

技术及应用

三投影CT钢管截面的二值图像重建研究

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摘要 尺寸检测是保证钢管质量的重要环节, 相关在线快速检测技术是目前钢管生产中亟待解决的技术难题。射线CT成像技术作为一种高效图像检测手段, 能通过重建钢管截面图像获取钢管的大部分尺寸参数, 特别适合对钢管质量进行检测和控制。为减少检测时间, 实现钢管尺寸的在线检测和控制, 本工作研究采用多源多探测器的CT扫描方式, 实现了投影数据的快速获取, 并根据钢管截面空间域和像素域的特点, 对最大后验概率(MAP)图像重建算法进行了修正, 实现了不完全投影数据条件下截面图像的重建。模拟试验的结果表明, 修正后的MAP算法可做到最少3组投影下的钢管截面图像重建, 得到的尺寸精度基本满足国家标准的要求, 这一方法具有一定的理论和实际意义。

关键词 [钢管检测](#) [CT成像](#) [扫描方式](#) [不完全投影](#) [重建算法](#)

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Research on Binary CT Image Reconstruction of Steel Tube Section From Three Projections

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Abstract Fast online inspection technology is a difficult problem in the manufacture of steel tube. Radiographic CT imaging technology can reconstruct the image of steel tube section and acquire its most dimension parameters, which is quite appropriate for its inspection and quality control. A scan mode with immobile ray sources and detectors is proposed to reduce the inspection time. It can obtain projection data quickly and meet the need of online inspection. Maximum a posteriori (MAP) reconstruction algorithm is modified based on the space domain and pixel value domain characters of steel tube sections in order to reconstruct its image from few projections. The results of simulation experiment indicate that the modified MAP algorithm can reconstruct the image of steel tube section from at least three projections. The precision of acquired dimension parameter meets the requirement of national standard and the technology is expected to be widely used in practice.

Key words [steel tube inspection](#) [CT imaging](#) [scanning mode](#) [few projections](#) [reconstruction algorithm](#)

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