



### F3 The Use of Computer Image Recognition and Interpretation Software for Automated Dental Age Determination – A Proof of Concept

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After attending this presentation, attendees will understand why computer image recognition and interpretation software (CIRIS) have been defined as programs that allow a computer to interpret visual images and derive meaningful information from the data.

This presentation will impact the forensic community by demonstrating how the use of Computer Image Recognition and Interpretation Software (CIRIS) in forensic odontology could open the door to numerous new applications. As an unbiased and repeatable method of interpreting radiographs it will give the Department of Homeland Security a valuable new tool for rapid dental age determination. Furthermore, the ability to segment radiographs could eventually lead to automated coding of victims of a mass disaster and for more rapid method of identification by odontological means.

Computer image recognition and interpretation software (CIRIS) has been defined as programs that allow a computer to interpret visual images and derive meaningful information from the data. CIRIS systems have been utilized in a wide range of applications from automate goods inspection to autonomous navigation systems. Their use in homeland security for real-time facial recognition and automated interpretation of satellite data is well documented. Medical applications including interpretation of chest radiographs and automated mammographic mass detection are gradually entering wide spread use.

The application of CIRIS to forensic odontology has only recently begun. These systems utilize a process known as image segmentation to partition an image into multiple regions or segments based on similar values of pixels. The purpose of segmentation is to simplify the image information and more importantly to separate object from background by defining object boundaries in a process known as edge detection.

This presentation will show a proof of concept application of an image segmentation system to determine dental age based on a computer's ability to segment a panoramic radiographic image while creating biometric data of the wisdom teeth utilizing a method known as active contouring. Active contours or snakes may be regarded as autonomous processes which employ image coherence in order to identify and track various features of interest. These deformable contours have the ability to identify various object shapes within an image. Snakes have been utilized for segmentation, edge detection, and shape modeling.

The goal of the project was to attempt to identify teeth within dental radiographs and compare them to an image library. The methodology utilized in the program combines both global statistical information with local edge based information, and is thus very robust with respect to noise and initializations. Once the contours have been extracted they may be matched to a template library via various metrics in order to obtain age estimation values based on data published by Demirjian, Mincer, Senn and others.

#### **Computer Image Recognition, Dental Age Determination, Homeland Security**