Technische Universität Berlin

Fachgebiet Mikrotechnik

Prof. Dr. Heinz Lehr

Freitag, den 20. Juni 2014

15:00 - 15:30 Uhr

Hörsaal EW 115 A

New Wireless Endoscope with Integrated RGB-Laser Light Source for High Contrast Visibility

Seminar lecture presented by Dipl.-Ing. Bastian Blase

Standard endoscopes for minimally invasive surgery feature a laterally connected light cable leading to an external and bulky light source. The cable's weight and its lateral placement at the endoscope are troublesome to handle for the assistant surgeon in long sessions. Integrating a light source inside the endoscope's handle spares light cables. LEDs at the endoscope's tip imply a hot spot and possible patient's scalding, when contacting organs.

Placing the LEDs in the handle necessitates fibers to guide the light to the endoscope's tip. However, due to the LED's broad emit-

ting angle the fiber coupling efficiency of LEDs is poor. Laser diodes instead are very small and allow low-loss coupling with high power output. By combining and mixing three colors the resulting color temperature can be adjusted to the surgical site. This is obtained in a small volume with an optical system, subsequently coupling the combined beams in a light fiber leading to the tip.



Experiments with suitable phase change materials proved that heat-storage inside the endoscope is feasible. The remaining heat losses are stored in a latent heat-storage unit surrounding the laser module by phase transition, which stabilizes the handle's temperature during the surgery.

The new endoscope incorporates an integrated RGB laser light source with an adjustable optical system to form, guide and combine the light rays. Speckles are minimized by a speckle-reducing module. Together with the camera, the heat storage, a radio module and electronics a standard endoscope handle's size is met.