Feasibility study of a computer-assisted radioguided surgery system

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Abstract

This paper deals with the study of a system prototype that can be used as an auxiliary tool in radioguided surgery methods. The use of new technologies in radioguided surgery concern the exact positioning of the lesion to be exerted. This is possible, in operation theatre, thanks to portable scintigraphics devices or to radiation counters. Due to lack of a coordinate system in the operation field, it is difficult for the surgeon to localize the pathology after removing the detection instrument. The system proposed in this paper is composed mainly of three elements: a handheld, high-resolution gamma camera with a small Field Of View (FOV) based on Hamamatsu R8900-00-C12 Position Sensitive Photomultiplier Tube (PSPMT), a laser scanner for the reconstruction of the body district and a stereoscopic system for contactless surgical tool tracking. Analyzing a set of scintigraphic images, taken from different projections, it is possible to localize the three-dimensional position of the lesion. Thanks to the use of the scanner and image fusion techniques, the pathology is shown on a PC monitor correctly positioned with respect to the body surface. Using a couple of stereoscopic cameras, the surgical tool can be tracked and shown on the same monitor, so that the surgeon can know the instantaneous relative position between the tool and the pathology. Exploiting these systems, a navigation system prototype has been developed that is suitable for radioguided surgical application.

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PACS: 87.58.Xs; 29.40.Mc; 85.60.Ha

Keywords: Gamma Ray Imager; Scintillation Detector; Position Sensitive Photomultiplier Tube; Portable Gamma Camera