

2021 IEEE 17th International Conference on Wearable and Implantable Body Sensor Networks (BSN 2021)

**Virtual Conference
27 – 30 July 2021**



**IEEE Catalog Number: CFP2137A-POD
ISBN: 978-1-6654-4771-3**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2137A-POD
ISBN (Print-On-Demand):	978-1-6654-4771-3
ISBN (Online):	978-1-6654-0362-7
ISSN:	2376-8886

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

SMALL-FORM WEARABLE DEVICE FOR LONG-TERM MONITORING OF CARDIAC SOUNDS ON THE BODY SURFACE	1
<i>Bruno Gil Rosa, Salzitsa Anastasova, Benny Lo</i>	
EFFECT OF NOISE ON GENERIC COUGH MODELS	5
<i>Sayanton V. Dibbo, Yugyeong Kim, Sudip Vhaduri</i>	
MULTI-OBJECTIVE OPTIMISATION FOR SSVEP DETECTION.....	9
<i>Yue Zhang, Zhiqiang Zhang, Shengquan Xie</i>	
DEEP 3D BODY LANDMARKS ESTIMATION FOR SMART GARMENTS DESIGN.....	13
<i>Annalisa Baronetto, Dominik Wassermann, Oliver Amft</i>	
BETTER BATTERY LIFE: TOWARDS ENERGY-EFFICIENT SMARTWATCH-BASED ATRIAL FIBRILLATION DETECTION IN AMBULATORY FREE-LIVING ENVIRONMENTS.....	18
<i>Hanbin Zhang, Li Zhu, Viswam Nathan, Jilong Kuang, Jacob Kim, Alex Gaol</i>	
REAL-TIME 3D ARM MOTION TRACKING USING THE 6-AXIS IMU SENSOR OF A SMARTWATCH.....	22
<i>Wenchuan Wei, Keiko Kurita, Jilong Kuang, Alex Gao</i>	
NONINVASIVE CONTINUOUS BLOOD PRESSURE MEASUREMENT WITH WEARABLE MILLIMETER WAVE DEVICE.....	26
<i>Catherine Liao, Oliver Shay, Elizabeth Gomes, Nikhil Bikhchandani</i>	
WAVELET-BASED ANALYSIS OF GAIT FOR AUTOMATED FRAILTY ASSESSMENT WITH A WRIST-WORN DEVICE	31
<i>Domenico Minici, Guglielmo Cola, Antonella Giordano, Silvana Antoci, Elena Girardi, Mauro Di Bari, Marco Avvenuti</i>	
DESIGN AND EVALUATION OF A WRIST WEARABLE JOINT ACOUSTIC EMISSION MONITORING SYSTEM.....	35
<i>Daniel M. Hochman, Goktug C. Ozmen, Lori A. Ponder, Sampath Prahalad, Omer T. Inan</i>	
ASSESSING INTERNAL AND EXTERNAL ATTENTION IN AR USING BRAIN COMPUTER INTERFACES: A PILOT STUDY	39
<i>Nataliya Kosmyna, Qiuxuan Wu, Chi-Yun Hu, Yujie Wang, Cassandra Scheirer, Pattie Maes</i>	
TOWARDS MOTION-AWARE PASSIVE RESTING RESPIRATORY RATE MONITORING USING EARBUDS	45
<i>Md Mahbubur Rahman, Tousif Ahmed, Mohsin Yusuf Ahmed, Ebrahim Nemati, Minh Dinh, Nathan Folkman, Md Mehedi Hasan, Jilong Kuang, Jun Alex Gao</i>	
COUGHBUDDY: MULTI-MODAL COUGH EVENT DETECTION USING EARBUDS PLATFORM.....	49
<i>Ebrahim Nemati, Shibo Zhang, Tousif Ahmed, Md. Mahbubur Rahman, Jilong Kuang, Alex Gao</i>	
A UWB RADAR-BASED APPROACH OF DETECTING VITAL SIGNALS	53
<i>Qimeng Li, Jikui Liu, Raffaele Gravina, Ye Li, Giancarlo Fortino</i>	

