UNIVERSITI TEKNOLOGI MARA

MODELLING OF DENTAL GEOMETRY CONFIGURATION

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ABSTRACT

In dentistry, determining the position and orientation for each tooth is mostly based on orthodontic qualitative perception. There is no standard method to obtain those values especially in three dimensional (3D) image which gives difficulty in some complicated cases. This study characterized and modeled a dental occlusal geometry structure, formulated methodology for dental position and orientation movement, and also demonstrated the concept of methodology. Based from images in CBCT scan software, 3D model of teeth was created using 3D modelling software to get a clearer view of teeth features. Every dental features are observed to find the best point in defining centroid for tooth. After defining the centroid, measurement tools in CBCT scan software were used to get the value needed directly from CBCT scan image. Using robot arm movement concept as reference, the methodology of position and orientation were formulated. Result from this study concluded that the centroid for one root teeth is defined as 1/3 of root to crown end. For teeth with two or more roots, the centroid is defined as the bifurcation point of tooth. Using that centroid, teeth position and orientation are obtained referred to reference frame which is the cone beam coordinate system in CBCT scan software. Transformation matrix was used to formulate the teeth orientation and position. From image processing software, data obtained were compared. There were some differences.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF PROJECT

Dental and occlusal rehabilitation mostly depends on the perception of the dentist in the assessment. To improve the result of dental rehabilitation, there are efforts to formulate a scientific basis for clinical observations. The attempt to create a balanced occlusion has led to the development of geometric schemes and mathematical models of dental system[1]. Currently, those models serve only as a visual reference but do not give a precise measure of the discrepancy of individual patient that needs to be corrected. As the result, the procedures can be time consuming. The patient does not have the final visual appearance of the teeth after the procedure. So, a detailed understanding of the complexity of dental geometry system is important for planning a successful dental and occlusal rehabilitation. A more accurate three dimensional model of dental geometry is required to improve the current occlusal rehabilitation. To address these issues, there is a need to establish a new model of dental occlusion. Recent advanced scanning and imaging technology can provide aid in formulating a more accurate model of occlusal geometric structure and can be developed and customized according to the need of each individual patient. It can be used to view internal structures and accurately locate dental fixtures, implants and orthodontic devices. This will result in fewer forces and moments in the process of dental rehabilitation that can lead to less pain and trauma. Furthermore, this model can also be used to calibrate the dental fixture structures, dimensions and shapes according to the exact requirements of individual patient's dental anatomy. Knowledge of this model can be used to characterize the human dental functionality, aesthetic and phonetics. This will furnish the base for the comprehensive bioinformatics model of the geometrical features of dental occlusion.