IQSUN 880 A NEW MODULAR CONCEPT FOR 3D-LASER SCANNING

Dr. R. Becker [1] , Dr. H. Volz [a]

[1] iQsun GmbH, Königsallee 35, 71638 Ludwigsburg, Germany - (reinhard.becker@iqvolution.de)
[2] iQsun GmbH, Königsallee 35, 71638 Ludwigsburg, Germany - (hansjoerg.volz@iqsun.com)

KEY WORDS: 3D-laser scanning

ABSTRACT:

3D laser scanning is becoming a more and more well established method for the 3D-capturing. New areas of application are permanently found. Quite often a new application means new requirements for the scanner hardware and software. Many different and sometime contradictory requirements can not be satisfied with one single device. A solution to this problem is a modular scanner system, that, like a camera, is able to capture different ranges, resolution and accuracies by using exchangeable modules. Thus very different applications, like robot lines as well as trees or landscapes, can be covered in an economical way. For each application a specific module can be found or developed. The iQsun 880 is an open scanner framework, that simplifies and accelerates massively the tapping of new areas of application. We will present this new and unique concept as well as the first experiences.

1. 3D-LASERSCANNING, ON IT'S WAY TO AN ESTABLISHED METHOD

1.1 Our background

iQvolution has it's root in digital factory solutions. The German automotive industry asked us to find a solution for highly efficient 3D-capture of factory reality. From this start point iQvolution created a complete process solution for the efficient 3D-capture.

Today iQvolution has scanned more than 2.5 Mio.
Square meters of industrial production facilities.

iQsun is a 100% daughter of iQvolution and develops and produces 3D-laserscanner.

1.2 Demands in industrial applications

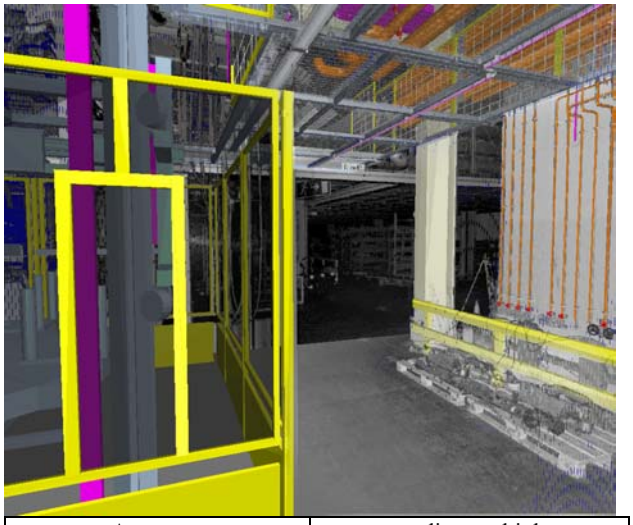
The demands for laser scanners in industrial applications are:

- High resolution (typically 28 Mio. 3D.Pixel per Scan)
- Fast
  - non interruptive in production environment
  - high speed 3D-Measurement
  - large field of view
- Accurate (5mm up to 25 m)
- Range (approximately 50 m)

2. DEMANDS OF DIFFERENT APPLICATION CLASSES

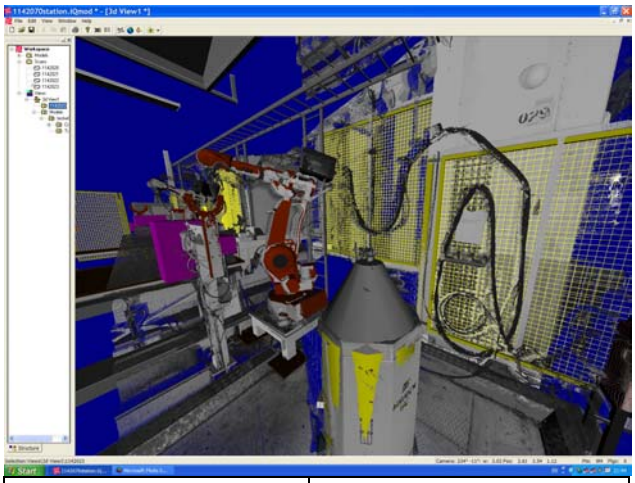
2.1 Factory Digitalisation

In factory digitalisation we have to differ buildings and complex machines like robot lines. In this example the required accuracy is higher. Figure 1 and Figure 2 show examples and the requirements in accuracy, resolution, range and speed to the 3D-laserscanner.



