The Promise of Low Cost 3D Laser Scanners

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Introduction:

Three-dimensional laser scanning effectively visualizes internal structures and is widely used in paleoanthropology and paleontology. This technology has been restricted by high equipment costs. Using the NextEngine Model 2020i Desktop Laser Scanner, a radically lower cost ($2.3K) laser scanner was introduced to the market. This study was to evaluate the potential of this scanner for palaeontological research.

System Description:

NextEngine Model 2020i Desktop 3D Scanner

Pros:
- USB 2.0 Hub
- Windows 3GHzPC 4 GB RAM 256 MB Graphics Power
- Easy to use and learn
- Good support
- Adjustments features when reading is not available

Cons:
- No adjustment for small or large topographically complex specimens
- Auto alignment can only be used with specimens that fit in horizontal planes (all scans must fall within the same horizontal plane)
- Bar code and stage length can not be measured at all horizontal scans
- Scan rate reduced with small or thin specimens
- Measurement functions external packages need prior linear alignment of the length of the specimen

System Description:

NextEngine Model 2020i Desktop 3D Scanner

Specimen distance from scanner 16.5 cm

Small field size (13.0 x 9.7 cm)

Highlight and cut to eliminate areas outside

“Macro” mode

Jepsen

Skull, length ~26 cm

Objects larger than the field can be scanned, but need to be composite captured and merged

Other exit features include: Buff (smoothes data to reduce error rate), Measure functions minimal (includes point to point and circumference), Trim feature extends all the way through the model, and Auto alignment based on your own calibration and stage

Accuracies

- Laser Design Inc. Surveyor Robot Pertector (160 x 160 x 160 mm)
- NextEngine市场化 their Desktop Scanner as having a maximal accuracy and resolution of 0.127 mm ("fine" scan mode)
- More accurate data was performed on a certified scale bar (100 x 10 x 1 mm)
- Less accurate data was performed on standard objects (no calibration)

Scan time about 3 minutes per view in highest resolution

ScanStudio, exported to Geomagic Studio to transfer the scanned mesh into a solid

The scale bar was coated with ammonium chloride and scanned at ten different orientations that were aligned to form a solid

Validation Methods:

Comparisons of NextEngine and Laser Design Inc. scan of USNM 511004 humerus

Cons:
- Great support
- Easy to use and learn
- Very inexpensive
- Most accurate (manufacturer estimates 0.127 mm with a maximum ~16 points per mm)
- Less accurate (manufacture estimates 0.38 mm with a maximum ~6 points per mm)
- Both models were processed in the proprietary software, imported to Photoshop, flattened, then the contact mesh was used to a solid

Alignment and Registration Features:

- Place beads and attach scans for composite models

Photographic surface capture ("Texture Pass")

Camera takes a picture that is saved as a 2D .jpg file (the color scanner)

Color ("texture") scanner

Great supports color and texture

Color makes the alignment of any turntable position must be user defined. This can be achieved in several ways (picture below). Then color to lineable precisely on an object in the area that you can draw landmarks.

Selected Edit Features:

- Models can be trimmed and smoothed
- Models can be moved in space
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