3d laser scanners, non-contact digitizers, white light projection scanners

Reviews and Evaluations

at RAPID 2010 3D Expo, Anaheim California May 2010
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2010, the year of 3D

From James Cameron’s Avatar 3D movie the biggest box office success of all time to all the new technologies in 3D television on sports, movies and video games, 2010 it is indeed the year of 3D.

This can be reflected on why major companies of digital imaging and printing technologies like Nikon and HP, now come into the market of 3d imaging and additive manufacturing. In October 2009, Nikon Corporation became wholly-owner of Metris Metrology and it’s now: Nikon Metrology, offering metrology solutions as: coordinating measuring machines (CMMs), Optical CMMs, 3D laser scanners, Optical CNC measuring systems, measuring microscopes, Metrology software for 3d scanning, 3D digitizing, 3D inspection and reverse engineering.

HP is entering the market by starting to sell its new 3d printer in Europe the: HP Designjet 3D printer series, manufactured by Stratasys, Inc. This is a desktop 3d printer, which prints three-dimensional plastic colored models, with a price range of: $13000 to $18000.

Even Microsoft is getting into 3D with is Microsoft Photosynth project. This is a product, which allows you to stitch still photographs and create a 3D scene that can be displayed on the web in point cloud mesh or in real 3d views. It uses photogrametry principles to work with its data.

There is even an open source application to visualize and render 3d scenes on the Ipod touch and Iphone from Apple.

Youtube has its own 3d channel where they publish 3d video content and it is open for the public to suggest and add 3d video content. I got to see 3d video content this week with a pair of 3d glasses and it was an entertaining experience, you can see real 3d straight form your desktop or laptop computer.

So it seems to be that 3d is the trend of 2010 and some major companies are getting into the market. Imagine the possibilities and advances in the near future for this technology.

As FLAAR Reports has been evaluating digital imaging for the past decade it seems right that we are now evaluators for 3d imaging technologies, software and additive manufacturing technologies. That is why once again FLAAR visited the RAPID 2010 conference and exposition show this year held at Anaheim California. We got the chance to see, how this technology is advancing, some of its new trends and new technologies.

In this report we will review new 3d scanners and 3d software that can be used for future Mayan archaeology, ethno-botany and ethno-zoology projects and evaluations from FLAAR Reports.
3d laser scanner reviews presented at RAPID 2010.

FLAAR has visited the RAPID 2010 conference and exposition show, several times, and this year we got to review 3d portable laser scanners, 3d desktop scanners and mid-range and long-range 3d laser scanners.

When time allows, there will be a separate FLAAR Report on 3D printers, 3D rapid prototypers, and 3D additive manufacturing equipment.

**DI3D (3D Capture Systems) dimensional imaging.**

One system that caught our attention was the DI3D (3D Capture Systems) sold and manufactured in Europe by dimensional imaging and re-branded in the US as Shape Shot, sold by Direct Dimensions.

What makes this system so attractive is the high definition 3d image that it creates and its high speed for capturing 3 dimensional images. It uses a capture system created by 4 DLSR 10 Megapixel cameras, normal photographic flash illumination and passive stereo photogrammetry software; to blend each pair of stereo photographs created by de DLSR cameras and then create a high definition 3d surface image.

This system is made specifically for 3d face capture, but you can generate a larger scan and with higher quality by adding 32 DLSR 20 Megapixel digital cameras.
Here is Juan Luis Sacayón FLAAR Reports technical writer, preparing for 3d face scanning with the Shape Shot 3D scanner.

3D calibration of Juan Luis, face with the Shape Shot 3D scanner.
The D13Dcapture software can process the 3D images generated to polygon meshes that can be worked on most 3d software.

Most entry-level 3d portable laser scanners, use laser, digital cameras and reflect targets to capture the information. In some cases, the laser has to do several passes on the same spot of the object so the camera can accurately capture the information. Sometimes, part of the information capture is incomplete and has to be generated on post-production 3d software. What we saw at the RAPID show from DI3D, was the accuracy and effectiveness of their system, which with a simple snapshot it can capture 3d images surfaces that are in the camera range. Here are some samples taken from the show:
Andrew Camardella, ShapeShot industrial designer and Juan Luis Sacayón technical writer from FLAAR Reports, viewing the capture images of the ShapeShot 3d scanner.

2 stereographic images of Juan Luis Sacayón made by ShapeShot 3d scanner, before process on the D13Dcapture software.
Andrew Camardella ShapeShot industrial designer and Juan Luis Sacayón viewing the 3d scan file of Juan Luis face after the 4 stereographic images have been processed by the D13Dcapture software.
Computer generated snapshots of the 3d file created by the DI3D (3D Capture System) and process file with Geomagic 3d software. Please check the end of this report for a 3d visualization of this file.
Comments on the DIRECT dimension booth: All the personnel at their booth in RAPID 2010 was very polite and helpful answering all the questions that FLAAR personal asked of the DI3D, and were kind enough to give us our 3d samples results so we can display them on this report. We will like to thank Michael Rafael President and Chief Engineer of Direct Dimension and Andrew Camardella, operator of the D13D System.

