INTERFACING ELECTRONIC FOR MEASUREMENT, SIGNAL PROCESSING AND WIRELESS COMMUNICATION

Edited by

Sheroz Khan, International Islamic University Malaysia

AHM Zahirul Alam, International Islamic University Malaysia

Anis Nurashikin Nordin, International Islamic University Malaysia

IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

INTERFACING ELECTRONIC FOR MEASUREMENT, SIGNAL PROCESSING AND WIRELESS COMMUNICATION

Edited by

Sheroz Khan, International Islamic University Malaysia

AHM Zahirul Alam, International Islamic University Malaysia

Anis Nurashikin Nordin, International Islamic University Malaysia

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Sheroz Khan, AHM Zahirul Alam & Anis Nurashikin Nordin: Interfacing Electronic for Measurement, Signal Processing and Wireless Communication.

ISBN: 978-967-418-171-0

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed By:
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

CONTENTS

Chapter	Title	Page
1	INDUCTIVE SENSOR Atika Arshad, RumanaTasnim, Sheroz Khan, AHM Zahirul Alam	1
2	WIRELESS TRANSFER OF LOW-POWER TO IMPLANTED BIOMEDICAL DEVICES: INTRODUCTION AND 2-D COIL PARAMETERS Imran M. Khan, Sheroz Khan , Othman O. Khalifa	8
3	WIRELESS TRANSFER OF POWER TO LOW-POWER IMPLANTED BIOMEDICAL DEVICES: 3-DIMENSIONAL COIL DESIGN CONSIDERATIONS Imran M. Khan, Sheroz Khan, Othman O. Khalifa	14
4	WIRELESS TRANSFER OF LOW-POWER TO IMPLANTED BIOMEDICAL DEVICES: INDUCTIVE LINK DESIGN Imran M. Khan, Aminullah Khan, Sheroz Khan, Othman O. Khalifa	22
5	WIRELESS TRANSFER OF LOW-POWER TO IMPLANTED BIOMEDICAL DEVICES: RECTIFIER DESIGN Imran M. Khan, Sheroz Khan, Othman O. Khalifa	28
6	DATA CONVERSION BASIC CONCEPTS Ma Li Ya, Sheroz Khan, Anis Nurashikin	36
7	NYQUIST-RATE ANALOG-TO-DIGITAL CONVERTER Ma Li Ya, Sheroz Khan, Anis Nurashikin	41
8	OVERSAMPLING ANALOG-TO-DIGITAL CONVERTER Ma Li Ya, Sheroz Khan, Anis Nurashikin	47
9	SWITCHED-CAPACITOR INTEGRATOR DESIGN Ma Li Ya, Sheroz Khan, Anis Nurashikin	53
10	CMOS OPERATIONAL AMPLIFIER DESIGN Ma Li Ya, Sheroz Khan, Anis Nurashikin	60

11	DIGITAL-TO-ANALOG CONVERTER Ma Li Ya, Sheroz Khan, Anis Nurashikin	68
12	CONVETERS RESULTS VERIFICATIONS Ma Li Ya, Sheroz Khan, Anis Nurashikin	73
13	DEVELOPMENT OF WEARABLE REFLECTANCE PULSE OXIMETRY FOR TELEHEALTH MONITORING SYSTEM Muhammad Arham, Syed Zulfauzi, Othman O. Khalifa	77
14	DESIGN OF CAPACITIVE MEASURING SYSTEM FOR HIGH FREQUENCY BAND TRANSDUCER Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	83
15	PRINCIPLE OF CAPACITANCE TO VOLTAGE CONVERTER Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	89
16	CMOS OPERATIONAL AMPLIFIER TESTING FOR CAPACITIVE TO VOLTAGE CONVERTER Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	95
17	MATHEMATICAL MODEL FOR CONTACTLESS MEASUREMENT Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	102
18	FREQUENCY RESPONSE OF A CONTACTLESS MEASUREMENT Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	107
19	A MATHEMATICAL STUDY OF A THERMISTOR ASTABLE MULTIVIBRATOR IN A LINEARIZATION TECHNIQUE Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	113

