

(Simulation)
CT

Broad-beam

The Broad-beam CT Image Reconstruction from Simulator Images

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Purpose : To generate the axial, coronal and sagittal images from conventional simulation images, as a preliminary study of broad-beam simulator CT

Methods and Materials : Volumetric filtered back-projection was performed using 90 sheets of films from conventional simulator for every 4° gantry angle. Two mAs exposure condition for 120kVp beam quality at SFD 140cm was given to each film. Outside the silhouette portion was removed and scatter component was deconvolved before back-projection.

Results : The axial, the sagittal and the coronal images with same spatial resolutions over all direction could be obtained. But image quality was very poor.

Conclusion : CT images could be obtained using broad-beam. Scatter deconvolution technique was effective for this reconstruction. The fact that same spatial resolutions over all direction tells us the possibility of application of this technique to DRR or Simulator-CT. But the quality of image should be improved for clinical application practically.

Key Words : Broad-beam CT, Cone beam CT, Simulator-CT, CT-Simulator, Simulation

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. CT
가 ,
, BEV(Beam's Eye
View), DRR(Digitally Reconstructed Radiograph)
가
1-4)
CT
CT
3-6)
, MRI CT가
1997 11 21 1998 2 18
1996
1997 XII International Conference on the
use of Computers in Radiation Therapy, Salt Lake City, USA
388-1

가 가 가 .
 . CT , MRI , collimation air gap, moving grid,
 CT scanning slit, rotating slit ,
 computer algorithm high-pass
 filtering, scatter deconvolution, subtraction
 .^{12, 13)}
 CT .
 CT Simulator-CT 가
 가 CT-Simulator (Virtual Simulation),⁸⁾ DRR⁵⁾ 가 1 narrow
 beam CT slit
 DRR CT Simulator-CT slice
 Simulator Simulator¹⁴⁾
 가 CT-Simulation Broad-beam Simulator-CT
^{8, 9)} , 1994 Cho¹⁵⁾
 CT Simulator-CT Engelbrecht¹⁶⁾가 Cone Beam CT
 . 1978 Harrison 가 X-
 Farmer¹⁰⁾가 가
 CT-Simulator Simulator-CT 가
 Simulator-CT CT 가 CT 가
 가 , CT-Simulator 가
 가 가 Broad-beam Simulator-CT
 Simulator-CT CT 가 Fan Beam Broad-beam CT
 Beam Broad-beam Cone Beam Film X-
 Broad-beam Filtered Back-Projection CT Simulator
 CT 가
¹¹⁾ narrow beam Simulator-CT Slit
 Slit 1.
 , Slit Broad-beam X
 Slit (Ximatron, Varian,) , 45
 가 x 45cm², 120kVp . SFD
 CT X 140cm 4° 90
 . Phantom Humanoid Phantom

PC

2.

1mm X

Film . Broad-beam

PSF(Point Spread Function)
Deconvolution . PSF 가

가 가

PSF¹⁷⁾

$$h(r) = k_1 (1 - \dots) \{ \dots(r) \text{ over } \{r\} + k_2 \{ \dots \text{ over } \{r\} \} \exp$$

$$\text{LEFT} [-0.5(\{r\} \text{ over } \{c\}) \text{ RIGHT}] \dots (1)$$

. k_1, k_2

M(r) U(r)

$$h(r) \dots^{18)}$$

$$M(r) = \text{INT}_{-0}^{0} \{ \dots \} \text{INT}_{-0}^{0} \{ \dots \} U(v) h(r-v) v dv d \theta$$

.....(2)

Deconvolution

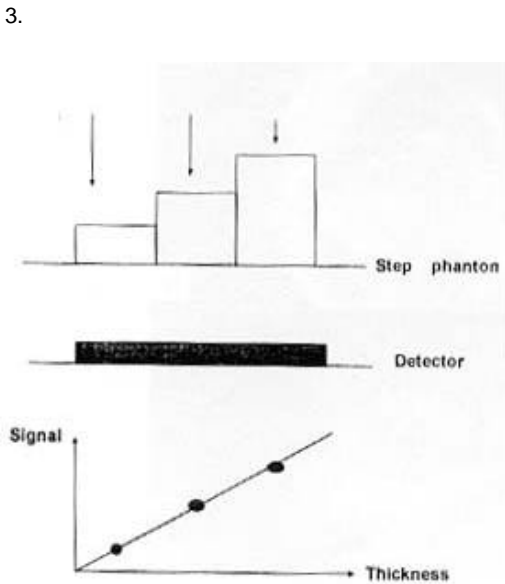
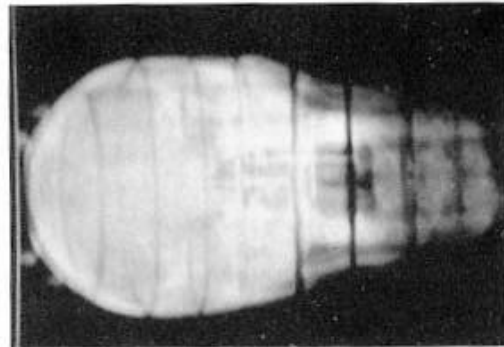
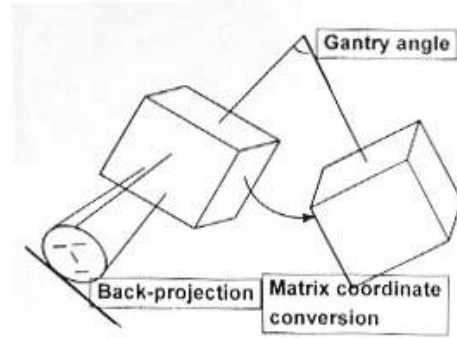
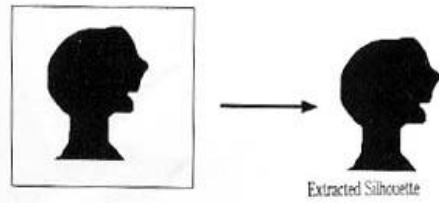


