



SNS COLLEGE OF ALLIED HEALTH SCIENCES
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DEPARTMENT OF RADIOGRAPHY AND IMAGING TECHNOLOGY

I YEAR

TOPIC – CT PRINCIPLE & GENERATION



INTRODUCTION



- Computed Tomography is a special form of tomography in which computer is used to make mathematical reconstruction of tomographic plane.
- CT Scanner was invented by Sir Godfrey N Hounsfield in 1970s and named as [CAT].
- First commercial machine was designed to study about head and later it was modified to scan any part of the body.



CT PRINCIPLE



- Internal structure of an object can be reconstructed from multiple projections of an object.
- X-ray tube emitting a fan beam from small focus is coupled to radiation detector and these two moved together on a carriage, so that the plane of interest is scanned.



GENERATION OF COMPUTED TOMOGRAPHY



FIRST GENERATION:

- Here the CT scanner is rotate / translate , pencil beam system.
- Also called EMI scanner . Because Godfrey N Hounsfield developed this scanner with help of company called Electrical and Musical Industries.
- The first generation of CT scanner was made up of only 2 detectors which are located on opposite side of patient from where X-ray tube was situated.
- **DRAWBACK** - It took about 4.5 min per scan



SECOND GENERATION:

- Here the CT scanner is rotate / translate system with narrow beam geometry.
- These scanners provide larger rotational increments and faster scans.
- Here scanning time is less than one minute.
- **DRAWBACK** - Scattering with an increased number of detectors introduced into the system to compensate wider X-ray beam. Then detectors were exposed to more scatter radiation which decreases resolution of images that were being produced.



THIRD GENERATION:

- Here the CT scanner is rotate / rotate systems with wide beam geometry.
- The number of detectors has increased substantially and the angle of fan beam is also increased to cover entire patient.
- The X-ray tube and detector array are mechanically joined and rotate together.
- Here scanning time is less than 0.5sec,
- **DRAWBACK** - Ring artifacts.



FOURTH GENERATION:

- Here the CT scanner is stationary/stationary system.
- The scanners are designed to overcome problem of ring artifacts it has stationary ring about 4800 detectors.
- X-ray tube has to move inside this detector. Since it is rotated continuously , very fast scan time is possible.



FIFTH GENERATION:

- Here the CT scanner is stationary / stationary system. No conventional X-ray tube is used , instead large arc of tungsten encircles the patient and lies directly opposite to detector.
- Since the detector is in the form of ring , it permits simultaneous acquisition of images
- Scan time about 50ms.
- Clinical Application - Cardiac tomography imaging , it captures images of beating heart with minimum motion artifact.



SIXTH GENERATION:

- Here the X-ray tube rotates continuously and the couch moves the patient through the plane of rotating beam.
- The sixth generation of CT scanner is the combination of third and fourth generation , slip ring technology and helical motion.
- The pitch influence radiation dose , image quality and scan time.
- **ADVANTAGE** : Less radiation dose to the patient and the scanning time is drastically reduced.



SEVENTH GENERATION:

- Here the CT Scanner is multi detector array with cone shaped X-ray beam.
- Combination of X-ray beam and panelled detector allows large number of slices to be acquired in a very short period of time.
- Clinical Application - Angiography, Virtual endoscopy.



THANK YOU

Dreams

is not what you see
in sleep

is the thing which
doesn't let you sleep

- A. P. J. Abdul Kalam

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