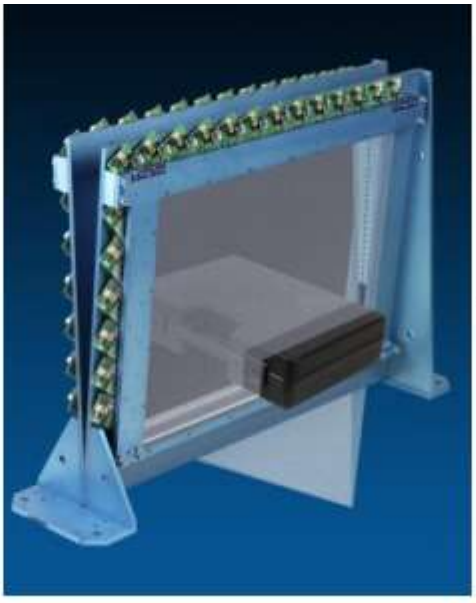
3D x-ray images

X-ray images are a convenient medium to look within objects. However the resultant images contain absorption information from all objects along the beam path between the x-ray generator and the detector. This concatenation of target depth to a single plane can lead to difficulty in understanding the nature of the target and the objects that lie within it. It may be useful to understand this original depth information and there are a number of x-ray imaging techniques available to reveal this. We will consider two such techniques for the purposes of the discussion here, stereoscopy and computer aided tomography.

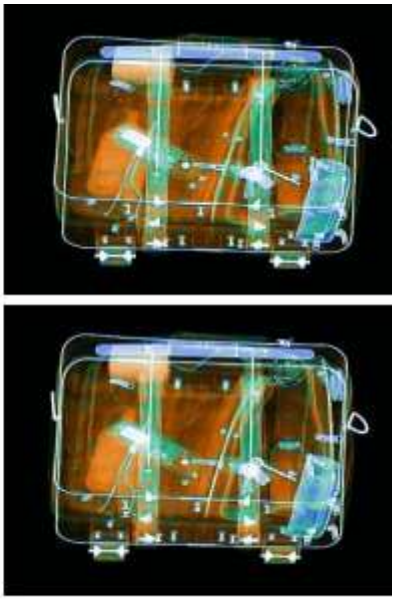
3D stereoscopic x-ray images

Stereoscopic pictures are produced in pairs with each member of the pair showing the same scene or object from a slightly different angle much in the same way as you view the real word with two eyes, each seeing a slightly different view of an object. If each eye of an observer is only shown one of the stereoscopic views then the brain interprets the differences in these views as depth or different distances to points and objects seen. Although an experienced observer of stereo pairs with training may be able to achieve the proper focus and convergence without special viewing equipment (e.g., a stereoscope), ordinarily some device is used that allows each eye to see only the appropriate picture of the pair. Typically, either different colours, polarizations or specialised projection systems are used to ensure that the observer sees only the correct image with the correct eye and hence get the full dramatic effect of 3D images.

Graphic of stereo x-ray camera



3D Stereoscopic x-ray camera



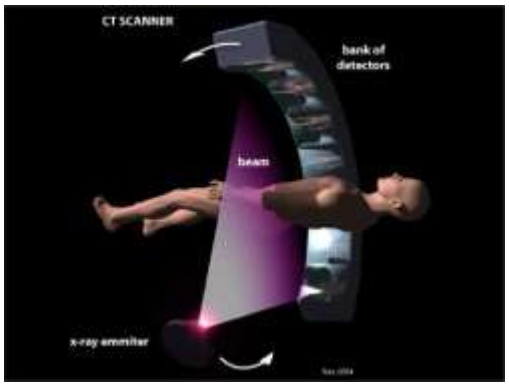
Stereoscopic pair of images

3D x-ray stereoscopic images can be created using a special camera which has a single x-ray generator and two x-ray detectors.

The stereoscopic pair of images are acquired at the same time and displayed on the monitor together with different polarizations. The images are viewed through spectacles with lenses of matched polarization which allow the observer to view real-time 3D images.

3D computed tomography (CT) x-ray images

Computed tomography (CT), originally known as computed axial tomography (CAT), was first developed for medical imaging and is now finding increasing uses within the industrial inspection field. It employs tomography (imaging by sections or sectioning) and uses digital processing to generate a 3D image of the internals of an object or person from a large series of two-dimensional x-ray images taken around a single axis of rotation. The word "tomography" is derived from the Greek tomos (slice) and graphia (describing).



CT produces a volume of data which can be manipulated, through a process known as windowing, in order to demonstrate various structures based on their ability to block the x-ray beam.

.In recent years CT imaging has been widely adopted in a range of industrial applications for inspection of large industrial components such as automobile engine blocks. Although this technique is relatively slow (10 minutes to acquire and process image data) the resultant images can be very powerful in the laboratory analysis of faults and failure mechanisms within products.