

MECHATRONICS

BOOK SERIES

SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 2

Editors

Md. Raisuddin Khan

Md. Mozasser Rahman

Muhammad Mahbubur Rashid

Shahrul Na'im Sidek



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CHAPTER 28

DIGITAL HEARING AIDS ANALYSIS AND IMPLEMENTATION

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28.1 Introduction

In this chapter, the basic understanding of Digital Hearing Aids System is introduced. It begins with a brief overview of hearing aid that is available nowadays. Basic approach of all hearing aids is also been described in this chapter. The differences between digital and analog hearing aid in the design to assist in optimizing perception of speech or other sounds are presented. Advantages of Digital Hearing Aids System over Analog Hearing Aids System are also highlighted. The implementation of Digital Hearing Aid System (DHA) in a MATLAB is shown. Basically, MATLAB is used to simulate the Digital Hearing Aid System which comprises Noise Reduction Filter, Frequency Shaping Filter and Amplitude Compression filter.

A hearing aid is an electronic device that makes sounds louder and can help to offset hearing loss. The aim of the hearing aid is to amplify sound signals in such a way that they become audible for the hearing impaired person. Although there are several different types and sizes of hearing aids, they all contain the same basic elements or components such as *Microphone* that changes sound into electrical signals, *Amplifier* which increases the intensity of the signal, *Receiver* changes the amplified signal back into sound and *Battery* provides the power source for the hearing aid. The working principle in basic hearing aid or analog hearing aid is simple. The microphone firstly will picks up the sound signals and transforms them into electrical signals. These electrical signals will then be amplified by a circuit that processes the signals before send the amplified signal to the receiver. However, bear in mind that, in all hearing aids, sound enters through a microphone, is processed and amplified and then delivered to a receiver (loudspeaker). Analogue hearing aids amplify sound signals picked up by a microphone and convert them into small electrical signals. These signals are transmitted into the ear in real time. They can be altered according to the needs of the individual user within the limits of the analogue.

Today, digital technology is very much a part of daily life. Most households have a variety of digital products, such as telephones, video recorders and personal computers. Hearing aids also was benefited from the emergence of digital technology. Nowadays, many modern hearing aids use digital technology. These are quite different from analogue hearing aids. They transform the sound, convert it into bits, and manipulate it before amplifying the signal. This type of technology is similar to that used in a CD player. A digital hearing aid can be programmed. This means that digital hearing aids can be individually adjusted to suit the specific user by means of a small computer Digital