

Abstract: The present study affords emotional differentiation in speech from the behaviour of the biomechanical stiffness estimates in voice, regarding dispersion and cyclicity. The Glottal Cyclic Parameters are derived from the vibrato correlates found in the Glottal Source reconstructed from the phonated parts of speech and have been shown to be good indices to neurologic disease detection and monitoring. In this paper the application of these parameters to the characterization of the emotional states affecting a speaker when expressing truth opposite to when they believe not saying the truth is explored. The study is based on the reconstruction of the vocal fold stiffness parameters and in the detection of possible deviations induced by emotional tremor and stress from a baseline. The method is validated using results from the analysis of a gender-balanced speaker's database. Normative values for the different parameters estimated are given and used in contrastive studies of some cases presented to discussion.

A Better Understanding of Esophageal Speech Excitation Source Behavior

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Keywords: Esophageal Speech, Excitation Source, Esophagus Extremity Vibration, Opening/Closing Cycle.

Abstract: Understanding the excitation source of the esophageal speech is a key approach for understanding the esophageal speech. In this paper, we extract the excitation source using an inverse filtering approach and we analyze it. We, for example, show some similarities with an artificial EGG signal. We also detect the closing instants in order to define cycles of opening/closing of esophagus extremity and to recognize the equivalent of glottal cycles. These cycles are classified into different types according to their characteristics. A physical explanation of the esophagus extremity behavior is systematically given at the different steps of the analysis.

Parallel Session 11
09:20 - 10:40
HEALTHINF
Room MR.08

A Roadmap to Implement a Quality Management System

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Keywords: Medical Devices, Software Process Improvement, Roadmaps, Quality Management System.

Abstract: In recent years the proportion and complexity of software in medical devices has increased considerably. This has presented an opportunity for software development organisations to expand into the medical device domain. Due to the high level of risk associated with medical devices, strict regulations must be adhered to in order to market such products. One key aspect of these regulations is the necessity to have in place a Quality Management System to help ensure an organisations' ability to consistently meet customer and regulatory requirements. This paper presents a roadmap which can be used to assist organisations, wishing to develop medical device software to implement a Quality Management System.

A Purpose Model and Policy Enforcement Engine for Usage Control in Distributed Healthcare Information System

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Keywords: UCON (Usage CONtrol), e-Health, Purpose, Policy Enforcement Engine.

Abstract: This paper addresses two issues: the purpose model designed for distributed healthcare and the purpose-based usage policy enforcement engine based on our purpose-based UCON (the extended UCON model). UCON has been proposed and applied to support security requirements in different computing environments such as resources sharing in collaborative computing systems and data control in remote users or platforms, but apparently absent in its core model is "purpose", which is important for formulating a more sound privacy sensitive policy. In this paper, by observing a lack of comprehensive enforcement mechanism for purpose, we extend the UCON core model to explicitly support purpose expression and then propose a usage purpose enforcement engine, particularly for ongoing-enforcement, applied in distributed healthcare information system.

A Comparison of Multivariate SARIMA and SVM Models for Emergency Department Admission Prediction

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Keywords: Forecasting, Emergency Service, Emergency Department, Hospital, Operations Research, SVM, Time Series Analysis, ARIMA, SARIMA.

Abstract: A comparison of multivariate SARIMA model with a multivariate regression-based time series based on a Support Vector Machine model was performed for emergency department admissions prediction. The same input variables were used in both models. Both models were trained with consecutive daily samples of data corresponding to the January 2009 - August 2012 period (n=1339). Performance was evaluated on the September 2012 test dataset (n=30). The results obtained with the Support Vector Machine were found to be more accurate with a 46,53% RMSE improvement and a 48,89% MAE improvement on the train set. The experiment was repeated six times with varying time periods. The SVM approach produced better results in all cases. Error measurements on the test set were compared with a paired T test. The differences between all comparisons were found to be statistically significant in all cases with a 95% CI.

Poster Session 4
10:40 - 11:30
BIODEVICES
Foyer

Optical Fiber Probe as a Source of Errors and Uncertainty in Measurements for Optical Noninvasive Diagnostic Devices and Techniques

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Keywords: Optics, Laser, Diagnostics, Results, Spectroscopy, Noninvasive, Medicine, Fiber, Measurements, Error, Uncertainty, Dispersion, Metrology.

