Development of a System for Designing Customized Dental Implants

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Abstract

Teeth are essential for chewing and play an important role in speech generation. This research presents the novel development of a system for designing and manufacturing dental implants based on CAD/CAM software systems. The research aims to generate a dental implants designing platform for meeting diverse specific patients’ different tooth cavity profiles requirement on replacement. The system is used to design replacement dental implants which will have occlusal contacts just like the occlusal contacts possessed by natural teeth. The approach used include using a suitable image mapping technique to achieve an exact shape of the tooth cavity area, in a two dimensional scan, onto which the implant is to be placed. This is succeeded by processing the 2D scan into an accurate 3D model and then using the 3D model, which clearly shows the tooth cavity, to design the suitable implant. Experimental simulation results achieved show that through utilizing the CAD/CAM system developed orthodontists and dental technicians can exploit computer power in the designing and fabrication of durable and precise dental restorations in reasonably short time and cost-effectively.

Keywords
Dental: implants; development; image: mapping

Biography
Njabulo Mangena is a former student at the National University of Science and Technology (2009-2014). He earned B. Eng hons in Industrial and Manufacturing Engineering from the National University of Science and Technology, Zimbabwe. He has published a journal paper based on his final year project and is interested in research projects in bio-engineering, operations research, advanced manufacturing technology and computer aided design/computer aided manufacturing. He is a member of the Zimbabwe Institute of Engineers (ZIE)
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**Samson Mhlanga** is a senior lecturer at the National University of Science and Technology (NUST), Chairman of Department of Industrial and Manufacturing Engineering. PhD Candidate at University of Johannesburg (UJ), South Africa. He holds an MSc in Advanced Manufacturing Systems (Brunel, UK, 1997), and BEng in Industrial Engineering (NUST, ZW 1995). He has edited two conference proceedings Manufacturing Processes, Systems and Operations Management (MPSOM 2002) and Appropriate Technology 2004, co-authored over 18 journal papers, presented and published over 50 refereed research papers at conferences. Research interests are in; Manufacturing Systems Optimization, Engineering Management, Simulation and Modelling.

**Nicholas Tayisepi** is a Master level Industro-Mechanical Engineer and is currently lecturing in the department of Industrial and Manufacturing Engineering at the National University of Science and Technology in Zimbabwe. A strong advocate of hands-on based engineering learning and training, he involves his understudies in a variety industrial field based learning, problem solving and technologically-infused scientific experimental activities which provides the trainees the opportunities to apply in live industrial applications their knowledge acquisition process. Nicholas’ current research interests focus on the development of sustainable production systems through enhancing energy use efficiency and optimization in the manufacturing processes of light hard alloy metals. Renewable energy use is a key point his current work thrust also. Nicholas worked in the manufacturing industry before joining training in both the Polytechnic and university environment. He is currently working on the final stages of his PhD candidacy in Mechanical Engineering.