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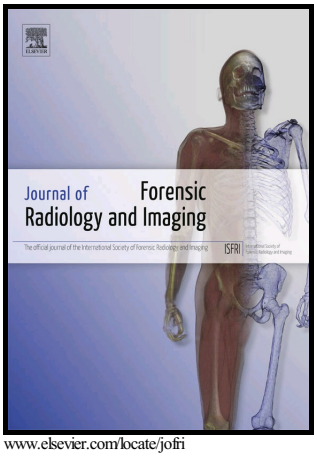

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PII: S2212-4780(16)30022-3
DOI: http://dx.doi.org/10.1016/j.jofri.2016.06.001
Reference: JOFRI218

To appear in: *Journal of Forensic Radiology and Imaging*

Received date: 31 March 2016
Revised date: 3 June 2016
Accepted date: 9 June 2016

Cite this article as: M Teistler, G Ampanozi, W Schweitzer, P. Flach, MJ Thali and LC Ebert, Use of a low-cost three-dimensional gaming controller for forensi reconstruction of CT images, *Journal of Forensic Radiology and Imaging* http://dx.doi.org/10.1016/j.jofri.2016.06.001

Use of a low-cost three-dimensional gaming controller for forensic reconstruction of CT images

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Abstract

We present an approach that utilizes a 3D game controller as an input device in combination with a 3D/2D display technique to provide a more intuitive and efficient user interaction for PMCT visualization. An inexpensive off-the-shelf game controller was used as an input device that provides six degrees-of-freedom to create oblique image reconstructions and control a volume-rendering view. Two specific examples are described in which the system was valuable in presenting the critical pathology.

Keywords: Virtopsy, forensic radiology, input devices, reconstruction, volume rendering, 3D user interface

Introduction

Virtual autopsy methods are increasingly important in medicolegal examinations, as indicated by the increased research output in this field in the past years[1].

Postmortem computed tomography (PMCT) is a recent tool that is routinely used in forensic medical investigations. CT imaging generates vast amounts of data[2]. Full-body scans with high spatial resolution are performed routinely in forensic radiology, and these scans result in several thousand images that must be visualized, read and analyzed [3].

It is important to extract relevant findings from these datasets for final reports in a time-efficient manner. The target audience includes physicians and medical laypersons, such as police officers, state attorneys, judges and lawyers. Therefore, a proper visualization should both display the finding itself and allow the user to picture the finding precisely in its correlating spatial position within the body. This positioning is especially important because relevant findings are often oblique to standard display axes and require angulation of the imaging plane. An understanding of these images requires anatomical knowledge or an easily understood anatomical reference. Three-dimensional (3D) display methods, such as volumetric renderings, aid in the understanding of 3D structures, e.g., fracture patterns. Volumetric rendering techniques provide clear advantages for demonstrations of injuries to medical laypersons. A survey of the format preferences among state attorneys in Switzerland revealed that volumetric reconstructions were favored over any plane of cross-sectional images or oblique CT slices[4]. The creation of adequate 3D reconstructions may be challenging, and this process requires training. Appropriate transfer functions must be defined, and volumes must often be cut using oblique cutting planes to visualize pathologies or other relevant findings. Traditional 2D input devices, such as computer mice, are unintuitive when it comes to the handling of 3D data,