Serial Comanipulation for Laparoscopic Surgery

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4 DoF Instruments used in Laparoscopy
Advantages and Disadvantages of Laparoscopy

Advantages (for the Patient)

- Fewer scars
- Less post operation pain
- Faster recovery
- Less post operation complications

Disadvantages (for the surgeon)

- Non dexterous instruments
- Hand eye coordination problem
- Longer operation time
Teleoperation

« da Vinci Surgical System » is a robot for teleoperation.
da Vinci's 6 DoF instruments give the surgeon the dexterity he needs.
Teleoperation resolves the Problem of hand eye coordination.
da Vinci's Advantages & Disadvantages

Advantages

- Dexterous instruments
- Intuitive hand eye coordination
- Ergonomic interface

Disadvantages

- High cost: $ 1.5 to 1.75 M + maintenance and training costs
- Bulky
- Long and difficult to put in place
- No haptic feedback
- Surgeon is far from the patient
Serial Comanipulators

RealHand from Novare Surgical

- Has had some success in single incision laparoscopy
- Not useful for precise operations
- Effector has low stall torque
- Costs $400 and it's disposable
- Non intuitive control results in a long learning curve
Robotic Serial Comanipulators

Robot developped at Toshiba Medical Systems

Heavy and big: not usable for surgeons
Towards an Optimal Comanipulator

- Dextrous
- Precise
- Lightweight
- Ergonomic interface
- Affordable
- Modular
- Easy to put in place
Towards an Optimal Comanipulator

Challenges

i. Finding the best way of coupling the surgeon's gestures to the end effector's movements

ii. Mechanical design and realization
Simulator
Test & Evaluation

Simulating a suturing movement. Suturing includes all elementary gestures in laparoscopy.
Next Steps

i. Completing the evaluations
ii. Making a prototype to validate simulation results
Thank you for your attention.