Abstract

The La Brea Tar Pits and Museum in the middle of Los Angeles, California is a paleontological marvel containing numerous fossil-rich asphalt deposits. Until very recently, the museum only recorded their findings in non-spatial databases. As a continuation of work completed by a former USC Geographic Information Science and Technology student to develop spatial databases documenting artifacts for the museum, the main objective of this thesis project was to create a methodology for visualizing fossils as high-resolution 3D objects on a 3D map in their pre-excavation, *in-situ* locations. Museum scientists selected nineteen fossils from one asphalt deposit for mapping. The fossils were laser scanned by museum scientists, and the resulting 3D objects were provided for this project with accompanying locality data gathered in the manner of a traditional paleontological dig. The data required extensive processing prior to importing the 3D objects into a GIS, including image file conversion, location and orientation diagramming and steps for coordinate transformation from paleontological location measurements to real-world, geographic coordinates. The 3D objects were then imported and manually positioned in a 3D GIS map beneath the earth's surface. The resulting 3D model provides an interactive, GIS-enabled visualization of the nineteen fossils in their original locations and orientations prior to excavation. It is intended that this project support future research efforts of the museum scientists in spatial analysis and modeling of fossils and substrate (tar pits), ultimately to improve our understanding of Ice Age animals and the environments in which they lived and died. In addition, the results of this project serve as an example application of 3D GIS capabilities that can support forensic archaeology, an important tool in intelligence and criminal investigations. Lastly, it is anticipated that the georeferenced 3D objects, as well as this 3D fossil visualization, may become part of an interactive museum exhibit in the future.