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Optimization of X-ray radiography

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X-ray radiography is a 2-D projection imaging technique that is extensively used for non-destructive investigation of objects. The investigation is performed on the radiographic image produced by a radiography scanning system of which parameters such as degree of collimation, spectrum tailoring and relative distances between source, object and detector can be adjusted. The aim is to arrange parameters in such a way that a radiograph is produced that optimises the qualities of a radiograph. This can be done experimentally by changing parameters until a desired image quality (such as say contrast or sharpness) is achieved. However this is a time consuming, labour intensive process and it is prone to human error. An X-ray radiography scan optimizer software was designed and implemented to provide Pareto optimal scanning parameters. The optimizer is based on ray tracing and particle swarm optimization techniques. The optimizer uses a computer model of an X-ray radiography system to automatically search for the best scanning parameters. The optimizer was successfully tested and benchmarked against experimental results. The test results showed that the optimizer software was able to provide a set of Pareto optimal solutions within which scanning parameters can be retrieved to optimize an X-ray radiography scan.

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