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Spatially-oriented EMR for Dental Surgery

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Abstract: As digital dental images become widely available, a new Electronic MR system (EMR) will be critical for the success of applying new technology to dental care. This project is designed an image-based and spatially-oriented EMR for dental surgery. A new panoramic image-based annotation model will be developed, which will complement dental charting precisely locating specific spatial findings for each patient. A spatially-oriented, multilayered data model for dental EMR will be developed using Geographic Information

System (GIS) methods. This project will explore the possibility of applying head and neck images from VHP into a spatially-oriented EMR system.

Introduction

Currently, symbolic dental charting and traditional radiographic films are used in most dental clinics. Based on the different attributes in clinical situations, the patient's information can be documented in different EMR formats, such as, time-oriented, source-oriented and problem oriented. The Visible Human Project created complete, anatomically detailed, three-dimensional representations of the normal male and female human bodies[1]. We believe that spatial dental information should be the primary attribute. In this project, the *Health Care Informatics Program*, at the University of Wisconsin-Milwaukee (UWM), and *Marquette University School of Dentistry*, are planning to design and develop a new image-based, spatial-oriented EMR system for dental surgery.

Methods

In this project, the new dental EMR system will integrate traditional dental charting software with digital dental imagery. Appropriate regions of a patient's real teeth will be electronically circled using a virtual overlay. Based on the GIS system, a multilayered data model will be developed for dental EMR to integrate the clinical information with image findings. Volume 1, the Head & Neck, of the Functional Anatomy of the Visible Human was developed by the University of Colorado center for human simulation. This project will explore how to use the digital anatomy as an important reference layer in our data model. For example, a digital anatomy image of the nerve is very helpful for giving local anesthetic, because locations of the needles to block the nerves are dependent on the patient's anatomy.

Results

The clinical information should be closely integrated with image findings, a multilayer data model is proposed for the dental EMR based on GIS system methods (see Figure 1). The information about regions

of interests (ROI) are organized in the six levels in the proposed data model, which includes: (1) the shape, (2) the spatial reference, (3) basic attributes, (4) the types, (5) relationships with non-spatial clinical information and (6) complex behaviors in the dental surgery.
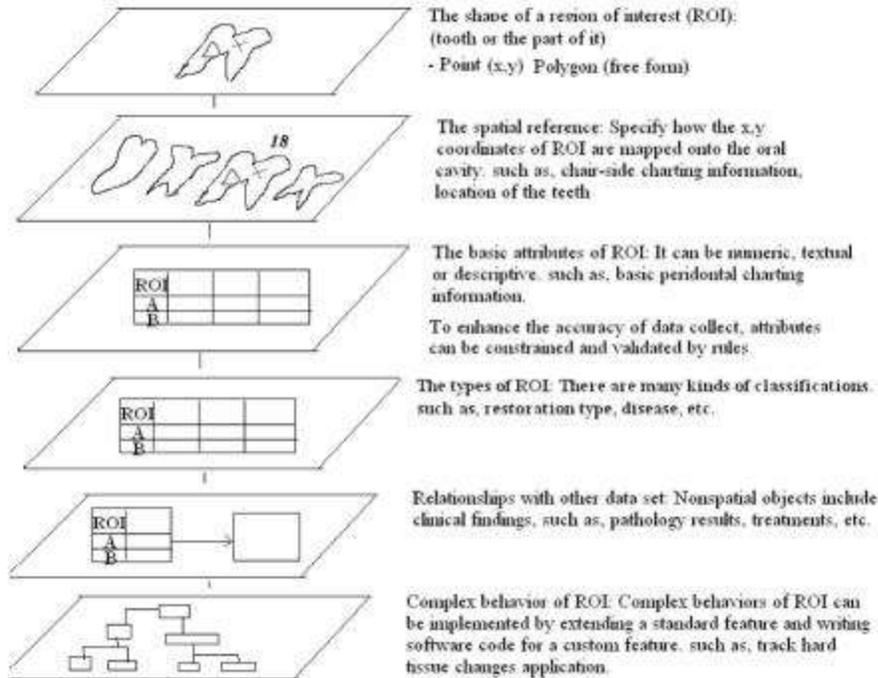
Figure 1: the multi-layer data model for spatial–oriented EMR for dentistry

Discussion

This data model is capable of supporting complex dental diagnosis and treatment, so specialized dental applications can be developed in this platform as well. For example, when the information about a hard-tissue is well classified and documented, a defined set of clinical rules can be created in the last level to track hard-tissue changes over time. A prototype system will be developed and demonstrated via a touch screen monitor at the end of the project.

References

1. Ackerman MJ, Spitzer VM, Scherzinger AL, Whitlock DG. The Visible Human data set: an image resource for anatomical visualization. Medinfo. 1995;8(Pt 2):1195–8.