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abstract={This work presents a mixed reality environment for orthopaedic interventions that provides a 3D overlay of Cone-beam CT images, surgical site, and real-time tool tracking. The system uses an RGBD camera attached to the detector plane of a mobile C-arm, which is a typical device to acquire X-Ray images during surgery. Calibration of the two devices is done by acquiring simultaneous CBCT and RGBD scans of a calibration phantom and computing the rigid transformation between them. The markerless tracking of the surgical tool is computed in the RGBD view using real-time segmentation and Simultaneous Localization And Mapping. The RGBD view is then overlaid to the CBCT data with real-time point clouds of the surgical site. This visualization provides multiple desired views of the medical data, surgical site, and the tracking of surgical tools, which could be used to provide intuitive visualization for orthopedic procedures to place instrumentation and to assist surgeons with their localization and coordination. Our proposed opto-X-ray system can lead to x-ray radiation dose reduction as well as improved safety in minimally invasive orthopaedic procedures.},   
keywords={augmented reality;biomedical optical imaging;cameras;computerised tomography;data visualisation;image segmentation;medical image processing;orthopaedics;phantoms;surgery;CBCT data;RGBD camera;RGBD view;X-Ray images;X-ray radiation dose reduction;calibration phantom;cone-beam CT images;detector plane;minimally invasive orthopaedic procedures;mixed reality environment;mixed reality support;optoX-ray system;orthopaedic interventions;orthopaedic surgery;real-time point clouds;real-time segmentation;real-time tool tracking;rigid transformation;simultaneous-localization-and-mapping;surgical tool;Cameras;Surgery;Three-dimensional displays;Tools;Trajectory;Virtual reality;X-ray imaging;Cone-Beam CT;Intra-operative;Mixed Reality;Multi-modal Visualization;Range Imaging;Tracking},   
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**Bibliography**

Fluoroscopic imaging allows orthopedic surgeons to perform procedures in a less invasive manner compared to direct visualization of osseous structures. This results in less blood loss, reduced collateral tissue damage, and in some cases shorter operative times.

This paper presents a mixed reality support system that incorporates multimodal data fusion via a one-time calibration, and marker less surgical tool tracking by model-based RGBD SLAM. This paper also presents a mixed reality environment for orthopedic interventions. The intervention provides a 3D overlay of Cone-beam CT images, surgical site, and real-time tool tracking. The system uses an RGBD camera attached to the detector plane of a mobile, which is a typical device to acquire X-Ray images during surgery.

A Calibration of the two devices is performed. This is done by acquiring simultaneous CBCT and RGBD scans of a calibration phantom and computing the rigid transformation between them. The marker less tracking of the surgical tool is computed in the RGBD view using real-time segmentation and Simultaneous Localization and Mapping. A proposal that has been made can opto-X-ray system can lead to x-ray radiation dose reduction as well as improved safety in minimally invasive orthopedic procedures.

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* <http://ieeexplore.ieee.org.libproxy.uml.edu/stamp/stamp.jsp?arnumber=8088484>
* UML Library guides

"This is entirely my own work, except as disclosed in the documentation. I gave help to the following persons:  
None  
Signed Kiran C Shettar"