Analysis and development of techniques and methods in medical practice in cochlear implant systems

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Abstract Cochlear implant methods are the area of interest and intensive medical and technical efforts for investigations, analysis, implementation, testing and finally producing more and more precise and effective cochlear implant prosthesis. The goals of this article are first to present the cochlear implant system in historical plan, then to analyze some of the existing signal processing strategies in cochlear implant systems, which leads to the decision of the importance of filter bank design for the precision of the signal processing in the cochlear implant algorithms and practical implementations. It is presented a detailed description and critical comparison of the most useful types of cochlear filter banks and as the results from the analysis some useful conclusion are presented for the cochlear filter banks characteristics, time consuming in calculation, the importance for overall cochlear implants quality of speech sound processing, etc. The defined in conclusion assertions are accepted as the basis of future investigations in area of new cochlear implant model development.

Keywords Cochlear implant, Signal processing strategies in cochlear implant, Cochlear filter banks, auditory prosthesis, electric stimulation

1. Introduction

In historical plan the cochlear implant devices are developed as it is shown in Table I. Three phases defining the major events in the development of cochlear implants [1]. The conceptualization phases demonstrated the feasibility of electric stimulation. The research and development phase legitimized the utility and safety of electric stimulation. The commercialization phase saw a wide spread use of electric stimulation in treating sensor neural hearing loss (Table I).

The listed above important comparative inferences for the existing cochlear bank filter models conduct to the decision for the future investigations in area of new cochlear implant model development and testing, combining the realism of the physical cochlear filter bank models with the sound signal processing capabilities of the artificial cochlear filter bank models for implementation in cochlear implants prostheses.

Acknowledgments Research in the subject has recently commenced through a NIS TU-Sofia funded project, No:121ПД 0063-07

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