AutoScan3D

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I/ Overview

Key advantage:

Higher quality, and time saving, thanks to multi-camera processing

David Laserscanner (DLS) allows you to scan in real time with a single video camera. With its "Image grabber" functionality, AutoScan3D achieves higher performance while using DLS processing in non-real time. Indeed, at shooting stage, AutoScan3D can control and synchronize several cameras (3, 4, or even more), which divides by 3 or 4 the time needed for shooting. With several cameras, carefully placed at different shooting angles, fringe areas are avoided, thus minimizing scanned object handling. Moreover, the scan quality will be increased thanks to the acceptance criterion that will be lowered for 3D points in fringe areas. This criterion varies from 0 to 1, and its default value is set to 0.5 for a single point. For instance, camera 1 will assign a liability rating of 0.4, camera 2 will assign 0.6 and camera 3 will assign 0.2. Working only with camera 1, the point would be rejected and a new shooting session would be necessary. With the multi-camera system, the usual 0.5 acceptance criterion will be raised, and the global scan quality will be positively impacted.

High precision

The precision of a 3D scan is directly related to the precision of the images captured at shooting stage. Automated control of a DSLR Canon camera allows for leaving aside the low resolution of live video, and diving into the high definition provided by 24x36mm sensors. Also, it allows to benefit from the whole range of Canon optics, and especially the L-series macro optics (professional range) with its exceptional line resolution. AutoScan3D can control any DSLR Canon device and contributes to open DLS onto new definition horizons. But this is not the only benefit that can be drawn from AutoScan3D.

More effective, much quicker

AutoScan3D provides a simple solution for scanning with DSLR cameras in association with David Laserscanner (DLS) system. While DLS displays a structured light pattern directly onto the object scanned, the operator needs to take a picture of this projection. The operation is renewed for every pattern. In order to obtain a quality scan, up to 54 different patterns can be used for calibration, and 54 for every shooting angle. If it is estimated that 8 rotations and 3 different positions of the object on the turntable will be needed in order to avoid fringe areas, one can estimate the actual number of manipulations needed as follows: 54 + ((8*54) * 3) = 1350! And this does not account for handling incidents like pushing your videoprojector, calibration landmark or camera while adjusting your object position or your camera. And that leads you to start it all over again. AutoScan3D allows you to work in a real professional way. It reduces the manipulations from 1350 to only 4: you will only need to press the "c" key for calibration, then set your object into 3 different positions on your turntable, pressing the "s" key for each of them. And that's all you'll need to do to get 1350 pictures, with no risk of having to start it all again.

Whom is it designed for?

Every David Laserscanner user who wants to achieve higher scan quality. With its gain in time and effectiveness, AutoScan3D is a low-price solution for artworks reproduction or 3D projects related to movies or video games, that call for increased realism.

What does it not do?

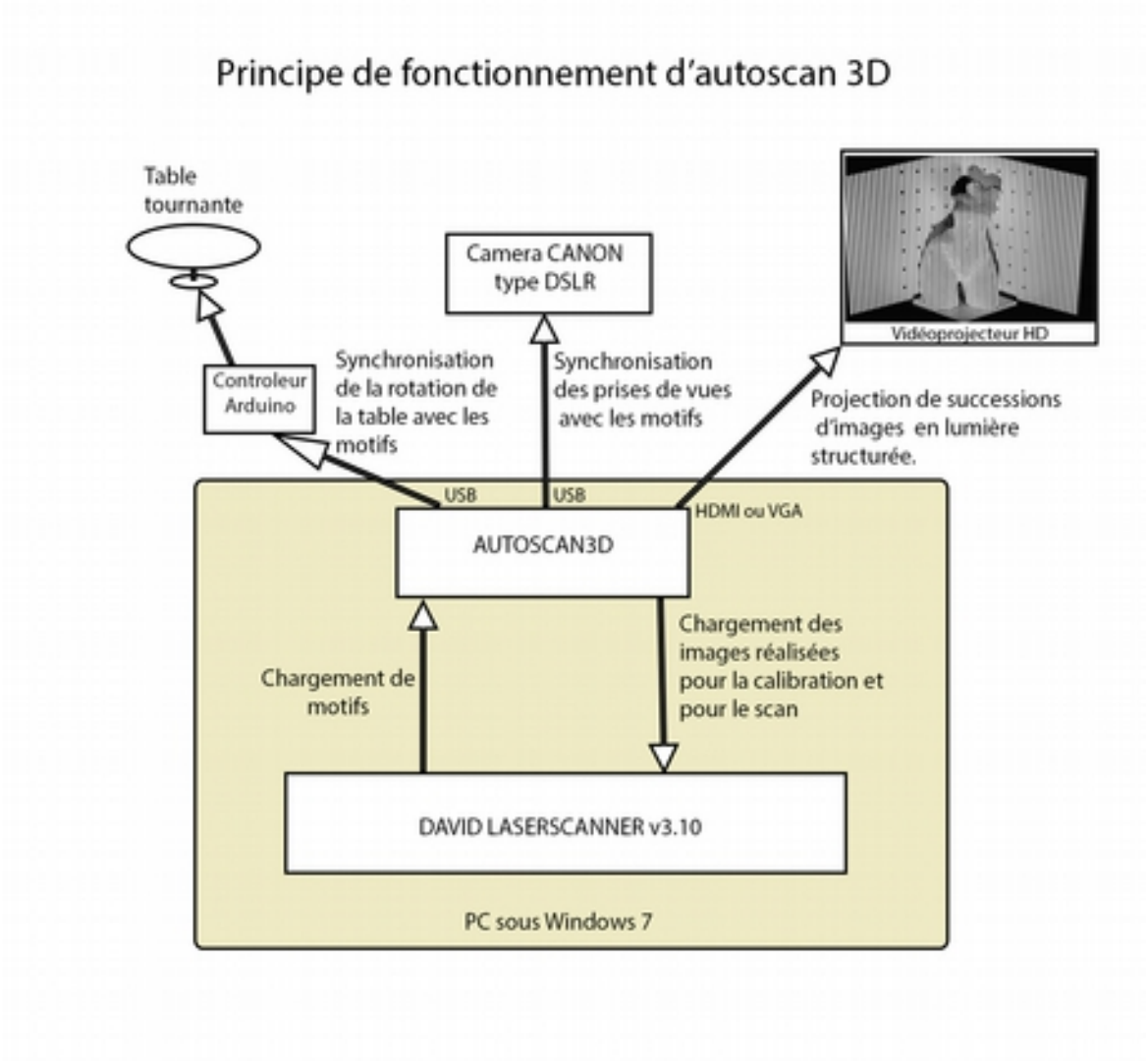
AutoScan3D has not been designed for quick scanning, as it requires a precise organization, and a strict workflow.

