

**Virtual Reality & Robotics  
for Abdominal Surgery :  
Training & Intra-Operative Assistance**

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**Current Surgical Planning**  
From Medical Imaging ... to Surgery

**Virtual Reality for  
Tumor Analysis and  
Liver Surgery**

**Fully automatic  
3D Reconstruction**

**The Future  
Of Surgery**

TeleSurgery

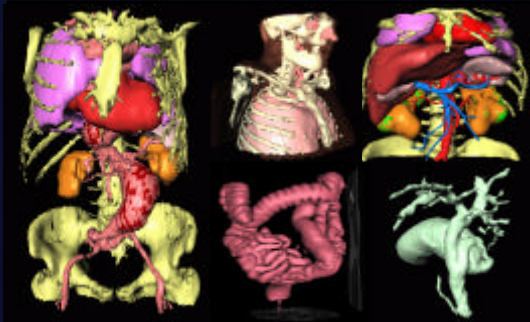
Augmented Reality

Surgical Planning    Surgical Simulation

**3D Analysis**  
From Medical Imaging (CT-Scan, MRI)

### 3D Analysis

Automatic 3D Reconstruction of the Patient and his Pathologies



### 3D Analysis

Automatic 3D Reconstruction of Abdominal Area



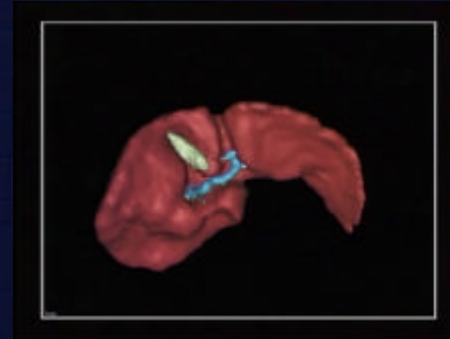
### 3D Analysis

Laparoscopic Instrument Placement



### 3D Analysis

Navigation & Simulation of Liver Resection



### 3D Analysis

Simulation of Radiofrequency Application

This slide shows a 3D analysis simulation. It features two main views: a top-down view of a liver with a green highlighted area, and a side view of a liver with a yellow highlighted area. The background is dark blue.

### 3D Reconstruction of the patient

Biliary Tract – Colon – Trachea – Abdom. Aorta

This slide displays 3D reconstructions of patient anatomy. It includes four panels: a biliary tract reconstruction (top left), a colon reconstruction (top right), a trachea reconstruction (bottom left), and an abdominal aorta reconstruction (bottom right). The background is dark blue.

**Virtual Reality for Tumor Analysis and Liver Surgery**

*The Future Of Surgery*

Fully automatic 3D Reconstruction

Surgical Planning    **Surgical Simulation**    Augmented Reality    TeleSurgery

This diagram illustrates the surgical simulation process. It starts with a 3D reconstruction of a liver and tumor, which is then used for surgical planning and simulation. The process involves augmented reality and tele-surgery, leading to the future of surgery. The diagram includes a laptop, a 3D model, and a person using a VR headset. A yellow circle highlights the 'Surgical Simulation' step.

### Simulation

Provide Pre-Operative Assistance :  
Evaluation & Planning through Simulation

This slide shows a person using a simulation system for pre-operative assistance. The person is interacting with a computer monitor displaying a 3D model of a liver and tumor. The person is also using a surgical instrument to interact with the simulation. The background is dark blue.

