Orthopaedic 3D Collection: Mission and Impact

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Innovation Is Now a Need, Not a Want [1]

Introduction

The simulation has occupied an increasingly important place in the teaching of surgery. This way of learning allows students to work in a controlled environment and progress on a learning curve before starting a real simulation [2]. In orthopaedic surgery, several models are used such as plastic models and cadaveric models. The high cost of these models opens the door to the use 3D simulation which offers learners the opportunity to repeat the exercise several times and to reach the acceptable level without damaging the model. In the last decade, this strategy was established in several surgical simulation laboratories. The designers of simulator need accurate data. The absence of data pushes scientists to use modelling to represent, create, process, and analyze digital representations of 3D objects. Designers can distribute data by using the web that provides a way to share information and resources among user communities (scientists, companies, etc.). With the complexity of the resources, it has become important to effectively manage digital resources. In literature, there are several 3D collections for industry. We can cite the example of Aim @ Shape [3]. The Stanford 3D Scanning Repository [4] and 3D Warehouse [5].

Mission

Today, to achieve an efficient simulator, we need a platform that contains all models with a detailed description of their use. The overall idea of the project is discussed by Mediouni et al. [6]. The objective is to provide the orthopaedic community a platform that contains templates for performing surgical simulations. This 3D collection will be accessible online, will provide all models of bones and surgical tools. The first step is to build 3D objects based on technology of acquisition as the Kinect camera or 3D scanner and 3D modeling software such as AutoCAD and SolidWorks. Sometimes, the information provided by acquisition technologies or by software cannot be used because the defects such as holes and overlapping regions. A pre-processing step was carried out to achieve an acceptable visual quality to the user.

For the purpose of achieving, some algorithms will be developed to animate 3D objects. This step is essential for all operations during the orthopaedic simulation such as drilling and screwing. After finishing all the steps: construction, pre-processing, smoothing, and animation, we need a platform for integration, which requires a strategy to facilitate the work. Our collection of 3D objects is composed of the management system which ensure the integration of 3D objects in the collection using a framework (Search Engine).

Impact

This platform is intended to be mainly used by surgeons. It provides specific criteria for quality models, commentaries and publications related to them. The large amount of data can be downloaded and used by researchers for testing in the pattern recognition field. In the long term, this platform will encourage other surgeons to work with us to make simulators for training. Our project has clinical benefits in order to make available (3D images, description) on anatomy data, the visualization tools and navigation data to students in medicine. In the longer term, thanks to the expertise acquired, it would be possible to produce simulations for other specialties in medicine.

References

5. https://3dwarehouse.sketchup.com/