Workflow

4 different steps are necessary:

1) Choice of the number of structured light patterns to be used during the shooting phase, and copy of the image files created by DLS into an AutoScan3D subfolder.
2) Shooting phase, controlled by a PC that runs AutoScan3D.
3) Transfer and post-treatment of the image files (JPEG or RAW for instance), from the camera memory card into the PC that runs the David Laserscanner license. The post-treatment of images can be realized using any software: Adobe Lightroom, Photoshop Camera Raw, UFRaw, etc.
4) 3D scan computing phase, with David Laserscanner Image Grabber option: for calibration first, then for the scan itself.

Schematic diagram:



AutoScan3D operations concept

Turntable

DSLR Canon Camera HD videoprojector

Arduino controller	Synchronization of the turntable rotation with patterns	Synchronization of shots with patterns	Projection of structured light images series
	USB	USB	HDMI or VGA
AUTOSCAN3D			
Patterns uploading			Images downloading, either for calibration or scanning purposes
DAVID LASERSCANNER v3.10			
Windows 7 PC			

II/ Specifications

Here are the specifications for AutoScan3D v0.1 (beta version), as of June 12th, 2014.

- Simultaneous support of multiple Canon cameras.
- Control of the shot number over 360°: for 8 rotations, you get a scan every 45° around Y axis.
- Choice of the series communication port that drives the Arduino turntable.
- Control of the delay between shots, with increments of 50 or 250 milliseconds.
- Control of the number of structured light patterns sent to videoprojector.
- Complies with all kinds of DLS 3.10 structured light patterns.
- Complies with all Canon DSLRs that support Canon EDSDK v2.14:

  EOS-1D C / EOS 6D / EOS M / EOS M2
  EOS-1D X / 1D Mark III / 1Ds Mark III / 1D Mark IV
  EOS 40D / 50D / 5D Mark II / 5D Mark III / 7D / 60D / 60Da / 70D
  EOS Rebel XSi / 450D
  EOS Rebel XS / 1000D
  EOS Rebel T1i / 500D
  EOS Rebel T2i / 550D
  EOS Rebel T3i / 600D
  EOS Rebel T4i / 650D
  EOS Rebel T3 / 1100D
  EOS Rebel T5i / 700D, EOS Rebel SL1 / 100D
  EOS Rebel T5 / 1200D / Hi.

  Designed for and tested on Canon 5DII.
- DLS 3.10 texturing compatible.
- Compatible with David Laserscanner 3.10 64bits only.
- Windows 7 64bits compatible (should work on other Windows system, but no support will be provided, as not tested under these conditions).
- Compatible with David Laserscanner series port communication protocol for messages and commands (Arduino turntable).

