Augmented Reality and Collaborative Work in Patient-Physician relation

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Background

Augmented Reality surgery is an area of current active development. In addition, more and more collaborative applications are emerging. But very few tackle the patient-physician relationship field. Progress in Augmented Reality could help physicians to explain pathology to their patients. By showing organs and their metabolism directly on the patient's body, physician could improve their relationship. Patient and Physician could both discuss in real time on a specific case and share the same understandings. Specific therapy modeling and anatomy lesson could also be a potential field of application of this kind of research.

Objective / Purpose

By using AR technologies and health knowledges , the goal of this 3 months internship is to obtain a good overlaid of any body constituents on a patient (Fig 1). The input images are captured by a camera placed at the physician or patient viewpoint and overlapping is performed in real time. The result will be displayed on computer screen (easy way). To increase the efficiency of AR, the result could be projected on the patient body, but it's time consuming.

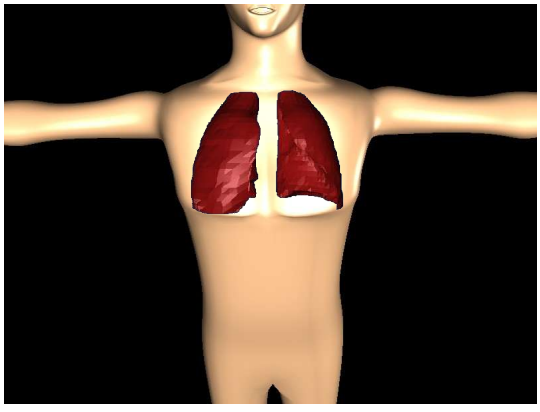

Figure 1: Overlaid of lung over a 3D human model.

To tackle this target, a precise localization of patient with all his movements is required. Then a 3D-human model will be overlaid to obtain a reference position. All virtual organs will have positional relation with the 3D-human model. They will be resized (and customized) according to patient's body. So, organ overlapping will be precise enough for collaborative work.

Technique part

The prototype system involves a Sony EVI-D100 Camera (640*480). This camera is driven by the software in order to give some flexibility to the physician. ARToolKit 2.70 is used to detect markers (8 cm * 8 cm. Flat surface) on the patient. These markers would be fixed on a belt in a real application. 3D-models (human, organs, bones,...) fit the VRML2.0 format. VRML is a web format for 3D objects. To create 3D-model, Blender software is used.

Results

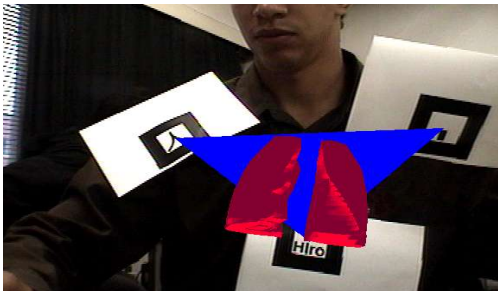

Figure 2 : Localization of markers and VRML lung display.

Camera control by software is enable. The localization of patient body is implemented. Relationship between markers is computed, and VRML models display is achieved (Fig 2).

Future

3D-human model matching over markers is required. Partial model deformation will be implemented. Other organs will be imported from a web database. Then, position relation between organs and 3D-model will be adjusted.