

PRINCIPLES OF TRANSDUCER DEVICES AND COMPONENTS

Edited by

Sheroz Khan, International Islamic University Malaysia

Jalel Chebil, International Islamic University Malaysia

Othman O Khalifa, International Islamic University Malaysia



IIUM PRESS

PRINCIPLES OF TRANSDUCER DEVICES AND COMPONENTS

Edited by

Sheroz Khan, International Islamic University Malaysia

Jalel Chebil, International Islamic University Malaysia

Othman O Khalifa, International Islamic University Malaysia



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Sheroz Khan, Jalal Chebil & Othman Khalifa: Principles of Transducer
Devices and Components

ISBN: 978-967-418-172-7

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		Page No.
1	RC CIRCUIT RESPONSE <i>Atika Arshad, Rumana Tasnim, Sheroz Khan, AHM Zahirul Alam</i>	1
2	RL CIRCUIT RESPONSE <i>Rumana Tasnim, Atika Arshad, Sheroz Khan, Musse Mohamod</i>	7
3	RLC CIRCUIT RESPONSE <i>Rumana Tasnim, Atika Arshad, Sheroz Khan, Musse Mohamod</i>	13
4	CAPACITIVE SENSING FOR NON-CONTACT MEANS OF MEASUREMENT <i>Rumana Tasnim, Atika Arshad, Sheroz Khan, Musse Mohamod, Nazmus Saquib</i>	19
5	SENSORS IN ELECTRONIC APPLICATIONS <i>Rumana Tasnim, Atika Arshad, Sheroz Khan, Musse Mohamod</i>	27
6	CONTACT TYPE AND NONCONTACT TYPE GAS FLOW MEASURING SENSORS <i>Rumana Tasnim, Atika Arshad, Nazmus Saquib, Sheroz Khan, Musse Mohamod</i>	33
7	OUTPUT CONTROL DEVICES: ACTUATORS <i>Rumana Tasnim, Atika Arshad, Sheroz Khan, Musse Mohamod</i>	39
8	INDUCTIVE POWER SYSTEM FOR ENERGY HARVESTING <i>Atika Arshad, Rumana Tasnim, Sheroz Khan, AHM Zahirul Alam</i>	45
9	ON THE ELECTRODE ARRANGEMENTS OF CAPACITIVE SENSOR FOR TWO PHASE GAS FLOW MEASUREMENT <i>Rumana Tasnim, Atika Arshad, Sheroz Khan, Musse Mohamod</i>	53
10	BASIC CONCEPT OF INDUCTANCE FOR INDUCTIVE TRANSDUCERS <i>Atika Arshad, Rumana Tasnim, Sheroz Khan, AHM Zahirul Alam</i>	59
11	MAGNETIC PROPERTIES FOR MAGNETIC TRANSDUCER <i>Atika Arshad, Rumana Tasnim, Sheroz Khan, AHM Zahirul Alam</i>	65
12	MAGNETIC, HYSTERESIS THEORY: APPLICATION PERSPECTIVE <i>Atika Arshad, Rumana Tasnim, Sheroz Khan, AHM Zahirul Alam</i>	71

13	THE PRINCIPLE OF RESISTIVE SENSING <i>Atika Arshad, Rumana Tasnim, Sheroz Khan, AHM Zahirul Alam</i>	75
14	SPIKES BLOCKING AND SURGE PROTECTION <i>Ahmad Lutfi Torla, Sheroz Khan, Asan Gani</i>	83
15	VOLTAGE SUPPLY AND VOLTAGE REGULATION <i>Ahmad Lutfi Torla, Sheroz Khan, Asan Gani</i>	89
16	FULL-WAVE RECTIFICATION OF A LOW-VOLTAGE SOURCE <i>Ahmad Lutfi Torla, Sheroz Khan, Asan Gani</i>	99
17	DESIGN OF DIFFERENTIAL RESISTIVE MEASURING SYSTEM AND ITS APPLICATIONS <i>Deji Abdulwahab, Sheroz Khan, Jalel Chebil</i>	107
18	LINEARIZING TECHNIQUES FOR SENSOR OUTPUT <i>Mohammad Tahir Siddiqi, Sheroz Khan, Ummer Siddiqi</i>	115
19	SENSOR AND SENSOR RESPONSE-ISSUES AND INTERFACING <i>Syed Masrur Ahmmad, Sheroz Khan, Anis Nurashinkin, Md Rasiuddin Khan</i>	119
20	UWB PULSE GENERATION SHAPING AND ANALYSIS <i>Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam</i>	133
21	POWER SUPPLY POWER-SUPPLY INTERFERENCE IN SMART SENSORS-TO-MICRONROLLER INTERFACE FOR BIOMEDICAL SIGNALS <i>Mohammad Ashraful, Sheroz Khan, Muhammad Ibrahimy</i>	139
22	RESPONSE AND INACCURACY ISSUES OF SENSORS <i>Mohammad Ashraful, Sheroz Khan, Muhammad Ibrahimy</i>	165
23	PERFORMANCE IMPROVEMENT OF SENSORS RESPONSE USING PIECE-WISE NON-LINEAR (PWL) A/D AND PULSE-WIDTH MODULATION (PWM) A/D TECHNIQUES <i>Ismaila Tijani, Sheroz Khan</i>	175
24	POWER SUPPLY INTERFERENCE IN SMART SENSOR MICROCONTROLLER INTERFACE <i>Ismaila Tijani, Sheroz Khan</i>	185

