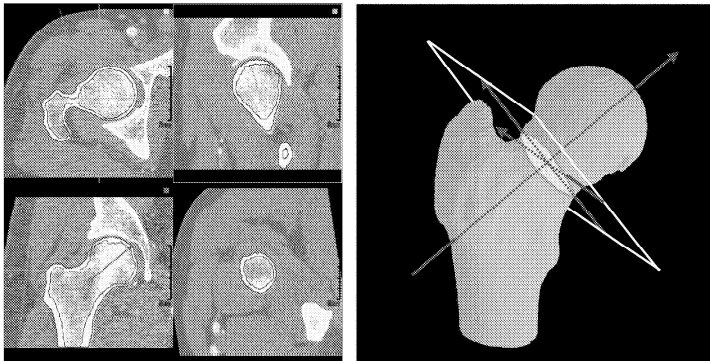


3D Quantitative Computed Tomography (QCT) of the Proximal Femur



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zur Erlangung der Doktorwürde
der Medizinischen Fakultät
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Yan Kang
aus Shenyang, V.R. China

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Dekan: Prof. Dr. Martin Röllinghoff

Referent: Prof. Dr. Willi A. Kalender
Institut für Medizinische Physik

Korreferent: Prof. Dr. Günther Greiner
Graphische Datenverarbeitung
PD. Dr. Klaus Engelke
Institut für Medizinische Physik

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Preface by the Editor

In view of the demographic changes and the increasing numbers of the older population osteoporosis is a disease of epidemiological dimension now already and of growing concern in the future. Osteoporotic hip fractures are of particular concern as they are associated with morbidity and mortality. Accordingly, there is a dire need for improved and reliable measurements of the bone mineral density and bone structure of the hip.

3D quantitative computed tomography (QCT) of the proximal femur constitutes a promising approach to solve these problems. While the measurement techniques are well established, the necessary analysis tools have to be developed yet to provide reproducible quantitative results.

Yan Kang has tackled the respective problems in his thesis project. The results which are presented in this report are of relevance potentially in two respects: 1. the approach and the solution for 3D segmentation and analysis and 2. the approach and the solution for the definition and establishment of evaluation parameters such as the definition of anatomy-oriented coordinate systems and anatomically defined volumes of interest. These approaches will be followed up at the IMP and hopefully will find acceptance in general.

Yan Kang's solutions for the 3D image segmentation and analysis problems have been submitted and accepted for publication meanwhile by peer reviewed international journals which is a further proof of the quality of this work. We hope that the full report presented here will provide additional valuable details and information.

Willi A. Kalender, Ph.D.

Editor

To my father (passed away), my mother, and my wife!

Abbreviations

ANOVA	Analysis of variance
AF	Adaptive filter
BMC	Bone Mineral Content
BMD	Bone Mineral Density
CSA	Cross-Sectional Area
CT	Computed Tomography
CV	Coefficient of variation
D	Dose
DXA	Dual-energy X-ray Absorptiometry
HBP	Head Border Plane
H. Dose	High Dose
ITU	Hounsfield Unit
IZ	Influence Zones
L. Dose	Low Dose
M. Dose	Middle Dose
MPR	MultiPlanar Reformations
MRI	Magnetic Resonance Imaging
NCS	Neck Coordinate System
PET	Positron Emission Tomography
pQCT	Peripheral Quantitative Computed Tomography
PSF	Point Spread Function
QCT	Quantitative Computed Tomography
QUS	Quantitative Ultrasound
R^2	Regression coefficient
RMS	Root-mean-square
ROI	Region of Interest
S	Effective slice thickness
SD	Standard Deviation
SE	Structuring Element
SSP	Slice Sensitivity Profile
SS_{res}	Residual Sum of Squares
SXA	Single-energy X-ray Absorptiometry
TBP	Trochanter Border Plane
VOI	Volume of Interest
WHO	World Health Organization
YN	Young Normal

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