3D model

The interactive and intuitive nature of 3D and AR models has the potential to significantly improve the teaching and presentation of radiologic anatomy and pathology to medical students audience [1).

Photogrammetry is a technique used to create 3D models or maps of objects and environments by analyzing photographs or images of them. The process involves using specialized software to analyze the visual data captured by the photographs and extrapolating accurate measurements and spatial information from them.

Photogrammetry can be used in a variety of fields, including archaeology, architecture, engineering, geology, and surveying. It is commonly used in the creation of digital maps and terrain models, as well as in the documentation and preservation of cultural heritage sites and artifacts.

The process of photogrammetry typically involves taking multiple photographs of an object or environment from different angles and distances. These photographs are then processed using specialized software that analyzes the images and creates a 3D model or map. The resulting model or map can be further refined and edited to produce highly accurate representations of the original object or environment.

One advantage of photogrammetry is that it can be done using relatively inexpensive equipment such as consumer-grade cameras or drones. This makes it accessible to a wider range of individuals and organizations than more traditional surveying and mapping techniques.

Overall, photogrammetry is a powerful tool for creating accurate 3D models and maps, and it is increasingly being used in a variety of fields to document, analyze, and preserve the physical world.

A 3D model was reconstructed and printed based on patient-specific magnetic resonance images. The fused deposition of polyactic acid (PLA) filament and selective laser sintering of polyamid were used for 3D printing. Silicone and SEBS materials were employed to mimic soft tissues. A neuronavigation protocol was performed on the 3D-printed models scaled to three different sizes, 100%, 50%, and 25% of the original dimensions. A neurosurgery team (17 individuals) evaluated the phantom realism as “very good” and “perfect” in 49% and 31% of the cases, respectively, and rated phantom utility as “very good” and “perfect” in 61% and 32% of the cases, respectively. Models in original size (100%) and scaled to 50% provided a quantitative and realistic visual analysis of the patient's cortical anatomy without distortion. However, reduction to one quarter of the original size (25%) hindered visualization of surface details and identification of anatomical landmarks.

A patient-specific phantom was developed with anatomically and spatially accurate shapes, that can be used as an alternative for surgical planning. Printed models scaled to sizes that avoided quality loss might save time and reduce medical training costs [2).

Two patients with cranial defects were presented to describe the 3D printing technique for cranial reconstruction. A digital prosthesis model is designed and manufactured with the aid of a 3D computed tomography. Both the data of large sized cranial defects and the prosthesis are transferred to a 3D printer to obtain a physical model in poly-lactic acid which is then used in a laboratory to cast the final customised prosthesis in polymethyl methacrylate (PMMA).

A precise compliance of the prosthesis to the osseous defect was achieved. At the 6 month postoperative follow-up no complications were observed i.e. rejection, toxicity, local or systemic infection, and the aesthetic change was very significant and satisfactory. Customized 3D PMMA prosthesis offers cost advantages, a great aesthetic result, reduced operating time and good biocompatibility [3].

1)
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