25	2.45 GHz PASSIVE RFID TAG ANTENNA MOUNTING ON VARIOUS PLATFORMS <i>Abubeker A. Yussuf, Md Rafiqul Islam, Sheroz Khan, Othman O. Khalifa, AHM Zahirul Alam</i>	201
26	ANALYSIS OF HYBRID STEPPER MOTOR PERFORMANCE UNDER THE INFLUENCE OF VOLTAGE SUPPLY INTERFERENCE <i>Abdulazeez F. Salami, Wahab A. Lawal, Sheroz Khan, Teddy Surya Gunawan, Sigit Puspito Wigati Jarot</i>	217
27	PC SOUND CARD BASED INSTRUMENTATION AND CONTROL <i>Teddy Surya Gunawan</i>	229
28	PIECE-WISE LINEAR ANALOG TO DIGITAL (PLADC) CONVERTER PROCESS <i>Abdulazeez F. Salami, Wahab A. Lawal, Sheroz Khan, AHM Zahirul Alam</i>	239
29	DESIGN AND IMPLEMENTATION OF AN OPTIMAL FUZZY LOGIC CONTROLLER USING EGENTIC ALGORITHM <i>Salami Femi Abdulazeez, Lawal Wahab Adetunji, Sheroz Khan, AHM Zahirul Alam, Momoh Jimoh E. Salami, Shihab Ahmed Hameed, Aisha Hasan Abdalla and Mohd Rafiqul Islam</i>	249
30	DESIGN AND HARDWARE IMPLEMENTATION OF CONDITIONING CIRCUIT FOR ACCURATE READING FROM TRANSDUCERS WITH NONLINEAR RESPONSES <i>Khairul Hasan, Aliza Aini Md Ralib, Ma Li Ya, Atika Arshad, Sheroz Khan</i>	265
31	TRANSDUCERS-TO-MICROCONTROLLER INTERFACES-SOFTWARE SOLUTION APPROACH <i>Lawal Wahab Adetunji, Salami Femi Abdulaziz, Sheroz Khan, AHM Zahirul Alam, Mohammad Rafiqul Islam, Shihab A. Hameed and Aisha Hasan Abdalla</i>	277
32	WAVELET ANALYSIS OF THE ECG SIGNALS FOR THREE COMMON HEART DISEASES IN JORDAN <i>Jalel Chebil, Jamal Al Nabulsi</i>	291
33	FUNCTIONAL ELECTRICAL STIMULATION SYSTEM AND PROFILE FOR WALKING <i>Noreha Abdul Malik</i>	303

34	FUZZY LOGIC BASED TEMPERATURE CONTROL OF THERMOELECTRIC COOLER FOR SINGLE PHOTON AVALANCHE DIODE APPLICATION	311
	<i>Nurul Izzati Samsuddin, Salmiah Ahmad, Nurul Fadzlin Hasbullah</i>	
35	SPECTRUM SENSING FOR COGNITIVE RADIOS	317
	<i>Izyan Munyanti Abu Hanifah, Siti Natrah Che Rus, Sigit Puspito Wigati Jarot</i>	
36	COGNITIVE RADIO VS INTELLIGENT ANTENNA	327
	<i>Siti Rabani Mat Nawwi, Nurul Farhah Toha, Khaizuran Abdullah, M. Rafiqul Islam, Sheroz Khan</i>	
37	APPLICATION AND CASE STUDIES OF MAGNETIC INDUCTION	341
	<i>Atika Arshad, Rumana Tasnim, Sheroz Khan, A H M Zahirul Alam</i>	

Chapter 36

COGNITIVE RADIO VS INTELLIGENT ANTENNA

SITI RABANI MAT NAWI, NURUL FARHAH TOHA, KHAIZURAN ABDULLAH, M. RAFIQU
ISLAM, SHEROZ KHAN

36.0 DEFINITION

Cognitive Radio

Mobile radio systems have shown rapid growth and hence have increased the awareness for more efficient use of spectrum. With the advancements of technology, the development of radio systems which are dynamic and efficient in terms of spectrum usage can be realised. Cognitive radio coined by Joseph Mitola is one of the advancements which may enhance the adaptive capabilities of radio systems and may contribute to more efficient, versatile and flexible use of spectrum. It is based on software defined radio with added intelligent signal processing, ideally based on logic, analysis and intuition, though early cognitive radios need not meet that level of sophistication. Cognitive radio has the ability to sense its surrounding environment and detect spectrum holes or white spaces, namely unoccupied frequencies, which it can use, rather than a fixed frequency assigned to it by the spectrum manager or regulator, as is currently the case (Omar).

In the 1999 paper that first coined the term “cognitive radio”, Joseph Mitola III defines a cognitive radio as [1]: “A radio that employs model based reasoning to achieve a specified level of competence in radio-related domains.”

However, in his recent popularly cited paper that surveyed the state of cognitive radio, Simon Haykin defines a cognitive radio as [2]: “An intelligent wireless communication system that is aware of its surrounding environment (i.e., outside world), and uses the methodology of understanding-by-building to learn from the environment and adapt its internal states to statistical variations in the incoming RF stimuli by making corresponding changes in certain operating parameters (e.g., transmit-power, carrier frequency, and modulation strategy) in real-time, with two primary objectives in mind:

- Highly reliable communications whenever and wherever needed;
- Efficient utilization of the radio spectrum.