WIRELESS RESPIRATION MONITORING USING A FLEXIBLE SENSOR AND BISTABLE CIRCUIT.....	57
<i>Zhipeng Li, Ze Xiong, Chenhui Li, John S. Ho</i>	
THE USE OF THERMAL IMAGING AND DEEP LEARNING FOR PULMONARY DIAGNOSTICS AND INFECTION DETECTION.....	61
<i>Suzie Byun, Bernardo Garcia Bulle Bueno, Yogesh Gupta, Nagesh Dhadge, Shrikant Pawar, Rahul Kodgule, Richard Ribón Fletcher</i>	
MULTI-BAND IMPLANTABLE MICROSTRIP ANTENNA ON LARGE GROUND PLANE AND TIO ₂ SUBSTRATE.....	65
<i>Lida Kouhalvandi, Ladislau Matekovits, Ildiko Peter</i>	
A SOFT INFLATABLE ELBOW-ASSISTIVE ROBOT FOR CHILDREN WITH CEREBRAL PALSY	69
<i>Yulin Wang, Benny Lo</i>	
IMPEDANCE PNEUMOGRAPHY: ASSESSMENT OF DUAL-FREQUENCY CALIBRATION APPROACHES	73
<i>Hewon Jung, Samer Mabrouk, Omer T. Inan</i>	
DIGITALLY-EMBROIDERED LIQUID METAL TEXTILES FOR NEAR-FIELD WIRELESS BODY SENSOR NETWORKS	77
<i>Rongzhou Lin, Han-Joon Kim, Sippanat Achavananthadith, John S. Ho</i>	
TOWARDS NONINVASIVE ACCURATE DETECTION OF INTRAPARTUM FETAL HYPOXIC DISTRESS.....	81
<i>Begum Kasap, Kourosh Vali, Weitai Qian, Herman L. Hedriana, Aijun Wang, Diana L. Farmer, Soheil Ghiasi</i>	
ARTIFICIAL EAR - A WEARABLE DEVICE FOR THE HEARING IMPAIRED.....	85
<i>Antonia Pavlidou, Benny Lo</i>	
SEMI-SUPERVISED CONTRASTIVE LEARNING FOR GENERALIZABLE MOTOR IMAGERY EEG CLASSIFICATION	89
<i>Jinpei Han, Xiao Gu, Benny Lo</i>	
HEART RATE DETECTION USING A CONTACTLESS BED SENSOR: A COMPARATIVE STUDY OF WAVELET METHODS	93
<i>Ibrahim Sadek, Bessam Abdulrazak, Terry Tan Soon Heng, Edwin Seet</i>	
IDENTIFYING CAUSAL RELATIONSHIPS IN TIME-SERIES DATA FROM A PAIR OF WEARABLE SENSORS	97
<i>D K Arvind, S Maiya, P Andreu Sedeño</i>	
DEEP LEARNING MODEL WITH INDIVIDUALIZED FINE-TUNING FOR DYNAMIC AND BEAT-TO-BEAT BLOOD PRESSURE ESTIMATION.....	101
<i>Jingyuan Hong, Jiasheng Gao, Qing Liu, Yuanting Zhang, Yali Zheng</i>	
ADHERENCE TO A GARMENT-ADHERED RESPIRATORY FORCE MONITOR IN PATIENTS WITH ADVANCED COPD	105
<i>Neema Moraveji, Mark Holt, Joanne Hollenbach, Richard Murray, Hadley White, Maureen Crocker</i>	

ADAPTIVE SURFACE ELECTROMYOGRAPHY NORMALIZATION FOR LONG-DURATION RECORDINGS.....	109
<i>Samantha R. Fox, Reed D. Gurchiek, Anna T. Ursiny, Brett M. Meyer, Julianne M. Boughton, Ryan S. McGinnis</i>	
PIEZOELECTRIC-BASED RESPIRATORY MONITORING: TOWARDS SELF-POWERED IMPLANTABLES FOR THE AIRWAYS.....	113
<i>Luis Lopez Ruiz, Vivian Lin, Lucy Fitzgerald, Joe Zhu, Larry Borish, Daniel Quinn, John Lach</i>	
KIRIGAMI STRAIN SENSING ON BALLOON CATHETERS WITH TEMPORARY TATTOO PAPER	118
<i>Jia Li, Yeow Bok Seng, Godwin Ponraj, Kirthika Senthil Kumar, Catherine Jiayi Cai, Hongliang Ren</i>	
CAMPUS SAFETY AND THE INTERNET OF WEARABLE THINGS: ASSESSING STUDENT SAFETY CONDITIONS ON CAMPUS WHILE RIDING A SMART SCOOTER	122
<i>Devansh Gupta, Wenyao Xu, Xiong Yu, Ming-Chun Huang</i>	

Author Index