

Neuron Network in developing software for identifying dental arch form

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Introduction

Despite wide acceptance of the idea that dental arch forms vary among individuals, there is a long orthodontic tradition of seeking a single ideal arch form. Dental arches are correlated with the dimensions and the shape of the face. This variation was caused by variation in tooth size, so that it is not the goal of orthodontic treatment to produce dental arches of a single ideal size and shape for everyone, Wijarnako(1999). Tooth size variations relate to ethnic groups and gender, Black (1902), Wheeler (1961), Lavelle (1972), Bailit (1975), Keene (1979), Bishara et al (1986).

The basic principle of dental arch form in orthodontic treatment, that the patient's original dental arch form should be preserved, Proffit (1986). Most thoughtful orthodontists have assumed that, this would place the teeth in a position of maximum stability. During orthodontic treatment, a lot of changes occurred within dental arches. Crowding and deformed dental arch form in malocclusion were not the actual original arch forms and size, so this condition can be changed during orthodontic treatment. At the end of the treatment, a good stability and normal function is expected, Graber (1966). The result of longitudinal study concerning stability of dental arch form showed that when intercanine and intermolar width had been changed during orthodontic treatment, there was a strong tendency for these teeth to return to their pre-treatment position, Bishara (1997). From the literatures, three basic qualitative dental arch forms have been described repeatedly as tapered, oval, and square.

Successful orthodontic treatment was based on comprehensive diagnosis and treatment plan. Diagnosis and treatment plan are based on clinical examination; dental cast, radiograph, face and profile analyses. The dental cast analysis was time consuming procedures. Nevertheless, it was a vital part of diagnosis and important for treatment planning, Ranly (1988). Software to replace dental cast analysis has not been used widely. OrthoCAD, Zilberman et al (2003), Hayasaki et al (2005) and three-dimensional cast analysis were difficult and expensive. UTHSCSA Image Tool is a free image processing and analysis program for Microsoft Windows 95™ or Windows NT™. Image Tool can acquire, display, edit, analyze, process, compress, save and print 8 and 16 gray scale and up to 24 bit color images, Wilcox et al (2002). This software can be applied to measure scanned-dental cast. Dental cast can be transformed with scanner, Taner et al (2004) or digital camera, Sondhi et al (1980). Transformed data is analyzed applying artificial neuron network. Traditionally, artificial neuron network refers to a network of biological neurons. Now, it refers to a computer model of an interconnected group of artificial neurons that uses a mathematical or computational model for information processing based on a connectionist approach to computation, Kusumoputro (2001).

The objective of this study was to develop diagnostic reference for dental arch form qualitatively using artificial neuron network from tooth size and dental arch dimension