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88: FRAMEWORK OF AN ESTIMATION ALGORITHM OF TIME VARYING MULTIJOINT HUMAN ARM VISCOELASTICITY	113
Parallel Session 10 (14:00 - 15:30)	113
Room MEDITERRÁNEO - BIODEVICES	113
26: DEVELOPMENT OF AN INTEGRATED ELECTRICAL STIMULATION SYSTEM WITH FEEDBACK FOR PHYSICAL REHABILITATION	113
27: DESIGN OF A PORTABLE ELECTROMYOGRAPHY DEVICE FOR BACK HERNIATED PATIENTS	113
59: INTEGRATION OF SMART USER INTERFACES IN THE NAVIGATION SYSTEM OF POWERED WHEELCHAIRS	114
70: PRACTICAL DESIGN OF FULL BODY EXOSKELETONS - Stretching the Limits of Weight and Power	114
Special Session on Rapid Prototyping for Improving the Development of Biodevices (14:00 - 15:30)	114
Room ALBUFERA	114
5: MIRACLE: A CAD/CAM SYSTEM FOR THE MANUFACTURE OF DENTAL SURGICAL SPLINTS	114
8: RAPID PROTOTYPING OF 3D ANATOMICAL MODELS TO HEMODYNAMIC STUDIES	115
3: THE ROLE OF THREE-DIMENSIONAL SCAFFOLDS IN THE REGENERATION OF JOINT CARTILAGE	115
6: INTELLIGENT EXPANDABLE STRUCTURES BASED ON THE IMPROVED ACTIVATION OF SHAPE-MEMORY POLYMERS	116
Poster Session 3 (15:30 - 16:00)	116
MARYLIN Y TURIA - HEALTHINF	116
91: HEALTHCARE INFORMATION SYSTEMS IN A NETWORK ENVIRONMENT - An Interoperability Model and a Real Case in a Pathology Network	116
116: WEB-BASED AND CONTEXT-SENSITIVE, MOBILE GEO-TOOLS TO SUPPORT SPATIAL DECISION MAKING IN HEALTH AND EMERGENCY MANAGEMENT	117
119: REAL-TIME 3D FILTERING OF ULTRASOUND DATASETS	117
124: CAN WE IMPROVE THE ACCEPTANCE OF E-HEALTHCARE SERVICES BY ELDERLY PEOPLE?	117
126: OPTIMIZED DATA MIGRATION WITHIN A MEDICAL GRID	117
128: MODELLING STABILOMETRIC TIME SERIES	118
MARYLIN Y TURIA - BIODEVICES	118
49: DEVELOPMENT OF A BIODIAGNOSTIC DEVICE ASSAY FOR COAGULATION MONITORING	118
54: PRESELECTION OF NEUROSTIMULATION WAVEFORMS FOR VISUAL PROSTHESES USING GENETIC ALGORITHMS	119
56: LOW NOISE MEASUREMENT OF PHOTOCURRENT FOR CONTINUOUS GLUCOSE MONITORING - Low Noise Measurement System Enables Continuous Monitoring of Glucose in Subcutaneous Interstitial Fluid	119
64: CAPACITIVE SENSING FOR PULSE RATE MONITORING	119
79: LOW-VOLTAGE SCRATCH-DRIVE MICRO-SCALPELS CONTROLLED BY A BINARY-ENCODED SIGNAL	119
MARYLIN Y TURIA - BIO SIGNALS	120
46: HEART-RATE ADAPTIVE MATCH FILTER BASED PROCEDURE FOR AUTOMATIC DETECTION OF T-WAVE ALTERNANS FROM 24-HOUR ECG RECORDINGS - Issues Related to Filter Implementation	120
81: FUZZY HYPER-CLUSTERING FOR PATTERN CLASSIFICATION IN MICROARRAY GENE EXPRESSION DATA ANALYSIS	120
97: FREQUENCY BANDS EFFECTS ON QRS DETECTION	120
101: PREREQUISITES FOR AFFECTIVE SIGNAL PROCESSING (ASP) - PART III	121
130: TOWARDS COMPUTER DIAGNOSIS OF LARYNGOPATHIES BASED ON SPEECH SPECTRUM ANALYSIS - A Preliminary Approach	121
135: ON SUPERVISED METRICS FOR SHAPE SEGMENTATION	121
MARYLIN Y TURIA - BIOINFORMATICS	121
59: RECURSIVE BAYESIAN NETS FOR PREDICTION, EXPLANATION AND CONTROL IN CANCER SCIENCE - A Position Paper	121
61: PICNIC - Portal-based Platform for MRI Processing of Neurodegenerative Diseases	122

dental implants and prostheses before its surgical implantation enabling a re-design process. This paper is focused on the CAD/CAM subsystem developed in order to automatize the process of manufacturing surgical guides using several 3D models of the patient dental anatomy. A summarized version of the image processing step will be also presented. The CAD/CAM subsystem has been clinically validated achieving mean errors less than 5 degrees in the placement of the prosthetic crowns.

Paper 8 Special Session RAPID-Bio
14:00 - 15:30 Room ALBUFERA
Special Session on Rapid Prototyping for
Improving the Development of Biodevices

RAPID PROTOTYPING OF 3D ANATOMICAL MODELS TO HEMODYNAMIC STUDIES

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Keywords: Carotid, Rapid prototyping, FDM, TDP, PDMS, Hemodynamics.

Abstract: The purpose of this work is mainly to manufacture several anatomical models in a polymeric material – polydimethylsiloxane (PDMS) to study the blood flow through a carotid artery bifurcation. Over the last few decades, research has been shown that the geometry of the carotid artery is closely related to the development of serious cardiovascular diseases. Hence, there is a considerable interest in the development of in vitro experimental techniques able to obtain accurate measurements of the blood flow behavior through a realistic carotid artery. In this study we decide to apply rapid prototyping (RP) technologies combined with a PDMS casting technique in order to fabricate an anatomically realistic model of a human carotid to investigate, in a near future, the effect of the geometry on the local hemodynamics and consequently improve the understanding of the origin and development of these pathologies. Based on a human carotid computerized tomography (TC) it has been developed a 3D model through the application of two rapid prototyping techniques – Fused Deposition Modeling (FDM) and Tridimensional

Printing (TDP). By combining the rapid prototyping techniques with a PDMS casting technique it was possible at the end to obtain an anatomically transparent model of a human carotid artery made by an elastomeric material, i.e. PDMS. Hence, we believe that this combination is a promising technique to perform in vitro blood studies through anatomically realistic models, such as a carotid artery.

Paper 3 Special Session RAPID-Bio
14:00 - 15:30 Room ALBUFERA
Special Session on Rapid Prototyping for
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THE ROLE OF THREE-DIMENSIONAL SCAFFOLDS IN THE REGENERATION OF JOINT CARTILAGE

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Keywords: Three-dimensional scaffolds, Chondrocytes, Joint cartilage, Rabbit model.

Abstract: A variety of polymer scaffolds with pore architecture consisting of interconnected spherical pores with the same architecture but varying mechanical properties (in particular elastic modulus), water sorption capacity, pore surface characteristics (surface tension, presence of hydrophilic groups or electric charges) was prepared and implanted in a 3mm diameter full thickness defects in the knee joint cartilage of rabbits in order to show the influence of the scaffold properties on the histological characteristics of the regenerated tissue.