

APPLICATION USING AUGMENTED REALITY

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ABSTRACT

Laparoscopy technique has caused a high impact in the surgical community. The success of this technology is the application of the surgical conventional practices to access in the abdominal cavity, with diagnostic and therapeutic purposes, with a minimum surgical intervention. This procedure has been used for biliary lithiasis, now it is an advanced procedure in several pathologies interventions; the reason is because surgical set of instruments has been improving. The base of laparoscopy procedure is the video surgery, which for nature needs the training of the surgeon and the knowledge of the set of instruments, as well as his advantages and his limitations.(Figure 1)



Figure 1. Tradicional laparoscopy technology

The correct use of this technology prevents surgical problems and the correct knowledge of the instruments in every particular condition, avoids human operation mistakes. Additionally to all inherent problems in the use of the technology, an additional variable exists; the position of the image is displayed in a monitor, in a

different position from the area of operation. This implies an additional training of the surgeon so that the surgical act has fluency and continuity.

The image is taken by an endocamera and projected in a monitor. The first barrier that the surgeon must overcome is the difference between the position of the image and the place of navigation of the instruments. If there is the possibility of projecting the image on the human body with the same characteristics of an open surgery, we can have closer this methodology over to the traditional surgeries, achieving the advantages of the video surgery over a virtual traditional surgery. With this new technological modification, the surgeon does not use the image of monitor and in his place he sees, in his visual field, the internal image of the abdomen like an open traditional surgery.

The training would centre on the use of the laparoscopy instruments and the surgeon will feel the sensation of being in a traditional operation, with consistent progress in his surgical skill. In order to obtain this objective, we can propose the use of the augmented reality technique, which allows having the human real body in the field of vision and the superposition of the internal image of the abdomen [4].

Keywords: *Laparoscopy Surgery, Augmented Reality, Traditional Operation*

1. INTRODUCTION

Augmented reality is changing the way we view the world. Augmented reality (AR) is a term for a physical real-world environment whose elements are augmented by virtual computer-generated. The technology functions by enhancing one's current perception of reality.

It is a combination of the real scene viewed by the user and a virtual scene generated by the computer that augments the scene with additional information.

In virtual reality, the virtual environment is a computer generated three-dimensional scene which requires high performance computer graphics. The virtual world is interactive. The user is immersed in this virtual environment. The head mounted display block out all the external world and present to the wearer a view that is under the complete control of the computer. The user is completely immersed in an artificial world.

In augmented reality, the virtual images are merged with the real view to create the augmented display. It is a mechanism to combine the real and virtual that is not present in other virtual reality work.

2. GENERAL OBJETIVE

The objective is to improve the laparoscopy procedure skills by means of the use of augmented reality devices, projecting in virtual way, the image of the endocámara in the position of laparoscopy devices navigation, making the procedure more natural, bringing this technology to the traditional surgery with his consistent benefits.(figure2)



Figure 2. Laparoscopy surgery with the suggested augmented reality technology

3. SPECIFIC OBJETIVES

- Connect the traditional surgery laparoscopy system to the augmented reality system



- Create a prototype adapted to the surgery laparoscopy training systems.
- Determine the grade of ergonomics and satisfaction for the use of this prototype for surgeons and doctors in training.
- Realize the final prototype for surgery in Pigs.
- Determine the grade of ergonomics and satisfaction for the use of this prototype in training for doctors and surgeons in practices with Pigs.
- Realize the final prototype.

4. JUSTIFICATION

The laparoscopy surgery procedure represents an important advance in the procedures by the surgical community. The technique has already begun several decades ago by gynecologists and now it is applied to the general surgical practices, for the reason of the advances in the surgical instrumentation and the medical equipment electronics.

With the purpose of improving the malpractice statistics and surgical errors, the project suggest adding new techniques to the procedure in order to improve the devices using modern techniques like augmented reality [1].

The basic idea consists of using the augmented reality to project the endocámara image on the patient abdomen, simulating to the surgeon a traditional open surgery operation. Projecting the image on the human body with the same characteristics of an open surgery, we can have closer this methodology over to the traditional surgeries, achieving the advantages of the video surgery in a virtual traditional surgery. This proposed system generates comfort and fluency in the surgical procedure, improving the interface man-machine with benefits in the procedure [2].

5. METHODOLOGICAL APPROACH

1. Bibliographical review. It allows knowing the advances in systems of

- augmented reality and his possible applications in laparoscopy surgery.
2. Connect the system of traditional laparoscopy to the equipment of augmented reality.
3. Select the type of reflective or electronic technology (Optical See-Through or Video See-Through) [3]
4. Creation of a prototype of augmented reality applied to laparoscopy training equipment.
5. Realize tests to determine the grade of satisfaction and of progress in the procedures of training of the medical personnel.
6. Improve the device in accordance with the results of the tests
7. Use the improved prototype for tests in Pigs
8. Realize tests to determine the grade of satisfaction and of progress in the training procedures of medical personnel.
9. improve the device in accordance with the results of the tests
10. Produce the final prototype.

6. EXPECTED RESULTS

The final prototypes improve the surgery laparoscopy procedure, allowing the surgeon to realize interventions with the same visual characteristics of a traditional open surgery operation. This proposed system generates comfort and fluency in surgical laparoscopy procedures, improving the interface man-machine with benefits in procedure, helping to reduce, in combination with other parameters, latrogenias and intraoperative fails.



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