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Digital Dentistry

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Abstract

To date, there has been various softwares used in the field of dentistry as a whole be it in the case history, imaging and in clinical practice management (PM). This article classifies the different types of dental softwares and gives an overview of the different softwares available and used in dentistry across the world with a brief note on its history. We highlight the different dental softwares available for various imaging modalities, PM and easy diagnostics in the field of dentistry. It also gives an insight into the future with different kinds of dental softwares used in the field of dentistry.

Keywords: Dental hardwares, Dental software, digital imaging

INTRODUCTION

The term dental software defines softwares used in dentistry. Computer software or just software is any set of machine-readable instructions (most often in the form of a computer programme) that directs a computer's processor to perform specific operations.

Software refers to one or more computer programmes and data held in the storage of the computer. In other words, software is a set of programmes, procedures, algorithms and its documentation concerned with the operation of a data processing system.

On most computer platforms, software can be grouped into a few broad categories as follows:
- System software: It is the basic software needed for a computer to operate (most notably the operating system)
- Application software: It is all the software that uses the computer system to perform useful work beyond the operation of the computer itself
- Embedded software: It resides as firmware within embedded systems, devices dedicated to a single use.

HISTORY

The history of the development of the dental software is brief. For the first time, the computers have been used in the dental medicine in the 1960s.[1] Since then, computers and information technologies spread progressively in the dental practice. The statistical data of dentists using computers in the United States were 1% in the year 2000, which was found to increase ever since then, according to Atkinson *et al.*[2]

CLASSIFICATION OF SOFTWARE USED IN DENTISTRY

There are many types of dental software in the dependence of specific task that they do to help the dental practice.
- One classification is given from Schleyer and Kirshner.[3] They categorise three main categories of dental software as follows:
  1. Administrative
  2. Clinical
  3. For the Internet.
- The clinical category from other side is categorised as follows:
  1. Electronic dental records
  2. Electronic dental designs
  3. Dental imaging software and
  4. Software used for diagnostics and treatment.
- Zimmerman *et al.*[4] recognises the following types of computer software, depending on their task:
  1. Administration and management of patient documentation

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2. Electronic archives of the documentation
3. Telecommunication computer-aided education is computerising instruments and techniques in the dental office software helping the clinical decision-making.

All classifications of dental software are relative since there are many software products designed for realising more than one task.

A larger classification based on the specific task shows more types of tasks and software.

This classification of dental software is as follows:
- Dental administration management
- Dental practitioners record management
- Dental schedules and dental scheduling
- Patient dental records management
- Dental billing
- Dental imaging processing
- Dental diagnostics
- Dental treatment helping
- Computer-aided dental education
- Software for usage of dental instruments and other techniques used in the dental practice.

DENTAL IMAGE PROCESSING SOFTWARE

The dental imaging processing software or imaging software defines software used for creating, processing, viewing and storing dental radiographs (X-rays), intraoral and extraoral images. In general, dental imaging software is included in the product package of dental radiographic devices or can be purchased separately.

The most imaging software follows digital imaging and communications in medicine format.

There are several types of imaging software as follows:
1. Manufacturer proprietary
2. Open hardware
3. Practice management (PM) linked
4. Native.

Manufacturer proprietary

There are many dental hardware manufacturers that produce their own imaging software. A few even have their own PM solutions that integrate very tightly between the two products to produce a near seamless environment (which can fall under PM linked-see below). All have their own database engines to help link and locate patient images, or they utilise a linked database structure from the PM software, which is known as bridging. In some cases, bridged imaging software cannot be utilised without the PM software operating in the background.

Manufacturer imaging software will have all the needed enhancements to make the X-rays their product produces look the best. In general, this sort of software comes free with the hardware and will have limited licensing usage or functionality unless an upgraded version is purchased. A couple of manufacturers will sell a full use, unlimited user license with their products. Most of the dental softwares are compatible only with the specific dental hardware manufacturers. Due to this, the dental provider is generally required to use the manufacturer's hardware and support.

Open hardware imaging

Some software vendors have created imaging software that will work with multiple hardware vendors and in some cases will produce derivative copies for manufacturers and PM vendors. Open hardware imaging (OHI) also focuses completely on the end result after taking an X-ray or intraoral/extraoral image.

All OHI software requires the manufacturer's software to be installed before usage. This insures the dental hardware's device software is operational and provides a default testing environment in the advent of a malfunction. It also provides a basis for the OHI software to obtain device settings.

Bridging to PM software is the most common way OHI can retrieve patient information for its own databases. Some PM vendors provide ways to integrate imaging into their software by use of creating toolbar buttons and other methods. In case the PM software does not have the direct bridge integration, the use of a data grabber or bridger is required.

OHI software generally works off of their own database engines, and therefore, requires their own database utilities. An advantage of this type of software is that if one part of the system fails, such as the PM software, the practice can continue to work and take images, which is what is used most of the time.