**Surphaser 3d scanner**

Direct Dimensions also distributes the Surphaser 3d scanner. This brand has a line of long, medium and short range 3d scanners; we had the opportunity to look at one of their scanners at RAPID 2010. This scanner seems to be very portable and is compatible with most of the 3d scanner software out there.

**NextEngine 3d scanner.**

One 3d laser scanner that caught our attention was the NextEngine desktop 3d laser scanner. One interesting feature of this scanner it its size, it is a very small scanner that can fit on a desk, it also has very powerful capabilities, you can capture full-color photo data in 3d objects and convert them in most 3d software files like: OBJ, STL, VRML and XYZ. Its price range starts at about $3000.
The scanner has separate accessories that help for 3d scanning the PartGriper which allows you to grip objects for 3d scanning and a multidrive, which is a two axis position robot that allows you to move and rotate an object to create 3d laser scans that can be put together by its 3d software and then generate a full 3d object scan. What we have noticed attending this conference, it is that most 3d laser scanners use their own 3d software to capture and generate their 3d scans, which can then be further process for specific application by 3rd party 3d software.

As most 3d laser scanners it applications are:

- Design.
- Manufacturing.
- CGI.
- Art & Architecture.
- Medical.
As we stated at the beginning of this report, major companies are getting into the 3d market, one of them is the Nikon Corporation who in October 2009 became wholly-owner of Metris Metrology and it’s now: Nikon Metrology Solutions. They were present at RAPID 2010 where they exhibited the Nikon ModelMaker MMDx-MMC, a digital handheld laser scanner, that can be adapted to major brands of portable CMM equipment:

- Nikon Metrology MCA/MCAII articulated arms.
- Nikon Metrology K-Scan Optical CMMs.
- Hexagon (Romer/Cimcore) articulated arms.
- Faro articulated arms.

This 3d laser scanner is more oriented to reverse engineering and rapid prototyping, inspection of geometric features and Part-to-CAD inspection.

This is only one product of new Nikon Metrology Solutions of is wide range of Metrology products. We can wait to see what future products Nikon Metrology will show next year at this event.
FARO

FARO has a wide range of measurement systems, it develops devices for measurements, inspection, imaging and surveying. They have short range, mid range and long-range measurement and capturing systems.

The Short Range:
FARO GAGE, Capturing distance (0m to 0.5m) this is a portable contact measurement device.
FARO ARM, Capturing distance (0m to 1.85m), this is a portable contact and non-contact measurement device.

Long Range:
Laser Tracker, Capturing distance (0m to 30m). This is a contact measurement device.
Laser scanner, Capturing distance (0 to 60m). This is a Non-contact optical measurement device.
FARO’s main focus is to develop 3d capturing systems, which can generate or recreate any geometry by constructing CAD models from the original digitized object. FARO long-range scanners are able produce documentation data of digitized buildings process plants or objects.

This is our third year visiting the RAPID conference and exposition show, the past two years we have seen the FARO Gage and Faro ARM in action, but we haven’t had the opportunity to see the FARO Laser scanner at work. Seems that for the last two years the laser scanner has been present but we haven’t seen any demos or scanning results. We will be very motivated to see this scanner at work or final result samples do to that we are interesting in scanning large Mayan archaeology sculptures and temples.
Konica Minolta.

Konica Minolta has been manufacturing 3d laser scanners for the last 10 years so they have experience in this systems and this year at the RAPID conference and exposition tradeshow they were exhibiting. Same as last year, the Konica Minolta Range 7 is a more a reverse engineering and inspection 3d scanner.

FLAAR Reports also evaluates 3d imaging technologies for cultural heritage preservation, is very interested in reviewing the VIVID series non contact 3d Digitizers which are more oriented to 3d laser scanning for cultural heritage preservation.

Some of its applications are:

- Human anatomy and face scanning
- 3d archiving and preservation
- 3d color and texture mapping
- Movies and gaming
- Architectural reconstruction.
• Reverse engineering.
• 3d documentation and research
• Modeling of art objects
• Virtual restoration.
• Medical restoration
• 3d virtual web presentations

We heard from Bradley Johnson, Technical sales manager from Konica Minolta: “one new project that Konica is working on is Photogrammetry software for 3d large scale data acquisition”

Also we have noticed on the website that they are now offering it as a company service of 3d scanning, inspection, reverse engineering and design and engineering.
threeRivers 3d.

This company has a second generation of the LC-2 3d laser scanner, which is a high resolution, non-contact 3D digitizer that can convert objects into 3d models. At the RAPID 2010 Conference and Exposition tradeshow, we got the opportunity to talk with experts from their booth who explained to us that this 3d laser scanner offers higher resolution and faster scan speed and has a new design.
This 3d laser scanner can be placed on the desktop scanner range, it can easily fit on a desk and it is lightweight for easy transport. This 3d laser scanner works like a white light projection system, which uses a white light to project patterns and capture information. The LC-2 uses a laser to project a series of patterns that are captured by the LC-2 to generate 3d models, the models can be generated with photo quality realism.

