Fraunhofer

IIS

DEFIBERIZER

IMAGE OPTIMIZATION FOR FIBER-OPTIC IMAGING SYSTEMS
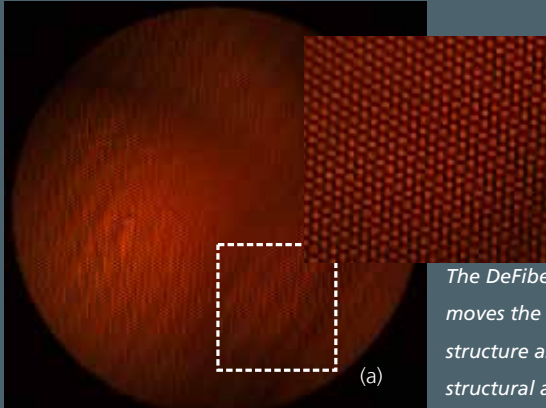
The DeFiberizer software removes the honeycomb structure as well as color and structural artifacts.

(a)

For direct visual examination of inaccessible body cavities, semirigid or flexible endoscopes (fiberscopes) are preferably used.
**Typical examples in a clinical environment are bronchoscopy, gastroscopy and neurosurgery and, in the technical area, inspection and maintenance of turbines and pipes.**

Challenge

Due to their flexible construction and miniaturization, the fiber-optic image conductors employed exhibit a honeycomb interference pattern (a) and poor brightness and color reproduction. These negative effects lower the image quality and, in conventional systems, are usually reduced through defocusing and adaptation of brightness and contrast.

Our Solution

To suppress the honeycomb pattern, all fiber centers in the fiber-optic image (a) are first registered in a calibration step. Direct access to the raw data from the color filter array in the camera enables optimized calculation of individual correction factors for color distribution within the various cells. Together with the information on local adjacency relationships, this forms the basis for subsequent interpolation. With the algorithms described, global shadowing effects and color artifacts can be visibly reduced (b). The software automatically adapts

(b)
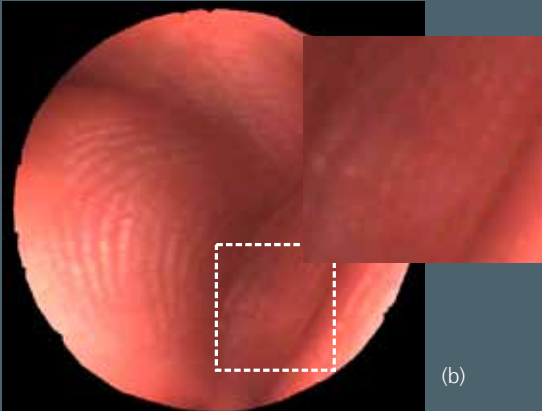
to most combinations of commonly used endoscopes and suitable digital camera modules. Operation from a PC platform additionally allows for acceleration via powerful graphics hardware. Adaption to prorietary or µC-based platforms possible.

Features

– Use of raw camera data to optimize color display
– Automatic parameterization
– Supports all camera and endoscope types

Specifications

Endoscope
Working diameter: 0.5 – 4 mm
No. of fibers: 3,000 – 30,000
Image conductor: fiber bundle

Camera
Resolution: 640 x 480 – 1024 x 768 (typically 800 x 600)
Digital Interface: FireWire, USB, ...

Software
Modes: grayscale, color, raw data from color filter array

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DeFiberizer has not yet been certified as a medical product. Fraunhofer IIS presents this functional prototype with the aim of engaging partners for further development as well as for production and marketing.

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