3D modeling of paleolithic tools

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The use of 3D models for registration and restoration is relatively widespread in recent prehistoric studies but it concerns mainly fossil Hominids. However, paleo-environment and in particular stone tools carry very important data for knowledge of the cultural evolution through the changing of lithic technology. We propose in this paper to study the feasibility of 3D modelling paleolithic tools. Such models are not only useful for archiving purposes but also for developing new applications as automatic indexing, or automatic refitting, that are currently studied in the frame of the FOVEA project (Virtual Excavation of Paleo-Anthropological Environment).

First, we set-up a state-of-the-art of available 3D acquisition devices. Two casts of paleolithic tools, one chopper and one chopping tool excavated at Terra Amata, Nice, France and estimated to around 300,000 years, were selected by a palaeontology expert. We tested 4 different non-contact 3D acquisition devices on this set of reference data: stereoscopic cameras, CT-scanner and two 3D laser scanners (Cyberware and Minolta systems). The resulted 3D models were converted in a common format and aligned in the same position by an automatic registration algorithm. It was then possible to compare qualitatively and quantitatively their resolution and accuracy.

Then, we tested the possibility to acquire 3D models of lithic tools in-situ, during the excavation campaign. We selected a portable non-contact 3D laser scanner (Minolta system) to execute the 3D modeling in a paleolithic excavation: the cave of Arago in Tautavel, France (450,000 years B.C.). We performed 3D acquisitions of three important elements: first the cleaned artifacts after digging up, second the casts of the archeo- stratigraphic layers in order to replace the artifacts in their archeological context and third different shoots of a survey sector during a one-day excavation.

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