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Fiber-Optic Force Sensor for Robotic Surgery CORNELIU RABLAU, BRENDAN ACRE, Kettering University — We report on the design, mathematical modeling and preliminary development work for a fiber optic ***force*** sensor for applications of force sensing and force-feedback in robotic surgery and in other systems where a small passive sensor immune to electromagnetic interference (EMI) may be needed. Some major technical merits of the proposed sensor are that it can be made small enough to fit the distal end (active tip) of typical surgical devices used in robotic laparoscopic surgery (cylindrical sensor of diameter 10 mm or less), that it can be assembled completely from glass/dielectric materials (RF magnetic fields compatible) and that it does not require active powering and local conditioning (filtering, amplification) of the response signal it produces to an applied external force. The last two characteristic make this sensor immune to EMI, unlike other sensors based on electric/electronic devices like strain gages, piezoelectric crystals or micro-electromechanical devices (MEMS), e.g. MEMS capacitors. The force sensor is based on an optical fiber + four-quadrant-mirror ***displacement*** sensor using a four-wavelength multiplexed interrogation scheme based on Gaussian beams.

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