Practice management linked

PM linked (PML) imaging software provides the tightest integration with PM vendors software. Due to this, patient images can be displayed in the patient charting screens. This generally does not combine the imaging and PM databases, but some vendors claim that is the case. The most PML software is open to the most hardware vendors though generally the biggest brand names are accepted. Some PML vendors will not work with certain dental hardware manufacturers because of various contractual matters or preferences. Some popular brands of PM software favour certain hardware that they prefer to sell and thus have adjusted their imaging to work well with those devices. For all purposes, PML software behaves such as OHI software and can be used with other PM vendors.

Native

Imaging software that shares the same code as the PM software is native and does not require integration. As a result, the imaging software and the PM software utilise the same database. The manner in which the user seeks and obtains technical assistance may also be easier as there is only one vendor, one set of code and one database.

DENTAL DIAGNOSTICS HELPING SOFTWARE

The software products are usually based on technologies that try to simulate the human intellect called artificial intelligence.

The expert systems designed to enhance the diagnostic process are part of the dental expert systems software. Today for more appropriate definition is supposed to be decision support system and knowledge-based systems.

The only one software product designed to help the dentists with the diagnosis that can be found in the Internet is the diagnostic helper software.[5]

Dental Internet and Ethernet Communication Software

Telecommunication technologies found application in the medicine in the 1950s, which led to the defining of a new term 'telemedicine.' In 1997, Cook for the first time used the term 'teledentistry',[6] and he defines it as the practice to be used video conference technologies for diagnosis placement or consultations for the treatment from destination. Different variations of medical and dental data interchange using the Internet are developed.[7] It is expected this type of software to revolutionise the way for interchanging information between medical and dental practitioners. Today, the teledentistry includes activities such as information interchange by phone lines, fax machines and transfer of computer-based documents by the use of the Internet. There are also special software products, designed especially for communication and information interchange between dentists, and software products specially designed to access dental information by the use of the Internet.

Free Dental Software

There are several types of free dental software as follows:
1. Shareware
2. Freeware and
3. Open source dental software.

Shareware is the most frequently used free dental software.

A licensed unlimited freeware dental software is available in the Internet.[8]

A well-developed open source dental project is available in the Internet.[9]

However, even with open source, the open dental software is not absolutely free, because it uses third-party intellectual properties, for which dentists have to pay for its usage.

Imaging and Management Software

Dolphin Imaging and Management Solutions provides high-quality imaging, diagnostic and case presentation software for dental specialty professionals worldwide. Dolphin products tightly integrate with digital X-ray units, cone beam computed tomography systems, telephonic solutions and web-enabled applications and are compatible with the latest operating systems and computers including Intel-based Macintosh computers.

Dental Software Versus Special Formats

Parallel with the development of the dental software many software products, which are not originally created as medical or dental software, were adjusted to work for dental purposes. In many cases, these adjustments were successful. For example, the patient database software in many dental offices were replaced by the software products for general database management, such as Microsoft Access, Microsoft Excel and the legally free distributed Open Office variations of the above. Access and Excel files, structured according to the need of the patient management (defining fields as Patient Name, Ambulatory Number, Diagnose, etc.,) in many cases are sufficient to represent functional, secure, powerful and intuitive for the usage patients database, powerful concurrence of the expensive dental patient management software products. The disability of the text-processing software to write the numbers of the dental teeth graphically (and thus unable to write and print dental patient reports) was overcame by the creation of dental fonts, that can be used in Microsoft Word and legally free text-processing software products, such as Open Office Write and AbiWord.

Readily made forms for dental patient report writing and printing appeared to be sufficient for the generation (by the dental practitioner, not automatically) dental patient records and their printing. Dental schedules management software can in a high degree be replaced with standard schedule management software projects, created for schedule management for general purposes, some of which can legally be downloaded for free.

For processing of dental images were used many software products for general image processing, such as Adobe Photoshop and Irfwan View. Processing dental images with software products for general pictures processing proved to be powerful, easy to use, reliable and much cheaper.

Dental treatment planning software was 'replaced' with legally scanned and legally purchased through the Internet books over the treatment topic, opened with e-books opening software and shortcuts, and designed to open the book on specific pages. Dental bills are calculated using Microsoft excel sheets instead of dental billing softwares.

Many dentists are successful in receiving computer-aided dental education without the usage of software for this purpose, by finding and purchasing e-books, lectures from the websites of medical universities, browsing the Medline and other medical and dental databases, using usual e-mail clients for communication through e-mail and materials interchange through e-mail, using internet explorer and other web browsers for participating in dental forums and using e-learning, that do not require the purchasing of software. So far now, the only type of dental software, for which special formats are not effective enough, is the diagnostics helping software.

RECOMMENDATIONS FOR CHOOSING THE APT DENTAL SOFTWARE

For choosing the best management software for their practice, the dentists should have many things in mind; however, the most important is whether the software fulfills the specific need of the dental practitioner. Another important advice to be considered is the usage of special format and degree in which the special format will satisfy the practitioner's requirements.

Dental imaging software has several factors to be considered as well and is dependent on the dentist's needs or wants. Some imaging software is proprietary and will accept very few outside hardware vendors, yet will produce good images for diagnosis. Others are more open and will work with a wide array of hardware and will have good image quality as well. Another factor is integration with the PM software and how well it can incorporate patient information into itself.

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