Visualization Wall for OR of the Future

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Motivation

The field of Surgery has seen two major paradigm shifts—from Open to Laparoscopic and then from Laparoscopic to Robotic. During this transition, newer more advanced technologies and devices have been added to the already existing Operating Rooms. But in spite of the technical advancements in the equipment used and the way Surgery is performed, the Operating Room itself has remained unaltered over the ages. As a consequence, our traditional Operating Rooms have succumbed to lack of space, cluttered cables, overcrowding, poor connectivity and data access making them an inefficient workspace. Our project "OR of the Future" hinges on addressing these issues while aiming to change the way we think of Operating Rooms. Imaging and Visualization is one crucial aspect of this otherwise broad scoped project.

In the current Operating Rooms, different members of the team view information pertaining to them on small independent screens. Due to this independent visualization scheme, working as a team and coordinating with each other at different stages of the procedure becomes problematic. Since the nurses, the Assistant Surgeon and the Anesthesiologist do not see exactly what the Surgeon sees; it becomes difficult for them to prepare for the "next step" in a timely fashion. With this problem in hand, we hope to find a solution with the proposed instrument, the Visualization Wall.

Instrument Description

The Visualization Wall, is an Ultra-high resolution Wall-sized Display for presenting a continuously updated view of all relevant patient information to the perioperative team, enabling everyone in the OR to instantly view, understand, and act upon crucial patient information. It will extract patient data from PACS servers, physiological monitors, Laparoscopic Cameras and other such medical devices while displaying the desired information in an interactive user-friendly manner. The user, the surgeon or the support staff in this case, will be able to **interact with the wall using speech, touch and infrared** remote controllers. Supported by high-speed networking and **tele-conferencing** tools, it will also serve as a tool for collaboration with co-located and remote surgeons. *Data elements* displayed on the wall will range from *patient identity, allergies, medical history, details of the procedure being performed, preoperative diagnostic imaging to real-time imaging from laparoscopic cameras, vital physiological data (heart rate, blood pressure, oxygen levels, fluids) and even the dynamic status of the procedure*.

The instrument will be developed and deployed by *Electronic Visualization Lab (EVL)* at UIC which has been the pioneer of high resolution visualization of scientific data for many years.

NEC Wall at the UIC EVL Cyber-Commons

Proposed Layout: 6x3, 18 Tile Displays, Wall Inundated

Visualization Wall - Conceptual Layout
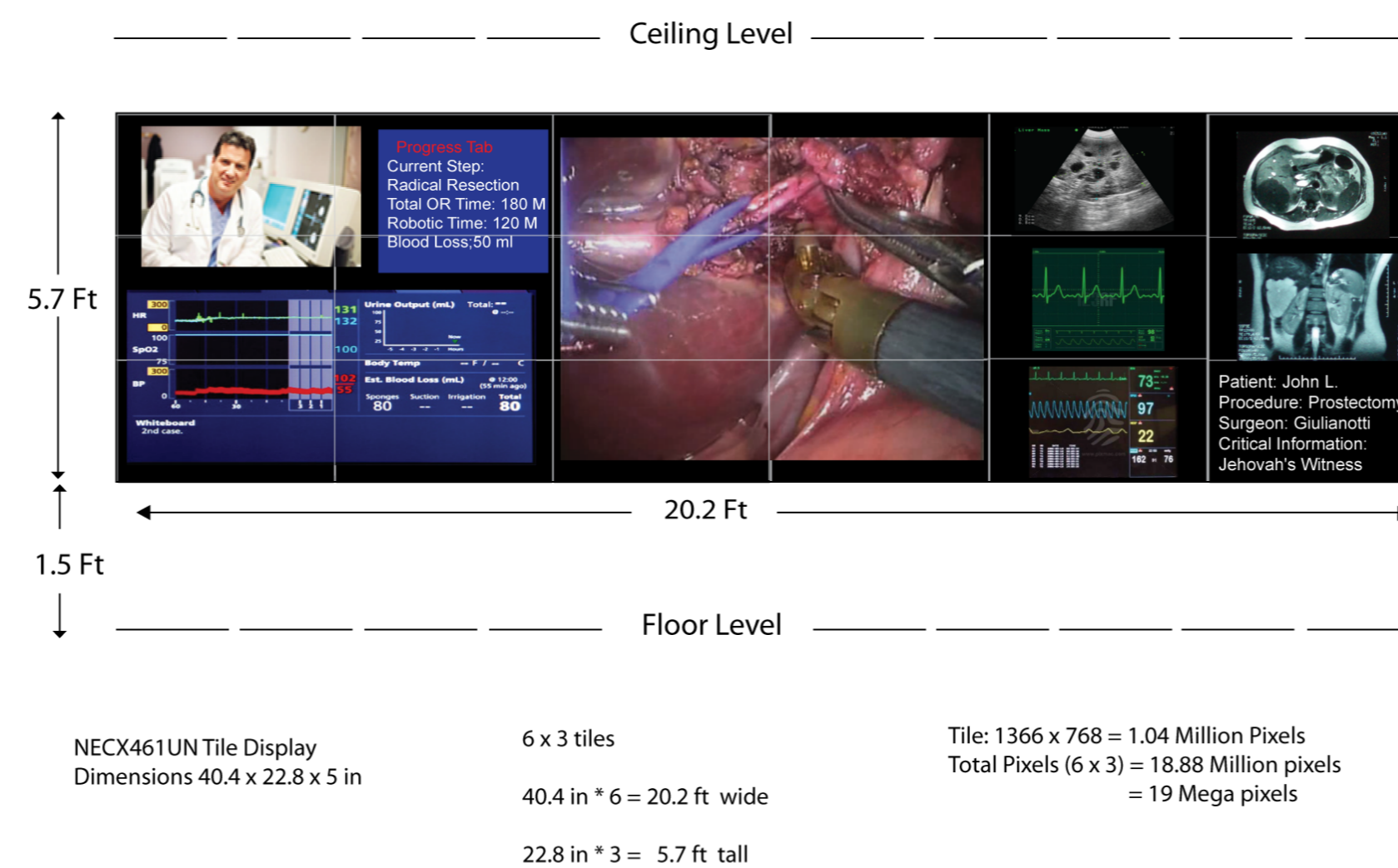
Benefits to the OR Team