**Simulation**

**Learning simulator**

ITM  
LIFM  
SIMEDGE  
IRCAD

**Virtual Reality for Tumor Analysis and Liver Surgery**

**Fully automatic 3D Reconstruction**

**The Future Of Surgery**

**TeleSurgery**

**Augmented Reality**

**Surgical Planning**   **Surgical Simulation**

**Augmented Reality**

**Combining Video Acquisition & Medical Imaging**

**Augmented Reality**

**Augmented Reality**



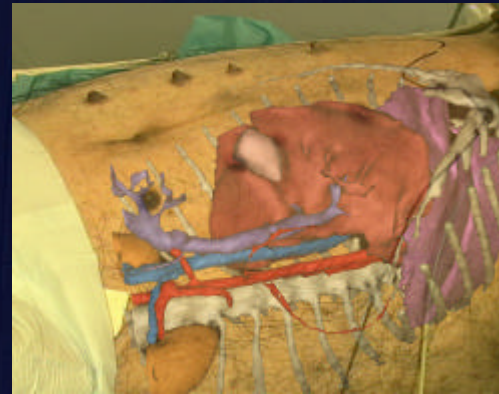
**Augmented Reality**



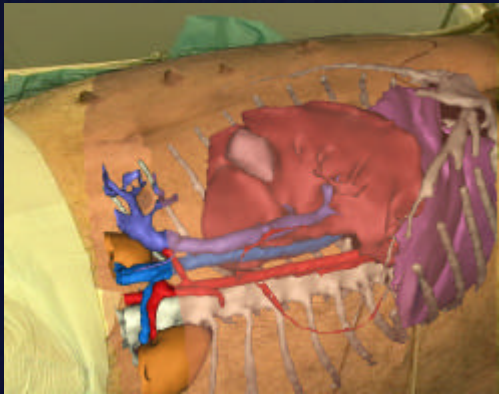
**Augmented Reality**



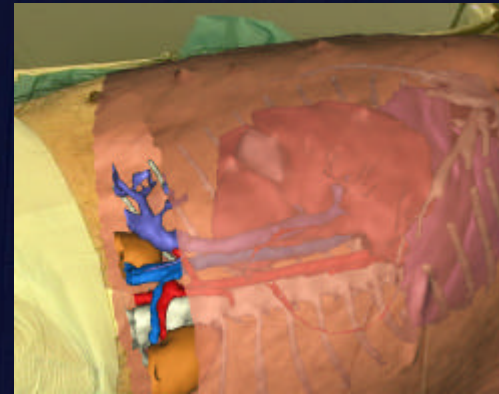
**Augmented Reality**



**Augmented Reality**



**Augmented Reality**



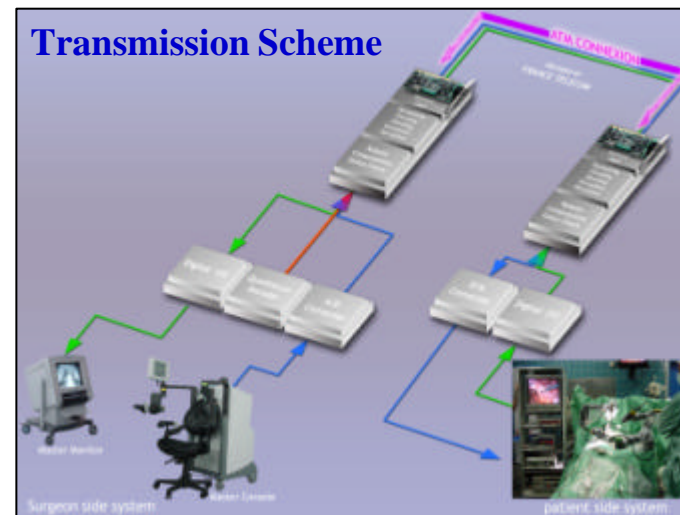
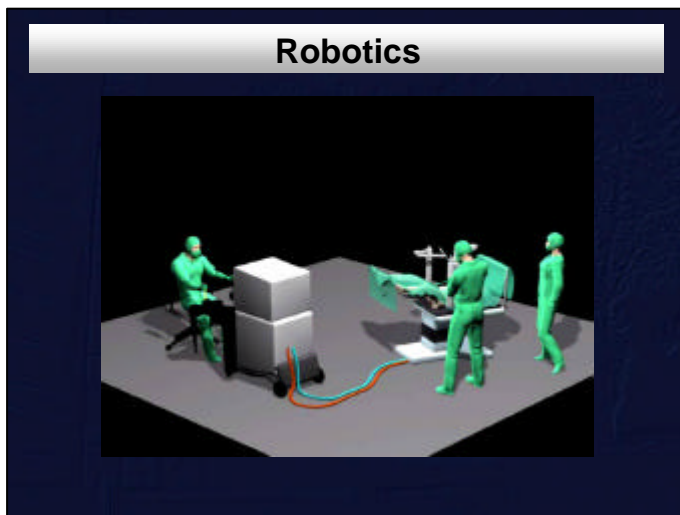
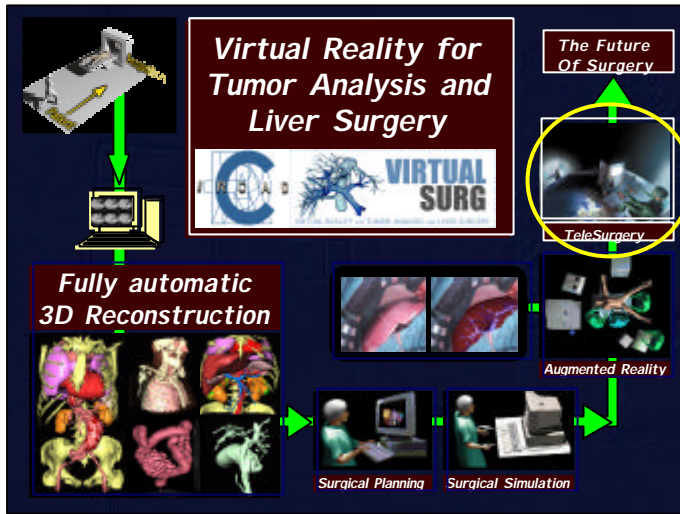
**Augmented Reality**

