

工程与应用

## 工业虚拟内窥关键技术研究

卢艳平, 喻洪麟, 王 珏

重庆大学 光电技术及系统教育部重点实验室ICT研究中心, 重庆 400030

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**摘要** 工业内窥镜在工业产品内壁缺陷检查中具有诸多局限性, 但是利用工业CT对工业产品进行扫描获得数字化的体数据, 并采用虚拟内窥镜技术模拟工业内窥镜的检查过程, 则具有更大的灵活性。论文简要介绍了工业虚拟内窥镜的成像原理, 并重点阐述了工业虚拟内窥镜技术的关键技术: 内表面数据获取、虚拟镜头的运动控制、漫游轨迹生成等内容, 最后将工业虚拟内窥镜技术应用于实际的工业检查。实验对一个汽车引擎管道进行检查, 发现了其内壁的凹坑, 并获得了直径为2 mm的细管道的一系列内窥图像。工业虚拟内窥镜不仅可逼真地模拟工业内窥镜, 而且解决了工业内窥镜无法解决的难题, 并具有可重复性、更强的适应性等优点。

**关键词** [工业CT](#) [虚拟内窥](#) [内壁检查](#)

分类号

## Study on key techniques of industrial virtual endoscope

LU Yan-ping, YU Hong-lin, WANG Jue

ICT Research Center, Key Laboratory of Optoelectronic Technology and System of the Education Ministry of China, Chongqing University, Chongqing 400030, China

### Abstract

Industrial endoscopy has much limit in defect inspection for the wall of industrial product, but if utilize industrial CT to scan industrial product and obtain its digital volume data, and take use of the virtual endoscope to simulate the inspecting process of industrial endoscope, that has more flexibility. This paper briefly introduces the imaging theory of industrial virtual endoscopy, and focuses on the its key technologies such as obtaining the surface data of product's wall, controlling of virtual camera, building of navigation path, lighting and so on. The industrial virtual endoscopy has applied to the industrial practical inspecting, a concave has been found, and a series of endoscopic images for a  $\phi 2$  mm pipeline have been obtained. The results show that industrial virtual endoscopy has not only vividly imitate the industrial endoscope, but also resolve the problems that the industrial endoscopy can't deal with, and what's more, it had the advantages such as repeatability and more adaptability.

**Key words** [industrial computed tomography](#) [virtual endoscope](#) [wall inspection](#)

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通讯作者 卢艳平 [luyp\\_cqu@126.com](mailto:luyp_cqu@126.com)

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