Faster Delivery and Better Visualization of Patient Information during Surgery

Many times during a surgery, the surgeon needs to view pre-operative diagnostic images and patient history before performing a particular step of the procedure. Presently, a member of the OR team has to either get a hard copy of the desired information or retrieve the digital version from a PACS server machine and then show it to the Surgeon. This can be an unnecessary bottleneck in the execution of the surgical procedure. With the Visualization Wall in the OR, the surgeon will be able to simply ask for this information using effortless verbal commands. The computer driving the wall will process his request, retrieve the information from the servers within seconds and display it on the Wall as well as the display of the robotic console. The instrument's high resolution capabilities will also allow the surgeon to zoom in and out on specific areas of interest.

Collaboration with Remote Surgeons

During difficult procedures, it can be very helpful if the surgeon can have other expert surgeons present for advise. With the tele-conferencing tools coupled with the Visualization Wall, the surgeon will be able to have contact with remotely located surgeons for advise during surgery. Since all the information related to the patient will already be present on the Wall in a comprehensive manner, the surgeon will be able to show this information to the remote surgeon advisor for reference with great ease.

Collaboration between OR Team members

The wall, being in the field of view of the entire operative team, will help everyone in the team be on the same page and collaborate effectively at every step of the procedure. On the whole, the Visualization Wall will remove the bottlenecks in patient data retrieval and visualization faced during surgery in the current Operating Room.

Benefits to the Patient

Patient Safety is the biggest concern in an Operating Room. Timely execution of the steps of the procedure is crucial for ensuring patient wellbeing. The Visualization Wall will significantly reduce time delays in the delivery of crucial patient information to the OR team; thus increasing their efficiency in reacting to that information. The direct consequence of the increase in efficiency of the surgeon and the OR support staff will be a significant decrease in procedural errors and increased patient safety

Benefits to the Hospital

Improved efficiency of the OR team has several advantages for the Hospital. With the Visualization Wall, the OR team can acquire necessary information faster and react to it in a timely fashion; consequently this can considerably reduce the total OR time. For the Hospital, this implies a higher throughput and turnover rate of the Operating rooms. A greater number of surgeries can be performed in the same period of time generating higher revenues. Because of the increased patient safety brought about by using the Wall; the Hospital will be able to greatly reduce the number of lawsuits it faces on account of Medical Negligence. It goes without saying that the use of such futuristic technology in the Operating Rooms will help foster the reputation of the hospital as the leading institute for Advanced Surgery.

Benefits to Students

Since all the information pertaining to the case will be presented in a comprehensive manner on a single unified display; the learning experience for the students will be greatly enhanced. They will be able to view the live surgery and patient diagnostic imaging in ultra-high resolutions enabling them to better understand the anatomy and the intricacies of the procedure.