Accuracy	medium to high
Resolution	high
Range	short
Speed	high

Figure 1: Factory Digitalization - Building

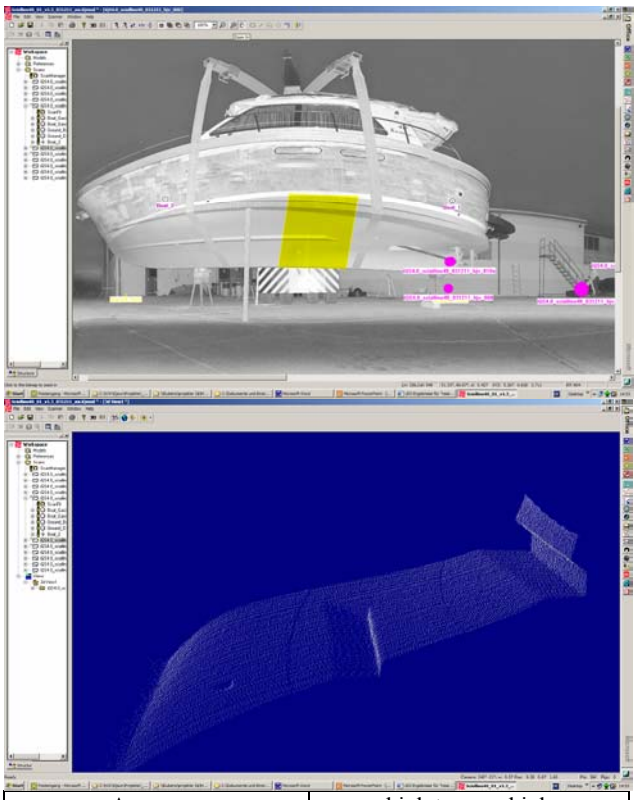


Accuracy	high to very high
Resolution	High
Range	Short
Speed	High

Figure 2: Factory Digitalization – Robot Line

2.2 Quality Assurance of Large Products

In this area high accuracy is required. An example and the specific needs to a 3D-laserscanner are shown in Figure 3.

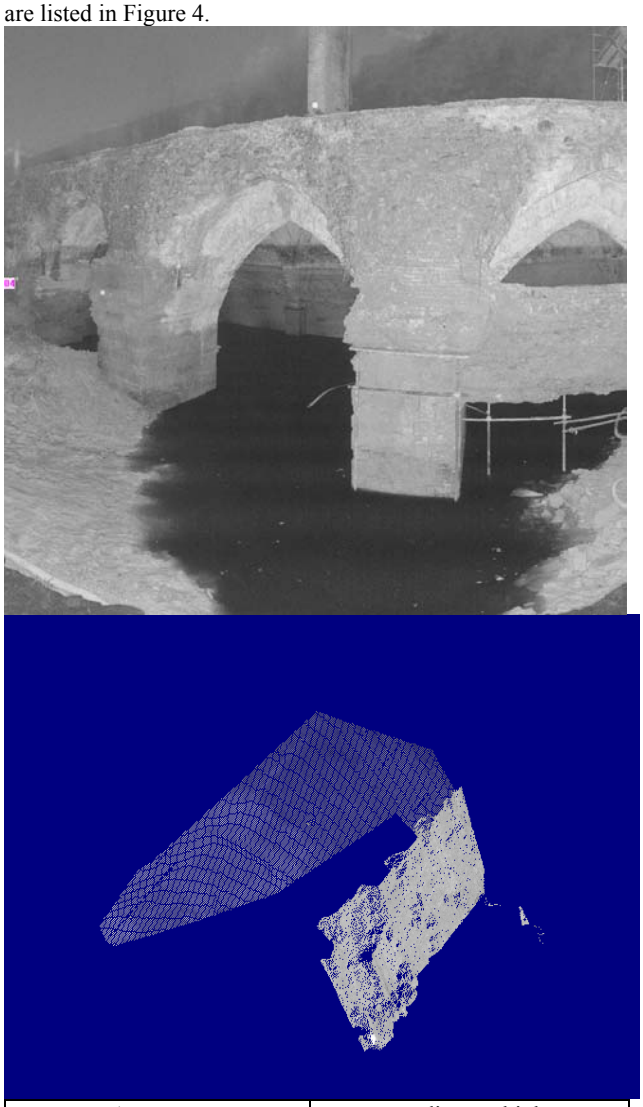


Accuracy	high to very high
Resolution	medium to high
Range	medium
Speed	medium

Figure 3: Quality Assurance – Large Products, 2D-view and 3D-point cloud

2.3 Long Range – Out Door

In this area the required accuracy is medium to high. The measurement range is high. An example and the requirements are listed in Figure 4.