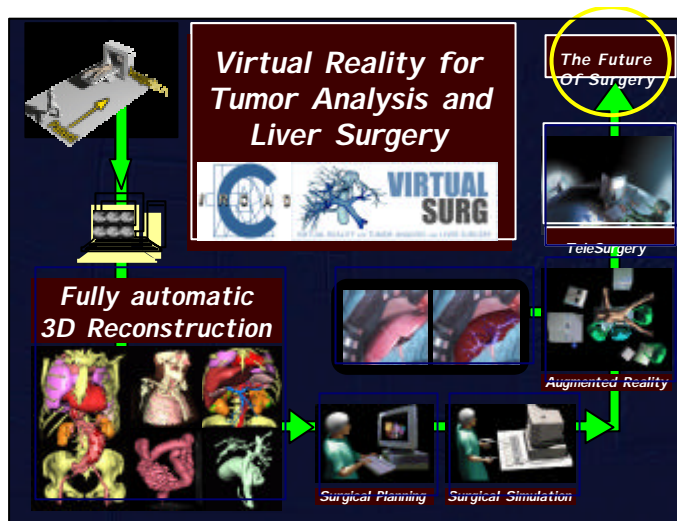
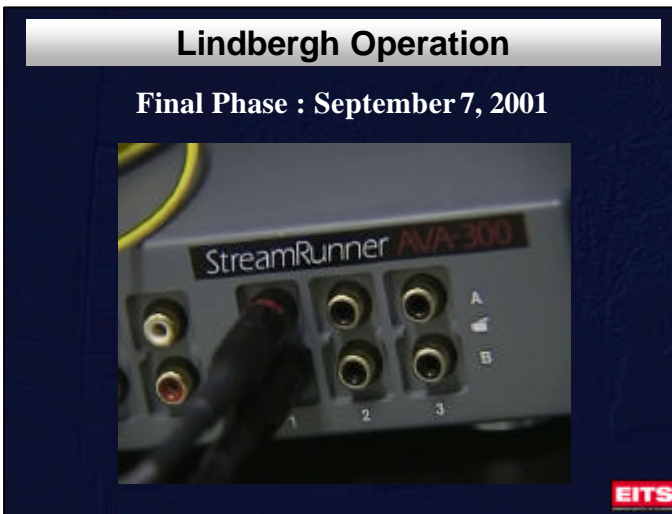


**Augmented Reality**

**Precision of Registration : Error  $\pm$  2 mm**









## Future of Surgery

Full automation of procedure



Thank you for your attention ...



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