Technische Universität Berlin **Fachgebiet Mikrotechnik** **Prof. Dr. Heinz Lehr**

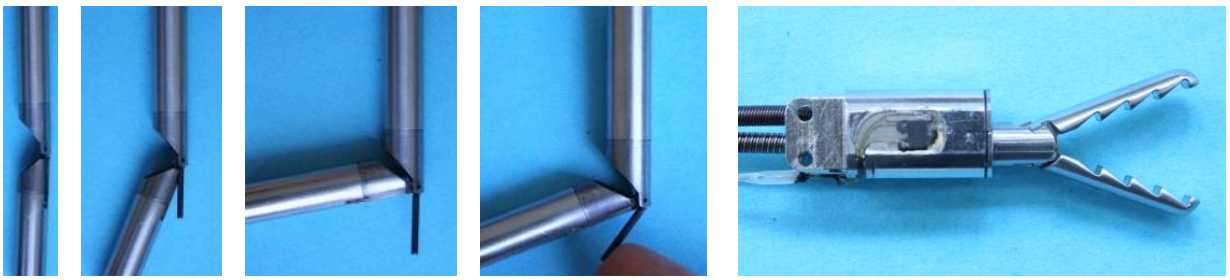
Dienstag, den 26. 5. 2015 **15:00 Uhr bis 15:30 Uhr** **Hörsaal EW 115 A**

Integrated Sensors for a Single-Incision Laparoscopic Instrument

Seminar lecture given by Simon Albrecht, M.Sc.

During robot assisted minimally invasive surgery, telemanipulation systems are used to move the instruments according to the surgeon's input by a human-machine interface. The subject of this talk deals with various sensors which can be integrated in a single-incision laparoscopic instrument for robot assisted surgery.

The developed system features instrument arms with a novel kinematic behavior and structure. To avoid collisions between this complex structure and the abdomen tissue, a fiber sensor is integrated in the protruding joint. The bionic fiber sensor monitors contacts with organs which are located outside the surgeon's field of vision.



All degrees of freedom of the instrument, e.g. closing of the gripper and wrist flexion, are driven by extracorporeal motors. The rotary power of the motors is transmitted by a drive mechanism which consists of flexible and rigid segments. Due to the elasticity of the flexible segments hysteresis in the drive shaft occurs. Thus, integrated absolute position sensors are needed to measure the actual joint position for an automated compensation of the deviations. Three different contactless position sensors based on the variation of the magnetic field produced by a permanent magnet and measured by a Hall sensor were developed and are presented in this talk.

Due to the robotic actuated instruments and the spatial separation between operational side and the surgeon a direct haptic feedback according to a manual operated instrument is no longer available. A concept for a gripping force sensor, which can be integrated in the drive shaft of the instrument, will be presented with regard to the effect of the location along the instrument's shaft. It will be shown that the force measurement in the drive unit directly adjacent to the applied force is suited to give the surgeon a realistic feedback of the gripping force and to restore the ability to palpate tissue stiffness.