Accuracy	medium to high
Resolution	high
Range	long
Speed	medium

Figure 4: Long Range – Our Door, 2D-view and 3D-point cloud

2.4 Summary different application classes

The analysis of different application needs for 3D-laserscanning shows the following requirements for an universal scanner:

Range: 0,5 m to 800 m
Speed: > 200.000 pionts/second
Accuracy: < 1 mm.

Today it is not feasible to build all demands in one machine. Our solution to this is the:

modular scanner.

Figure 5 shows the requirements to a 3D-laserscanner from different applications.

Demands Applications	Range [m]	Modeling -accuracy	Speed	Resolution
Large Products	15	1	L	H
Industry Discrete	50	1,2,3	H	H
Industry Process	50	1,2,3	H	H
Architecture	50	3	L	L
Civil Engineering	250	3,4	L	M
Open Pits	500	3,4	L	M
City Modelling	250	3,4	L	M
Scenery	800	3,4	L	L
Mining	100	2,3	M	L
Tunnel	30	2,3	H	H
Forensic Accidents	50	2,3	H	H
Automation	50	2,3,4	H	M
Documentation	50	2,3,4	H	H
Airborne Laserscanning	1500	4	L	L
Accuracy: 1:<=3mm 2:<=5mm 3:<=25mm 4<=80mm				

Figure 5: Application classes

3. THE MODULAR LASER SCANNER IQSUN 880

3.1 The Modules

The iQsun 880 modules are:
the base module, the distance sensor module, the mirror module and the PC module (Figure 6).

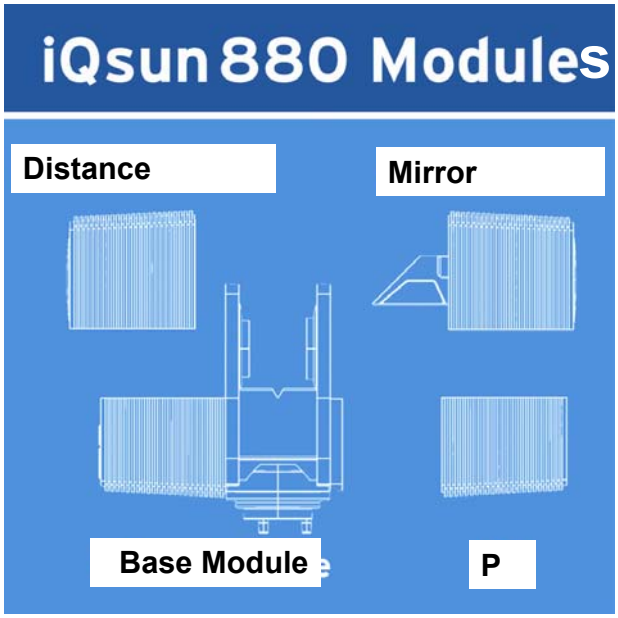


Figure 6: Modules of iQsun 880 3D-Laserscanner

3.2 Advantages of the concept

For different applications specific requirements can be solved with specific modules. The owner of an iQsun 880 can participate from future technical improvement by updating only modules.
The iQsun 880 offers a lifelong upgrade promise. Thus the customer can always upgrade to the latest state of the art.
Maintenance and repair are much easier, less expensive and faster based on exchangeable modules.
The PC module enables local processing of scan data, so an additional Laptop or PC is not necessary. The scanner can be operated by Start/Stop bottoms on the base module.

3.3 Outdoor use

The iQsun 880 3D-laserscanner and our accessories enables the user to do professional outdoor scans. A battery box allows 8 hours scanning based on the low power consumption of less than 60 W. Figure 7 shows the iQsun 880 in outdoor action.

Figure 7: iQsun 880 in outdoor use