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

12 CONVERTERS RESULTS VERIFICATIONS
Ma Li Ya, Sheroz Khan, Anis Nurashikin

13 DEVELOPMENT OF WEARABLE REFLECTANCE PULSE OXIMETRY FOR TELEHEALTH MONITORING SYSTEM
Muhammad Arham, Syed Zulfauzi, Othman O. Khalifa

14 DESIGN OF CAPACITIVE MEASURING SYSTEM FOR HIGH FREQUENCY BAND TRANSDUCER
Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan

15 PRINCIPLE OF CAPACITANCE TO VOLTAGE CONVERTER
Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan

16 CMOS OPERATIONAL AMPLIFIER TESTING FOR CAPACITIVE TO VOLTAGE CONVERTER
Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan

17 MATHEMATICAL MODEL FOR CONTACTLESS MEASUREMENT
Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan

18 FREQUENCY RESPONSE OF A CONTACTLESS MEASUREMENT
Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan

19 A MATHEMATICAL STUDY OF A THERMISTOR ASTABLE MULTIVIBRATOR IN A LINEARIZATION TECHNIQUE
Nurul Arfah binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan
A STUDY OF LINEARIZATION TECHNIQUE USING A NONLINEAR THERMISTOR
Nurul Arfa binti Che Mustapha, AHM Zahirul Alam, Sheroz Khan

COGNITIVE RADIO VS INTELLIGENT ANTENNA
Siti Rabani Mat Nawi, Nurul Farhah Toha, Khaizuran Abdullah, M. Rafiql Islam, Sheroz Khan

UWB PULSE GENERATION AND MODULATION CIRCUITS FOR BIOMEDICAL IMPLANTS
Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan

UWB COMMUNICATIONS FOR BIOMEDICAL IMPLANTS
Mokhaled M. Mohammed, Sheroz Khan, Jalel Chebil, Khalid A. S. Al-Khateeb, Imran Moez Khan

UWB PULSE GENERATION FOR BIOMEDICAL IMPLANTS
Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan

ULTRA-WIDE BAND TECHNOLOGY
Mokhaled M., Mohammed, Sheroz Khan, Jalel Chebil, Khaled A. S. Al-Khateeb, Imran Moez Khan

MVL ADC DESIGN AND SIMULATION
Soheli Farhana, AHM Zahirul Alam, Sheroz Khan

MVL DESIGN AND CURRENT MODE CIRCUIT ELEMENTS
Soheli Farhana, AHM Zahirul Alam, Sheroz Khan

NOISE MODULATED CRYPTOGRAPHIC GENERATION FOR USE IN UWB WIRELESS COMMUNICATION
Siti Hazwani Yaacob, Sigit Puspito Wigati Jarot, Sheroz Khan

UWB PULSE GENERATION AND SHAPING: ANALYSIS AND SIMULATION RESULTS
Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam
SIMULATIONS OF RESISTANCE VARIATIONS TO PULSE GENERATOR CIRCUITS
Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam

PULSE OXIMETRY DESIGN USING ARDUINO BOARD
Muhammad Arham, Syed Zulfauzi and Othman O. Khalifa
Chapter 14

DESIGN OF CAPACITIVE MEASURING SYSTEM FOR HIGH FREQUENCY BAND TRANSDUCER

NURUL ARFAH BINTI CHE MUSTAPHA, AHM ZAHIRUL ALAM, SHEROZ KHAN

Capacitance-to-voltage conversion (CVC) is a simple and attractive method for accurately measuring very low value capacitance variations over a wide range of capacitance changes, leading to almost linear relationship between the capacitance variations and the resulting voltage fluctuations obtained. Another added advantage of this technique lies in its simple implementation in MOS technology (Krummenacher, 1985). Also, this technique bypasses the usage of the conventional analog-to-digital converter, as the signal obtained is already digital, thus reducing the hardware cost by saving an important stage in the whole process (Chiang, Wang, & Huang, 2008). The resulting output signal is digital which can be easily transmitted, received and processed even by systems including wireless sensor networks. To meet such expectations, the 0.13 \( \mu m \) CMOS technology transducer is used.

14.1. CVC BLOCK DIAGRAM

Converter circuit used in this design uses a basic inverting principle as shown in Fig. 14.1 where capacitance \( C_f \) is the feedback circuit, and both capacitance \( C_r \) and \( C_x \) are at the inverting input of the Op-amp.

![CVC Block Diagram](image)

*Fig. 14.1: Schematic of a Basic CVC (Sedra & Smith, 2004)*