Fig. 1

- ① (Fig. 1)
- ② (Fig. 2)
- ③ Filtered Back-Projection (Fig. 3)



Filtered Back-Projection

Ramlak Filter

Fig. 4

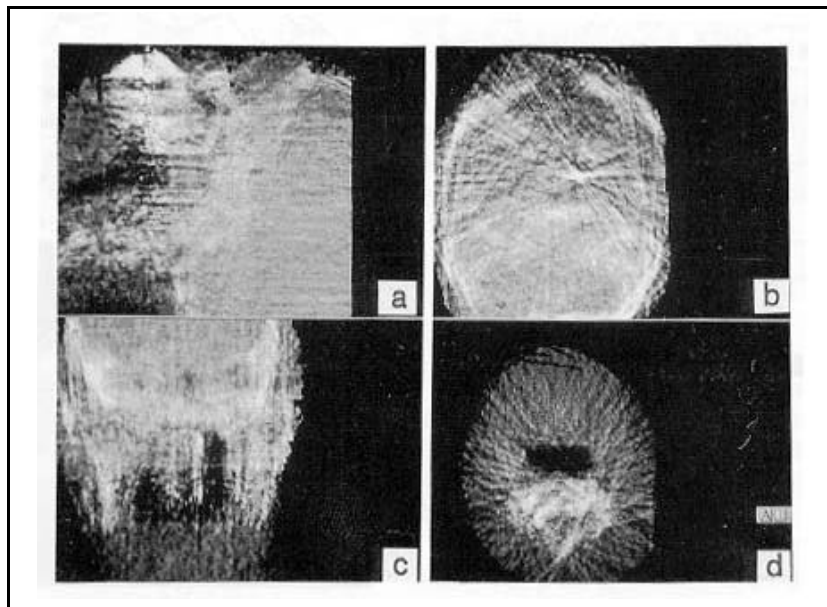
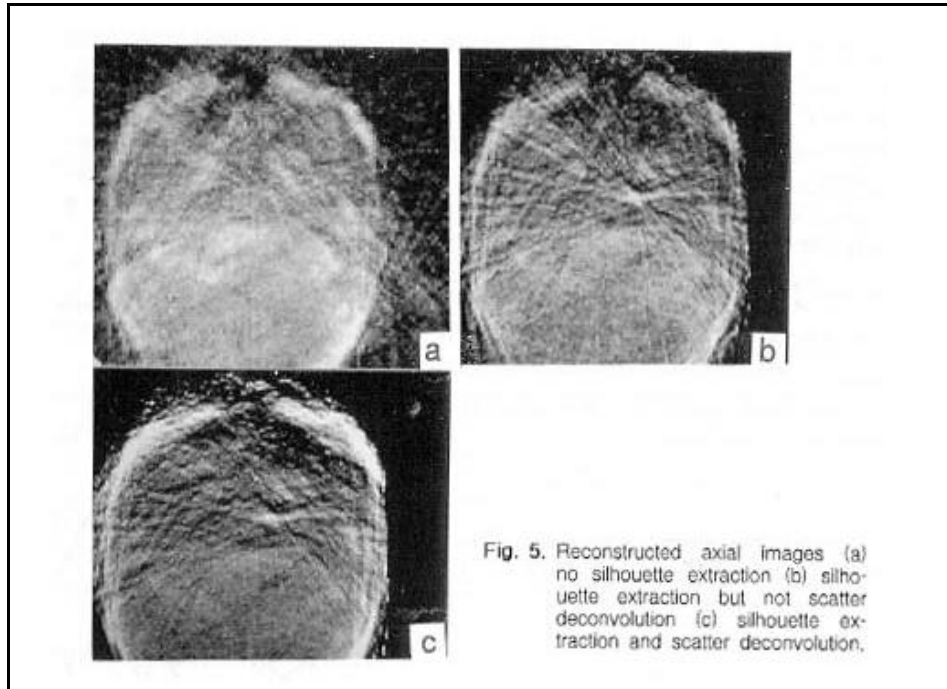


Fig. 6. Reconstructed axial, sagittal, coronal images.

Fig. 5 (a) Fig. 2 (b) (c) Artifact (b) (c) (a) DRR CT Scan width Back projection Reconstruction Simulator-CT 가 (Simulation-CT DRR 가 Fig. 5 Fig. 6 Simulation-CT 가 90 60 가 Cho 15) 가 Broad-beam CT Simulator-CT 가 DRR 가

- Film 가 가
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(Simulation)

Broad-beam CT

: Broad-beam Simulator-CT

: 120kVp, 2mAs

4° 90

Filtered back-projection

Deconvolution

:

: Broad-beam CT

Deconvolution

back-projection

DRR Simulator-CT