Slide 1_X-ray imaging overview Radiography & Mammography:

X-ray imaging page 2

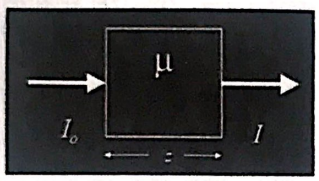
History of X-ray page 4

What is X-ray and X-ray tube? page 6

Attenuation Coefficient page 7

$I = I_o e^{(-\mu z)}$

Page 8. Indirect exposure vs direct exposure



X-ray tube vs X-ray cone

Advantage and disadvantage of Computed Digital radiography ảnh digital
+ No maintenance of chemical use & dark room & storage space of films
+ Image processing capability
- Spatial resolution is a bit lower than analog film
- Contrast resolution is better than analog film

Dynamic Range (Analog Film) page 10
Evaluate the film characteristic curve?

Dynamic Range (Digital Detector) page 11
Digital Detector Characteristic Curve

Radiography (Rad) page 12
What is Radiography?

Profile of General Radiography? page 15
What *Procedure, Reimb, Diseases, Challenges* for Spine/head/neck/abdominal/thoracic/extremities and hip?

Radiography is used for? page 16
Radiation Dose in X-Ray exams page 18
What Effective radiation dose and comparable to natural background radiation for? liều cao, liều thấp
nồng độ radiation

Advanced Applications of X-ray page 19
Dual Energy (two technologies, bone or soft-tissue images may be obtained...) / dose page 20
Single exposure bone. low energy; mô mềm high energy page 21
Dual exposure page 22
Auto Image Paste page 23
Computer Aided Detectioni (CAD) page 24
Clinical Performace Terms page 27 – page 31
What is the percentage/the formula for estimating the Sensitivity, Specificity, positive/negative predictive value, accuracy?
What is P-value?

Dual energy → subtract để lấy high energy và low energy

Sensitivity vs specificity: bài toán đánh giá binary classificat° estimat° /25 [Recall trên category (−) [Ứng dụng

Sensitivity = $\frac{TP}{TP+FN}$

Specificity = $\frac{TN}{TN+PF}$

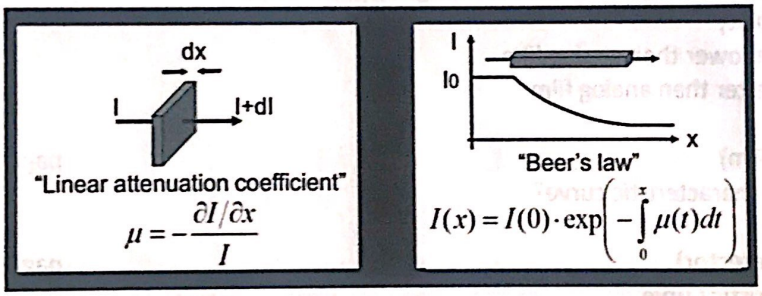
Radon transform

Temporal Subtraction (highlight change between previous and current, potential applications) page 34
RAD Tomosynthesis (Goal, Acquisition,...) source chay , L dứng yên page 35
Radiography and Fluoroscopy (R&F) page 37 – 38
How many types of geometry? What is the major application? What substance is used?
Mammography
What is breast cancer? page 41
How many breast cancer types? page 41
Breast cancer statistics in 2013 page 43
Breast imaging modalities page 45
What is mammography? Most common technology in mm? New technology? page 46
History + Sign of breast cancers page 47-48
How to procedure performed? page 49
Digital Breast Tomosynthesis (DBT) page 50
SOTA of DBT reconstruction (advantage) page 53

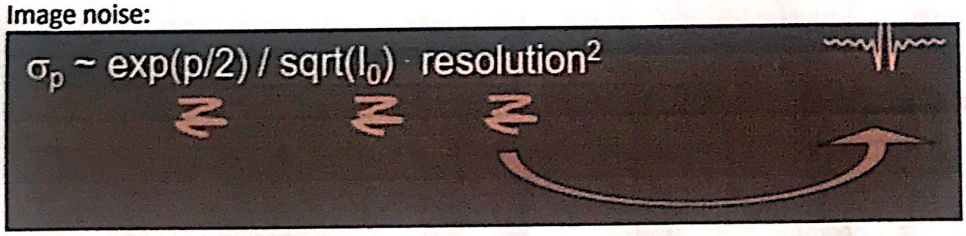
Slide 2_X-Ray CT Fundamentals 2021-2022:

- CT: Computed Tomography
- CAT: Computerized Axial Tomography
- CAT: Computer Assisted Tomography

Beer's law page 9

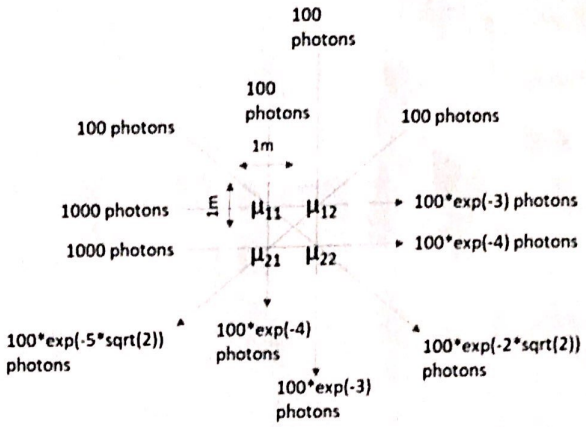


Sinogram page 11
Filtered Backprojection page 16 – 17
Why iterative reconstruction? page 21
What is CT system and component, X-ray tube? page 28 – 29
Spatial resolution (How to increase spatial resolution by; Uniform spatial resolution; Boost page 35
Spatial resolution and reduce allasing artifacts by?
Temporal resolution (cardiac CT) page 36
Image noise: page 38



Slow-gantry cardiac CT page 43
Multi-tube multi-detector CT (Benefit, challenges,...) page 46
Multi-source inverse-geometry CT (X-ray source, detector, recon&cal) page 48
Spectral CT ; Dual kVp CT page 53

Calculez les coefficients d'atténuation de l'objet dans l'exemple ci-dessous.



On utilise la formule:
I = Io*exp(-Integrale(mu*dx)) (Calculer la surface)
100*exp(-3) = 100 exp(-(mu_11*1 + mu_12*1'))
=> mu_11 + mu_12 = 3

En pareil avec les autres dimension:
mu_11 + mu_21 = 4
mu_21 + mu_22 = 4
mu_12 + mu_22 = 3
=> mu_11=1; mu_22=1; mu_12=2; mu_21=3

Stereo Vision Algorithms
- Definition of stereo vision page 4
- Disparity and depth page 12
- Stereo vision system page 20
  - calibration (offline) /21
  - rectification /25
  - Stereo correspondence / 26
  - triangulation / 27
  - + Problem page 42
  - + Naive approach page 46-47
  - + Fixed window page 55-59

1. les systèmes d'imagerie analogiques ont une meilleure résolution spatiale que les systèmes numériques:
Vrai / 9 bcs: résolution mesure en pixel → résolut° dans les détecteurs numérique est limitée par la taille de pixel, dans l'analog → pas notion de pixel, le film est continue / depend on pixel size & pixel depth

2. contrast resolution images analogiques > numérique Faux
Intensity transfer function of analogs is curve ⇒ trade of for short dynamic
└ digital is linear ⇒

3 les détecteurs numérique image ont une réponse linéaire → vé hùs