

Advantages:

- Force feedback capability
- More ergonomic posture for surgeon
- Highly maintenance-free operation
- Bed movements / pan-tilt rotations during operation
- Surgeon's hand tremor reduction and movements scaling
- Acceptance of a wide range of conventional surgery instruments



Technical Specification

Master Robotic Console

Total dimensions (L*W*H)	180*95*150 cm3
Total weight	210 kg
No. of total active DOFs	10 motorized joints (5 for each master robot)
No. of total passive DOFs	6 joints plus two 6 DOF articulated arms for holding monitors
Local communication frequency	1 kHz
Main monitor resolution	Full HD (1080*1920)

Slave Robotic System

Total dimensions (L*W*H)	200*220*Max.215 cm3
Total weight	260 kg
No. of total active DOFs	16 motorized joints (5 for each surgery robot, 3 for cameraman robot & 3 for surgery bed)
No. of total passive DOFs	13 joints (6 for each surgery robot & 1 for cameraman robot)
Local communication frequency	1 kHz
Endoscope resolution	Full HD (1080*1920)
Movement resolution	1 micro meter in each direction at no load operation
Pinch Force sensing resolution	0.1 N
Interaction force sensing resolution	0.5 N



SINA

A Robotic Telesurgery System with Force Feedback



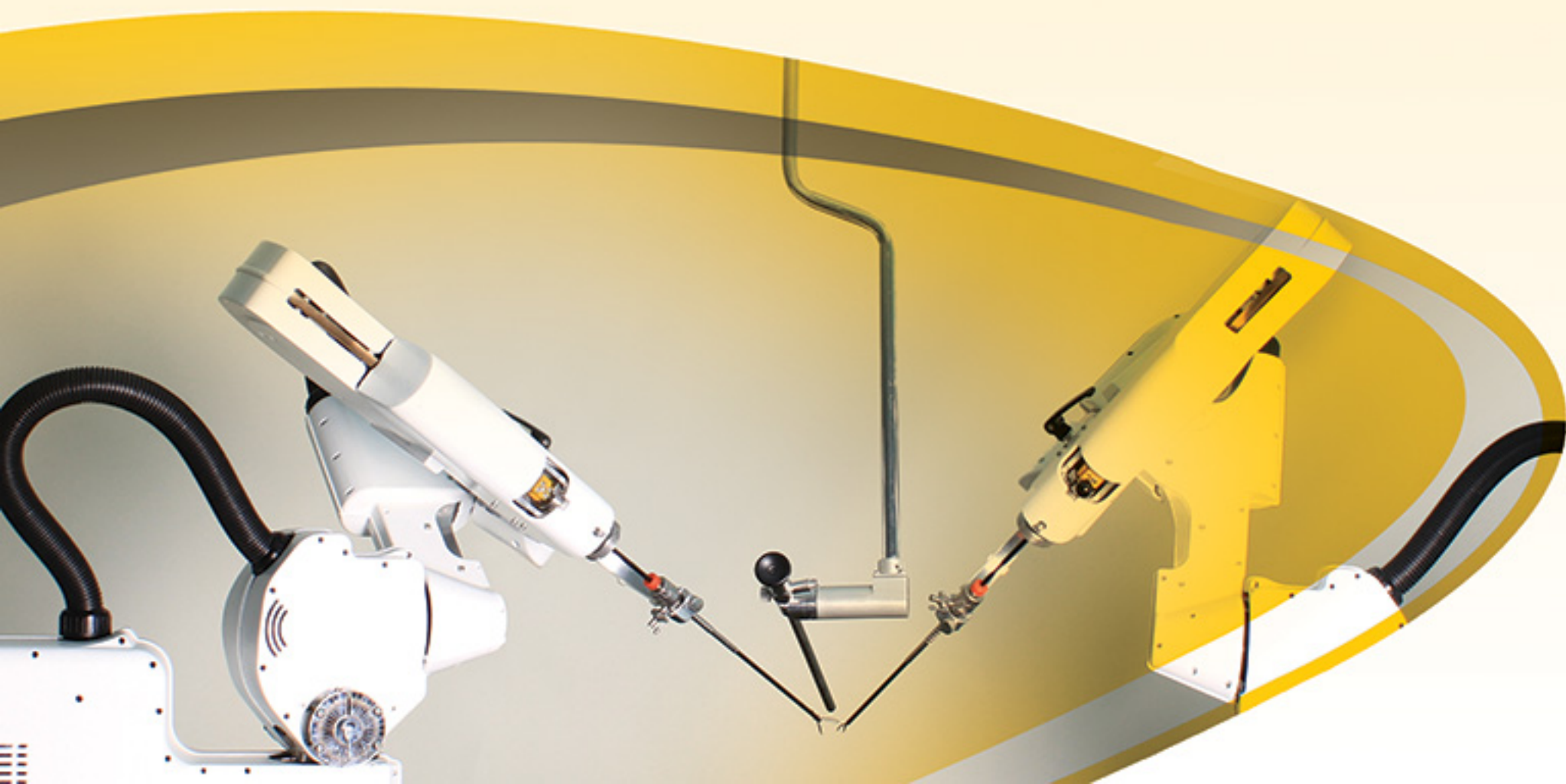
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Description:

