to its workplace and its dispositional and technological equipment have created a new segment in the market. These developments will enhance the progress of technologies and will provide efficient and significant advancements in practice.

USP has four main basic pillars that have appeared as a result of the need for practice. These are:

- New progressive material and technology development
- Intelligent production systems
- Intelligent transport systems
- Information and communication technologies.

Each area of these pillars are focused on continual contribution with its unique solutions to process precision and automatization. Division of intelligent production systems aims for effectiveness of production processes, and also creation of the environment, where it would be possible to predict critical parts in processes that occur during the working traffic in plant halls or more precisely in factories.

3D laser scanner

One of the technologies that constitute the base of production system division is also the laser scanner FARO Focus3D X 330 HD (Figure 1). The essence of this device is in creating the objects´ digitalization in space and their analysis. FARO scanner, compared to previous models, can significantly move the laser scanning forward from request´s point of view, such power and functionality. The main and basic difference is the possibility of scanning up to 330m, compared to previous models, where it was possible to scan up to 130m maximum. Thanks to integrated GPS receiver, laser scanner is able to coordinate and harmonize separate scans in post processing, hence, this is the reason why it is ideal in areas such as geodetic applications or areas where it is possible to register the information in any given time, space and analyze this information afterwards. Besides, the quality of FARA Focus3D X 330 scanning has been increased and the noise has been lowered by 50%, where it would provide three dimensional photo real models. Precision of this device is with divergence ±2 mm, which is possible to identify by scanning in large halls or other areas. For example, floor straightness, defects in constructions and etc. The FARO device has gone through a complete change

concerning the safety of scanning that might be too close to people. In terms of safety it is number one as it encompasses the high quality of not damaging the apple of the eye. Thus it is also possible, in constraint conditions, to scan the environment or more precisely the area of interest very close to the scanner. This device is a highly regarded as a technology that within its increased extant and scanning. The quality of Focus3D X 330 significantly decreases the effort spent by measuring and post processing. The 3D scanning data can be easily imported into all commonly used software solutions for various reconstructions, architecture, civil engineering, forensic, industrial production, and many more. Thus the equipment efficiency has a wide scope and it is possible to use its outputs for further case studies or as a basement for related branches. Dimensions, distances, surfaces, volume calculation, analysis and inspection assignments as well as documentation can be completed with precision, reliability and saving time.

Figure 1 – Faro scanner Focus X 330 HD [4]

Measuring Principle

The measurement technology of Focus 3Dx330 is very simple. As the basis itself, it consists of a laser detector that broadcasts laser beam from rotating mirror placed in the center of a device towards the area being the object of scanning. The user cannot touch the mirror with beam during scan initiation, as it could cause not only the non-evaluation of measurement as a whole but also the mirror. Also, it cannot be placed too closely to the device while scanning, as the person would be scanned and a shadow would appear. This is why the user has to be out of reach of the scanning, or more precisely he should find such place, where would be no need of repeated scanning from his point of view. Moreover, the device divides the laser beam into a vertical extant of 300° and horizontal extant of 360°. Laser beam is consequently reflected from individual points back to the scanner. The distance to objects defined by surface is calculated in the same way as from relative vertical and horizontal angles. Another important part of scanning, as well as principle of correct scanning are the reference points. These points are replaced by reference sphere having a special surface treatment necessary for the correct measuring and having also a precisely given radius. Those reference spheres need to be placed properly so that you can work with the requested scene in final scanning.

Figure 2 – Reference sphere [6]

Data is captured directly in the device. This can be seen in the scanning solution directly in the device after scanning. The output on the screen, well readable in sunny weather, is a picture format where the captured scanning area can be seen. In case of connectivity and data transfer, the device is equipped with WLAN, where the user is able to download the data fast and simply and begin able to work with it. Another important factor in scanning is the location rectification. The circular level can be found in this device and in frame of fast scanning, it is possible to roughly adjust this device, where after the device has been switched on, it will be rectified faster. Also, before scanning the user can set various parameters in the software environment, such as the final quality of scanning, the velocity of scanning, sunshine condition and etc. The emphasis is put on these conditions, because the device takes the sun as infinity and in final measurement it is displayed as a dark cloud. That is the reason why the relevant modes are adjustable. A trained employee is able to evaluate them based on sunshine intensity. The resultant scheme, or more precisely modifiable is possible to analyze after and keep on working in SCENE software environment. This environment is very intuitive and the user can regulate all required scenes he needs to work with. These scenes, as mentioned above, serve as background for the above-mentioned areas and mainly together with various advantages like measuring and the need of repeated travelling.

Figure 3 – Software SCENE [4]

Conclusion

FARO Focus3D X 330 HD is a technological top in scanning equipment. Its forwardness enables reading the scanned objects in detail, or more precisely the scenes in a way that makes it possible to work on it in a software environment SCENE with this example. A huge advantage compared to competitive devices and previous versions, is that it has better scanning in sunshine with precision ±2 mm, the possibility of scanning the object in distance of 330m, the noise being decreased by 50%. The software environment output is a precisely scanned scan, which can be used as a basis for modelling or construction software solutions. This type of device placed in USP UNIZA is compatible with other equipment's and that is the reason why their output quality potential increases.

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