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“Flexible Robotic Approaches to Enhancing Laser Surgery and Microsurgery”

RoboSoft plenary meeting - Pisa, April 1, 2014
Surgical scenario

Transurethral laser ablation of the prostate for the treatment of benign prostatic hyperplasia (BPH)

**ISSUES:**

- Limited dexterity and tactile feedback at the tip
- Not homogeneous ablation: carbonization and craters formation
- Decrease of accuracy, lengthening of operative and recovery time and increase of patient’s pain
ASTRO: Actuated and Sensorised Tool for laserR assisted surgery of the prOstate

Design of ASTRO:

- Flexible multilumen catheter in polyamide (PA12): optical isolation, mechanical continuum for strain transmission
- Integration of sensors for contact detection (FBG) between laser and prostatic tissue: miniature size, no cabling, biocompatibility, electromagnetic interference immunity
- Redundant sensors for temperature compensation
- Integration of cables for actuation
ASTRO: Actuated and Sensorised Tool for laserR assisted surgery of the prOstate

- New assistive technologies and **flexible robotic tools** to provide safety, efficiency, and improved quality to laser assisted surgical procedures.

- Design and evaluation of a **novel, miniaturized, flexible robotic endoscopic system**, based on a **steerable catheter**, for laser assisted transurethral surgery of BPH.

- The central idea is to augment the **surgeon's dexterity, manipulation skills** and efficiency through advanced **surgeon-robot interfaces**, **sensors** and **actuators**.

- Preliminary study demonstrated the ability of the system to sense contact forces between the laser fiber and the target tissue of up to **1 mN** and to steer the laser tip inside the prostatic urethra of about **± 10°**.