Section: **Intraoperative Bildgebung**

ID: 150

Abstract-Title:
INTRAOPERATIVE 3D IMAGING WITH A MOBILE C-ARM WITH FLAT PANEL DETECTORINTRAOPERATIVE 3D BILDGEBUNG MITTELS MOBILEM C-BOGEN MIT FLACHBILDDETEKTOR

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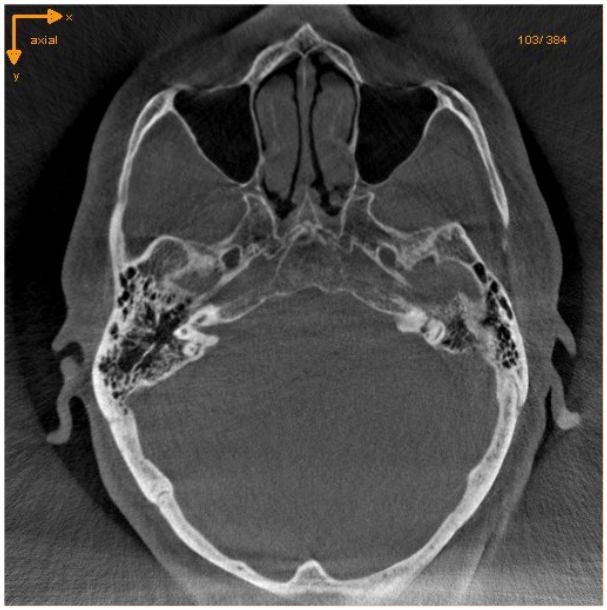
Abstract-Text:
Purpose
Intraoperative 3D imaging with mobile C-arms has been introduced successfully in surgical orthopedics and traumatology. Because of system properties the applications were confined to the reconstruction of high contrast objects like bones, this is mainly due to the limited dynamic range of the image intensifier. The availability of flat panel detectors with high dynamic range in combination with improved reconstruction algorithms and calibration procedures has improved image quality significantly. Even imaging of low contrast objects as organs seems to be possible. It is expected that this will open up new applications in different clinical fields. Technical improvements and current clinical results will be presented and discussed.
Method
The mobile C-arm prototype is based on a commercial isocentric C-arm device (Powermobil®, Siemens). The C-arm prototype is driven motor controlled in orbital direction and equipped with an advanced 40x30 cm2 flat panel detector (FD) with a dynamic range of up to 17 bit (PaxScan® 4030CB, Varian). The 3D reconstruction is based on a filtered backprojection and results in a reconstruction volume of about 20x20x15 cm3 with an isotropic voxelsize of approximately (0.4 mm)3. The reconstructed 3D data set requires the acquisition of up to 400 projection images covering at least 180 degree. The soft tissue reconstruction requires sophisticated calibration procedures and image processing algorithms. Fundamental tests on image quality, system properties, and dose have carried out extensively in phantom, animal, and cadaver studies. Recently a multi centric study on living humans covering different clinical disciplines has been started to investigate the C-arm prototype. Results
In phantom studies a spatial resolution of approximately 0.3 mm could be achieved. The contrast resolution is measured as 5 Hounsfield Units (HU) for a head phantom and 20 HU for an abdominal phantom. In the first clinical evaluation on living humans the system capability could be demonstrated successfully. Soft tissues, organ boundaries, and even pathological tissue could be very well reconstructed and recognized. Clinical results will be presented and possible fields of applications discussed. Conclusion
The current extension of the 3D C-arm imaging towards low contrast reconstruction facilitates new applications in supporting surgical or interventional procedures. The impressive image quality, the mobility and flexibility of the system combined with an excellent patient accessibility may shift this system to the method of choice for intraoperative imaging. Even the surgical navigation may benefit from the intra-operative

3D C-arm imaging. Although the technical aspects and results are very promising broad future applications dependstrongly on the integration into the clinical workflow and the development of simple user interfaces. Fig1: Prototype of a mobile C-arm with flat panel detector
Fig2: 3D image quality example: high contrast objects (left)
Fig3: 3D image quality example: low contrast objects (right)

Bild 1/JPG

Bild 2/JPG



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