20	A STUDY OF LINEARIZATION TECHNIQUE USING A NONLINEAR THERMISTOR Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan	117
21	COGNITIVE RADIO VS INTELLIGENT ANTENNA Siti Rabani Mat Nawi, Nurul Farhah Toha, Khaizuran Abdullah, M. Rafiqul Islam, Sheroz Khan	123
22	UWB PULSE GENERATION AND MODULATION CIRCUITS FOR BIOMEDICAL IMPLANTS Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan	134
23	UWB COMMUNICATIONS FOR BIOMEDICAL IMPLANTS Mokhaled M. Mohammed, Sheroz Khan, Jalel Chebil, Khalid A. S. Al-Khateeb, Imran Moez Khan	141
24	UWB PULSE GENERATION FOR BIOMEDICAL IMPLANTS Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan	145
25	ULTRA-WIDE BAND TECHNOLOGY Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan	149
26	MVL ADC DESIGN AND SIMULATION Soheli Farhana, AHM Zahirul Alam, Sheroz Khan	153
27	MVL DESIGN AND CURRENT MODE CIRCUIT ELEMENTS Soheli Farhana, AHM Zahirul Alam, Sheroz Khan	159
28	NOISE MODULATED CRYPTOGRAPHIC GENERATION FOR USE IN UWB WIRELESS COMMUNICATION Siti HazwaniYaacob, Sigit Puspito Wigati Jarot, Sheroz Khan	164
29	UWB PULSE GENERATION AND SHAPING: ANALYSIS AND SIMULATION RESULTS Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam	173

30 SIMULATIONS OF RESISTANCE VARIATIONS TO PULSE GENERATOR CIRCUITS 177
Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam
31 PULSE OXIMETRY DESIGN USING ARDUINO BOARD 184
Muhammad Arham, Syed Zulfauzi and Othman O. Khalifa

Chapter 23

UWB COMMUNICATION FOR BIOMEDICAL IMPLANTS

MOKHALED M., MOHAMMED, SHEROZ KHAN, JALEL CHEBIL, KHALED A. S. AL-KHATEEB, IMRAN MOEZ KHAN

Modulation is the process of changing a certain attribute (Amplitude, Phase, Frequency, etc...) of a signal to represent information to be transmitted. As with conventional communications, UWB communication system requires modulation to carry the information. In this chapter, we take an overlook over the concept of modulation, UWB modulation, highlighting the main techniques in UWB modulations and their applications.

23.1. MODULATION

As described above, the process of modulation is the operation of changing certain attribute of a carrier signal (or modulated signal ,a signal that would carry the information through the communications medium) with the baseband or information signal (modulator signal, a signal that represents information). The process of modulation in conventional narrow band communications happens through the multiplication of these two signals. The process of modulation employs the characteristics of the convolution process to multiply the signals. Convolution (folding together) of two signals is the process of integrating, adding, multiplying, and time shifting of two functions together. This is mathematically represented by:

$$(a * b)(t) = \int_{-\infty}^{\infty} a(\tau) b(t-\tau) d\tau \quad (1)$$

The most important characteristic of convolution that is very vital to communication systems is that the Fourier transform of convolution which is the point-wise product of the two functions. In other words, the convolution of two signals in one domain is equal to the point-wise multiplication in the other domain. This is given by:

$$F\{f * g\} = F\{f\} \cdot F\{g\} \quad (2)$$

Therefore, by multiplying the two signals in the time domain, the signals are convolved in the frequency domain. There are two main categories of modulation systems, namely: analog modulation and digital modulation. In digital modulation, the analog or continuous signal is modulated after discrete samples are taken in the process of analog to digital conversion. The discrete samples are taken in time in the process of sampling, and discrete values are taken for the amplitude of the signal in the process of quantization. Then the resulting digital signal is modulated, by the modulating signal, for transmission (Sudakshina, 2010).