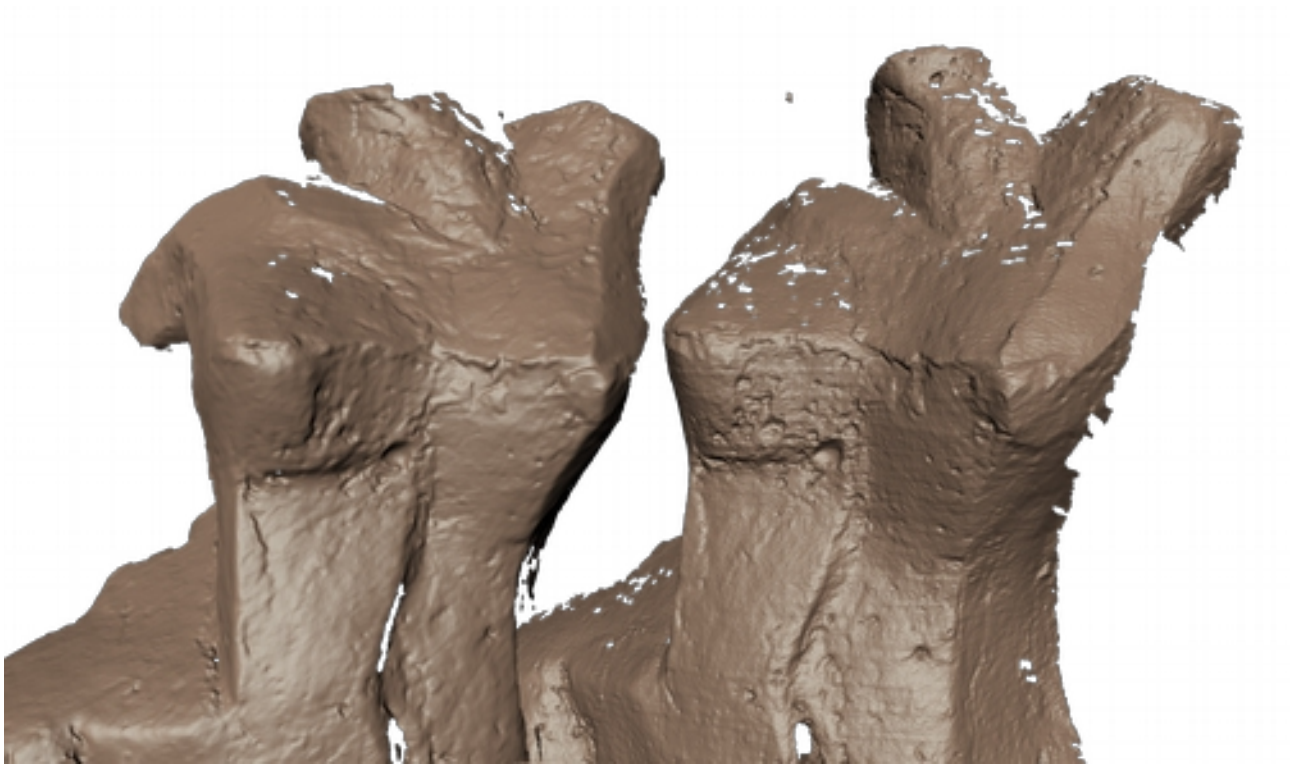
III/ Installation & System requirements

Can only be installed on PCs running Windows 7 64bits. The beta version should run on other Windows systems, although not tested. The control PC may have low system requirements as it will only be sending images and controlling devices during shooting, which implies a low computing charge. However, processing the images obtained from AutoScan3D (copied from the camera memory card) through David Laserscanner requires a computer with high computing power.

IV/ Results driven from first beta version, v0.1.

The comparison below shows the huge difference in precision obtained when scanning with AutoScan3D (right), and without AutoScan3D (left).

On the left, the image has been captured in real time through the Canon 5D2 lifeview, while on the right the image has been computed in non-real time using RAW (6Mpx) files with 3000x2000 pixels resolution. The right image bears a bit more noise, due to the testing conditions used for the beta version, and this inconvenience will be corrected in subsequent tests.



V/ Price and Availability

All tasks of designing, developing, encoding, testing, debugging, French documentation writing and Internet marketing are carried out by myself, which implies that you cannot expect the technical and commercial support of a major company. However, I will do my best to answer your queries and concerns. Being a very small organization may lead to drastic decisions like providing no upgrade from the single camera to multiple camera version. This means that you will need to purchase a new multiple camera license when realizing your needs were misevaluated. No version will be provided for Mac or Linux or Android, and no support for Nikon cameras will be developed. Upgrades will be planned as tests and debugging phases will be carried out.

On the basis of test results, the software beta version should be available sometime in July 2014 (date is provided for information only).

AutoScan3D beta version will cost 99€ for the single camera version, and 249€ for the multiple camera version.

The software requires good handling and understanding of David Laserscanner "Image grabber" mode. Beginners should get experience with DLS prior to using it. As a beta version, the software should not be used for critical productions. It is provided AS IS and cannot be held liable for any data or commercial loss.

No issuing date, no adaptation, and no final price have been set for version 1.0 at this point.

VI/ TODO list

- Bug resolution.
- Creation of a friendly user interface.
- Development of a new function for automatic copy and renaming of files when transferred from the camera memory card into the PC.
- Tests on other Windows systems, and with other Canon DSLR cameras.
- Improvement of the multiple camera version with control of each single camera through display of every selected camera lifeview.