SIMULATION OF TRANSLATIONAL DATA ACQUISITION SCHEME AND DEVELOPMENT OF RECONSTRUCTION ALGORITHM IN NON-DESTRUCTIVE TESTING USING X-RAY TOMOGRAPHIC PRINCIPLES

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The applications of non–destructive testing using X-ray tomographic imaging technique [1] for inspecting objects on an industrial scale became known some few decades ago. Despite its effectiveness in the industrial arena in defect detection in small and medium objects using the conventional approach of Rotational X-ray Tomography Data Acquisition Scheme, where the object under inspection mounted on a rotational stage is placed between an X-ray source and a flat panel detector and an X-ray beam projected towards the object and rotated at a suitable angle after each projection until 360 degrees complete scan is achieved [2]. This conventional technique is abruptly limited to small and lighter objects since it is complicated and highly expensive to build a rotational stage to accommodate such huge structures which also requires sophisticated fittings to give an accurate and precise angle of rotation as small as 0.1 degrees [3]. Therefore, this work will focus much on Reconstructing Algorithms and implementing it into simulation data known as the Translational Tomographic Data Acquisition Scheme (Figure 1) [4]. The Translational technique takes into account the variations of magnification by changing the X-ray focal length distance and that of the detector panel to give different ray paths and beam angles with respect to the object under inspection [5]. Hence python programming software with necessary plugins were used in implementing the Reconstructive Algorithm and simulation aspect in modelling suitable images of inspected object.

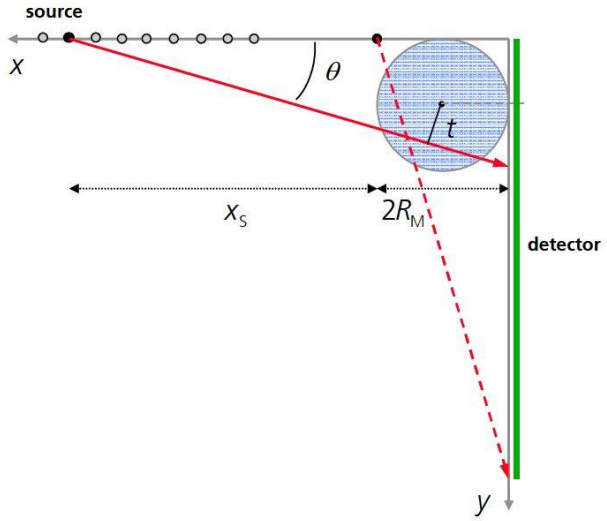

Fig. 1. Scheme for data acquisition with linear translation of the source only. The mechanical expense is much less compared to a rotational set-up. The detector (green vertical line) is fixed behind the object. The blue circle (radius RM) indicates the field of measurement (FoM), which encloses the cross-section of any object therein. As can be seen from the red arrows, the angle of the rays travelling through the object changes as the source is moved towards or away from the object

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