

INTISARI

PENGEMBANGAN METODE UJI KESESUAIAN RADIOGRAFI DIGITAL BERDASARKAN ANALISIS DISTORSI CITRA MENGGUNAKAN PHANTOM GEOMETRI

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Telah dilakukan penelitian pengembangan metode uji kesesuaian radiografi digital berdasarkan analisis distorsi citra menggunakan phantom geometri. Pelaksanaan penelitian ini didasarkan pada pentingnya kebutuhan *quality control* sistem radiografi digital dan keterbatasan dari alat uji kesesuaian saat ini yang belum mampu mengidentifikasi, serta mengukur variabel geometri fundamental seperti magnifikasi, *displacement*, dan distorsi bentuk. Metodologi penelitian ini mencakup pembuatan *tools* uji berupa phantom geometri berbentuk kubus dari bahan akrilik, segmentasi citra radiografi, dan analisis uji yang terdiri atas uji ketegaklurusan titik pusat sinar-X, uji kesesuaian lapangan penyinaran (*beam alignment*), uji magnifikasi, uji *displacement* dan uji kontras. Pengujian dilakukan pada tiga variasi *Focal Detector Distance (FDD)*, yaitu 500 mm, 600 mm, dan 700 mm. Hasil penelitian menunjukkan bahwa metode ini mampu mendeteksi penyimpangan geometri secara kuantitatif, dengan rentang sudut penyimpangan titik pusat sinar-X sebesar 0° – $0,284^{\circ}$, persentase penyimpangan *beam alignment* sebesar 1,286%–2,006%, magnifikasi sebesar 0,85%–50,55%, *displacement* sebesar 5,45%–54,05% dan analisis kontras menunjukkan peningkatan intensitas *gray level* seiring bertambahnya ketebalan titik uji.

Kata kunci: uji kesesuaian, radiografi digital, distorsi citra, phantom geometri.

ABSTRACT

DEVELOPMENT OF DIGITAL RADIOGRAPHY SUITABILITY TESTING METHODS BASED ON IMAGE DISTORTION ANALYSIS USING GEOMETRIC PHANTOMS

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Research has been conducted to develop a digital radiography conformity testing method based on image distortion analysis using a geometric phantom. This research is motivated by the critical need for quality control in digital radiography systems and the limitations of current conformity testing tools, which are unable to identify and measure fundamental geometric variables such as magnification, displacement, and shape distortion. The methodology involved the development of a testing tool in the form of a cube-shaped geometric phantom made of acrylic, segmentation of radiographic images, and testing analyses comprising X-ray beam alignment testing, beam alignment testing, magnification testing, displacement testing, and contrast testing. The testing was conducted using three variations of Focal Detector Distance (*FDD*): 500 mm, 600 mm, and 700 mm. The results demonstrate that this method is capable for detecting geometric deviations, with the angular deviation of the X-ray beam center ranging from 0° to 0.284° , beam alignment deviations ranging from 1.286% to 2.006%, magnification ranging from 0.85% to 50.55%, and displacement ranging from 5.45% to 54.05%. The contrast analysis revealed an increase in grey level intensity corresponding to the increasing thickness of the test points.

Keywords: conformity testing, digital radiography, image distortion, geometric phantom.