Sina is a complete robotic telesurgery system with force feedback which can be used for performing remote surgery operations through internet or other communication channels. This system has two main subsystems including a master robotic console at surgeon's side and a slave robotic system at patient's side with two robots which are installed on the sides of a specific surgery bed. A robotic cameraman called RoboLens is also integrated into the system to take the intra-abdominal images of the patient and send them to the surgeon's master console. The master robots receive the surgeon's hands movements and transmit them to the patient's side slave robots that mimic the movements in a real-time manner. Simultaneously, the slave robots measure the robot and patient interaction forces/torques, including the pinch forces under instruments jaws, and transmit them to the surgeon's side master robotic system. As a result, all tool-tissue interaction forces/torques are feedback to the surgeon's hands. The cameraman robot may be controlled through foot pedals from the surgeon's side or smartly track the surgery instruments with no need to any human control command. Other operating room equipments such as electrocauter may be also remotely controlled from the surgeon's side master consol.



Main Features

- **Master Robotic Console (at surgeon's side)**
 - Ergonomic console with 3 DOFs to bring a comfortable workstation for surgeon:
 - Height (based on tool handle): 75-120 cm
 - Distance between two master robots: 35-80 cm
 - Tilt: 0-40 deg
 - Two fully cable-driven master robot to be manipulated by surgeon hands:
 - 2 DOF gimbal mechanism for laparoscopic tool orientation
 - 1 DOF for tool insertion
 - 1 DOF for tool rolling
 - 1 DOF for grasping
 - Software clutch for adjusting the master robot orientation to provide maximum comfort for surgeon
 - Foot pedals for controlling the laparoscopic camera
 - Foot pedals for activating the electrocauter
 - High resolution monitor for providing HD image from the surgery site
 - A small touch monitor for setting up the system
 - Extra roller to provide continuous rolling as in commercial hand-held laparoscopic tools
- **Slave Robotic System (at patient's side)**
 - Adjustable bed
 - 3 active DOFs
 - Height: 770-1070cm
 - Pan angle: -15 to 15 deg
 - Tilt angle: -15 to 15 deg
 - Two bed-side passive robots
 - 3 Cartesian motions for adjusting the active robots' RCMs
 - Longitudinal displacement: 175cm
 - Vertical displacement: 50cm
 - Lateral displacement: 36cm
 - Pan and tilt DOFs for adjusting the initial orientation of the active robots based on the surgery type and positions of entry points
 - Two bed-side active robots:
 - 2 DOF spherical mechanism for laparoscopic tool orientation
 - 1 DOF for tool insertion
 - 1 DOF for tool rolling
 - 1 DOF for grasping
 - A 6 DOF force sensor between end effector and tool
 - Incorporating commercial laparoscopic tools
 - Containing trocar holder
 - Including mono-polar electrocauter
 - Capability of robot head sterilization