Creaform.

Creaform is a company that manufactures and sells 3d capturing and measuring devices. Some of their major products are the: 3d portable handheld laser scanners:

- UNISCAN (Entry level 3d scanner)
- REVSCAN (3d scanner for reverse engineering)
- EXASCAN (High accuracy/resolution 3d scanner oriented for inspection applications)
- VIUSCAN (Color 3d Scanner)
- MAXSCAN (3D scanner for large parts)
- ERGOSCAN (Medical 3d scanner).

We visited the Creaform booth once again this year, where they were showing their line of 3d portable handheld lasers scanners and the HandyPROBE (a arm-free measurement system) oriented for inspection and reverse engineering applications.
Z Corporation.

As every year Z Corporation was present with a large booth displaying its 3d portable laser scanners and rapid prototyper machines, as always their team at the booth was very polite and friendly explained how their products work. We saw interesting applications of their 3d printed samples and their new ZBuilder Ultra. You can learn more on this product on our new trends on Rapid Prototypers and Additive Manufacturing Machines at RAPID 2010).
3D White light Projection scanners.

ATOS Capture 3D.

The Atos Capture 3D is a high-end industrial 3D digitizer. It is mostly used for three-dimensional measurements in industrial components on reverse engineering and inspection, it can acquire data as polygon mesh that can be converted to CAD using reverse engineering software. This 3D digitizer system works using a white light projection that projects fringe patterns on an object surface, which are captured by two measurement cameras. It can be mounted on a stand or on a robot for automated measurements. Results are processed by its own software and can be converted to standard 3D software files for further work.

It major applications are:

- Quality Control.
- Reverse engineering.
- Rapid Prototyping.
- Rapid Milling.
- Digital Mock-Up.

There are also a variety of ATOS 3d digitizers for different applications.
There is the:

- ATOS II
- ATOS LLe
- ATOS III:

COMET 5 3D Digitizing from steinbichler Vision Systems.

The FLAAR Reports staff had the opportunity to visit the booth of steinbichler where they were exhibiting the **COMET 5 3D** this 3d scanner uses and integrated white light from a projector and 11 megapixel camera to capture 3d models. One difference of this 3d scanner and most of white laser scanners showed at RAPID, it’s that others scanners use a separate projector and cameras which makes them look like a prototype on development. The integration of the projector and its camera in same body of the **COMET 5 3D** is made just by viewing it as a real 3d scanner. And also by reviewing its specifications you can see how steinbichler has 20 years of experience on optical sensor and measuring technology and are experts on quality control inspections.

Its applications are:
Mold and tool-making.

Design.

Quality control and Inspections.

Rapid Manufacturing.

Reverse engineering.

Archeological research and Art applications.

Medical applications.

We will like to continue to review this product to see how it performs on Archaeological objects, architecture, and ethno-botany and ethno-zoology projects.
3D3 Solutions

Once again this year at RAPID 2010 we caught up with 3D3 Solutions, where they had a booth, with various presentations of their models of 3d white light projectors scanners. We saw a new compact presentation of their HDI 3D scanner and various presentation and configuration of this scanner. As we reviewed in our last year report, this kind of scanner uses a projector to emit a white light pattern on the surface of an object and uses two cameras to capture the information. The HDI 3D can be positioned on an entry level 3d scanner with a price range of $5000 to $10000. Another interesting aspect of this 3d scanner is that you can upgrade it hardware with different cameras and lenses adjusting the scanner to particular needs. Their applications are the same as most 3D Scanners:
Applications:

- Reverse engineering.
- Quality Inspection.
- Medical (Dental scanning, face and body scanning.)
- Arts and archaeology.
- Entertainment.

3D3 Solutions also develops its own software the:

- FlexScan3D.
- Leios 2010.

We will have more on this software on our 3d software at RAPID 2010 FLAAR Report.
Appendix A
3d visualization of DI3D (3D Capture System) file with Geomagic 3d software convertor to Adobe PDF.

In our next page you can do a 3d visualization of the 3d file created by DI3D (3D Capture System) and process by Geomagic 3d software, of Juan Luis Sacayón FLAAR Technical writer.

We will like to thank IB-ProCADD our 3d partner research institute in Ljubljana Slovenia, for arranging a trial version of the Geomagic software for FLAAR evaluations.

Contact Information:
IB-PROCADD d.o.o. Slovenia
Dunajska cesta 106
1000 Ljubljana
Slovenia
Phone: +386 (41) 657 925
Fax: +386 (1) 568 45 78
Email:
jure@ib-procadd.si
edo@ib-procadd.si
3Dstudio1@3dt.si
Click on the image to activate the 3D Model.
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3D Laser Scanning Archaeology Sculptures
Kissing Snakes of Museo Cotzumalguapa

3D Machine Parts via Rapid Prototypers

3D Modeling Healthcare Applications via Rapid Prototypers
Z Corp Models: ZPrinter 650, ZPrinter 310 Plus, ZPrinter 450, ZPrinter 600 and Spectrum Z510

3D Architectural Models via Rapid Prototypers
Z Corp (Models)

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