PROTOTYPE PROPOSAL OF A REDUNDANT CONTINUUM ROBOT FOR DIAGNOSIS AND SAMPLING OF BIOPSIES

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Overview on the several applications of robotics.

Background.

Introduction to continuum robots:
- Features and classification.
- Mathematical models.
- Proposal prototype model.

Conclusion and challenges
Tendency of Robotics Systems

- Medical Robot
- Entertainment Robot
- Life Supporting Robot
- Battle/Rescue Robot

Industrial Robot
Background

Assistive Technologies
Robots and machines that intend to improve people’s quality of life.

Rehabilitation Robotics
Mechatronic tools for clinical therapy.

Robots created for surgery, exploration, diagnostic and therapy purposes.

University of Salford Braided Pneumatic Muscle Actuators

DaVinci Robot Surgery Machine
Development of Surgical Robotics and Devices

Open Surgery

MIS
Minimal Invasive Surgery

NOTES
Natural Orifice Trasluminal Endoscopic surgery
Why do we need a surgery robot to conduct a biopsy procedure?

Some found difficulties:

- 3 hands are mandatory.
- Discomfort of the surgeon.
- Eye-hand coordination.
- Restricted workspace.
- Damage on tissue.
- Occlusion of the field of view.
- Critical areas are hardly avoided.
Natural Orifice Transluminal Endoscopic Surgery (NOTES)

Insertable Robotic Effector Platform
Columbia University

Medrobotics Raynham, Massachusetts
Background

Discrete Structure

Extrinsic Actuation
- Tendon/Cable
  - Columbia University

Intrinsic Actuation
- Micro-motors
  - Columbia University

Elastic Structure

Concentric Tube
- Columbia University

Multi-Backbone
- Vanderbilt University

Pneumatic
- Nagoya University

Shape Memory
- Jhons Hopkins University

Hydraulic
- Nagoya University
Modeling

Discrete Structure

Continuos Structure

Rigid Links

Constant Curvature

Variable Curvature

Kinematics

Frameworks
Modeling

Discrete Structure

Energy Methods

Contiguous Structure

Classical Elasticity Theories
Medical Applications

- Transnasal Surgery
- Ophthalmic Surgery
- Cardiac Surgery
- Vascular Surgery
- Urologic Surgery
Proposal Prototype Model
Challenges

- Instrumentation, visualization and Integration.
- Human-machine interactions.
- Structure and sensing.
Thanks for the given attention