Abstract: Over the last 10-15 years a large amount of methods and devices of noninvasive medical spectrophotometry including such techniques as *in vivo* Laser Fluorescent Diagnostics, Tissues Reflectance Oximetry, Laser Doppler Flowmetry, etc. has been developed and involved in a real clinical practice. In that number several problems of accuracy and reproducibility of clinical diagnostic results have been under discussion as well. But systematic metrological research in this field is still unknown. What dispersions and errors in diagnostic data can be estimated if measurements will be executed on the same object several times, by several doctors with different qualifications or using several devices from both the same and a different manufacturer? In this paper some results of the complex study of errors and uncertainties in diagnostic data caused by using an optical multi-fibers probe are presented. Dispersion and errors up to a level of +/-36,3% for the average registered values were discovered. It is shown that the interactive component of errors caused by interaction of the probe and a surveyed object gives the main contribution to the total uncertainty in diagnostic data.

Algorithmic Surface Extraction from MRI Data Modelling the Human Vocal Tract

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Keywords: MRI, 3D Image Processing, Automatic Surface Extraction, FEM Meshing, Physical Modelling.

Abstract: A procedure for the vectorisation and feature extraction of the human vocal tract is proposed. The raw data is obtained by high resolution 3D MRI. Because the amount of manual work in the data processing has been minimised, large datasets can be treated. The vectorised data can be used for both numerical as well as physical modelling of the vocal tract biophysics, including speech and applications in medicine.

Reverse Translational Research

How Clinical Trials on Fluorescence Imaging for Vocal Cord Cancer Fuels Fundamental Research

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Keywords: Translational Research, Vocal Cords, Fluorescence Imaging.

Abstract: Translational research consists in translating fundamental research results as closely as possible to patients. Researchers sometimes underestimate these studies because it is thought that, although essential for setting up new investigation tools, they do not deepen fundamental knowledge. However, users face specific difficulties due to the variability of the biological systems under study. Variability is easily understood from one patient to another, but there is also variability in a single patient whose metabolism evolves together with therapeutic actions. Results obtained in translational research often depend on this variability, and new questions and scientific obstacles arise when research is applied to the real world. In order to address these new challenges, reverse translational research is required. Fundamental research is fuelled by the results of translational research. In this position paper, we consider vocal cord fluorescence imaging as an example of bi-directional translational research. First, we briefly recall the basics of fluorescence imaging, and we explain why commercial fluorescence systems lead to variable estimations of their efficiency by end-users. Second, we describe solutions intended to improve fluorescence techniques. This position paper will then make conclusions.

Pure-tone Audiogram

Measuring Auditory Sensitivity over the Age

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Keywords: Pure-tone Audiogram, Hearing Sensitivity, Ear.

Abstract: In this study a pure tone audiogram was developed under the Matlab® mathematical software. Audiogram measurements were performed to 35 subjects belonging to the female and male and aged between 10 and 88 years old. Some of the subjects with more advanced age had hearing problems over the course of age, however, none of them was carrying any type of hearing aid. The threshold of the Sound Pressure Level (SPL) was recorded under 12 pure tones between 125 Hz and 15 kHz. The developed pure-tone audiogram confirmed its ability to produce auditory brainstem responses (ABRs). Statistical analysis of the SPL threshold shows no differences between genders and confirms the correlation between age and loss of sensitivity, more accentuated for higher frequency tones. A strong loss of sensitivity was observed after the decade of 60 years old.

Poster Session 4
10:40 - 11:30
BIOSIGNALS
Foyer

On the Accuracy of Representing Heartbeats with Hermite Basis Functions

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Keywords: Heartbeat Representation, Hermite Functions, ECG.

Abstract: Automatic ECG analysis requires choosing a representation for heartbeats. A common approach is using some basis of functions to represent the heartbeat as a linear combination of these functions. The coefficients of the linear combination are used as the features that represent the heartbeat, providing a very compact representation. The most used basis of functions is the one made up of the Hermite functions. Some authors have used as few as 3 Hermite polynomials to represent each heartbeat, while others have used as many as 20. Often little or no justification for the choice of the number of polynomials is given. This paper aims to analyze the impact of using a certain number