

# **2021 IEEE International Symposium on Technologies for Homeland Security (HST 2021)**

**Virtual Conference  
8 – 9 November 2021**



**IEEE Catalog Number: CFP21THS-POD  
ISBN: 978-1-6654-4153-7**

**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:	CFP21THS-POD
ISBN (Print-On-Demand):	978-1-6654-4153-7
ISBN (Online):	978-1-6654-4152-0

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# TABLE OF CONTENTS

<b>COMMUNITY-SCALE RESPONSE TO CLIMATE CHANGE IMPACTS ON RURAL AGRICULTURAL ECONOMIES</b> .....	1
<i>Ann-Perry Witmer; Donald J. Wuebbles; Atul Jain; Eliezer Colina Morles; Carolee Rigsbee; Patricia Byrnes; Sandy Dall'Erba</i>	
<b>TEST METHODS TO EVALUATE MAPPING CAPABILITIES OF SMALL UNMANNED AERIAL SYSTEMS IN CONSTRAINED INDOOR AND SUBTERRANEAN ENVIRONMENTS</b> .....	9
<i>Adam Norton; Peter Gavriel; Brendan Donoghue; Holly Yanco</i>	
<b>THE EVOLUTION OF CYBER SECURITY NORM DEVELOPMENT IN THE DIGITAL AGE</b> .....	17
<i>Benjamin Madnick; Keman Huang; Stuart Madnick</i>	
<b>EMERGING TRENDS IN GREEN BEST PRACTICES</b> .....	22
<i>Emily Holt; Casey Corrado</i>	
<b>THREAT ANALYSIS USING TOPIC MODELS IN LARGE-SCALE VULNERABILITY DATABASES AND SECURITY INCIDENT CASE DOCUMENTS</b> .....	27
<i>Hiroki Koyanagi; Kazuo Takaragi; Sven Wohlgemuth; Katsuyuki Umezawa</i>	
<b>WIDEFT: A CORPUS OF RADIO FREQUENCY SIGNALS FOR WIRELESS DEVICE FINGERPRINT RESEARCH</b> .....	33
<i>Abu Bucker Siddik; Dawson Drake; Thomas Wilkinson; Phillip L. De Leon; Steven Sandoval; Margaret Campos</i>	
<b>AUTONOMOUS DETERMINATION OF THE AIMING DIRECTION OF FIREARMS</b> .....	40
<i>Benjamin Abruzzo; Kevin Carey</i>	
<b>ON THE USE OF SMALL-SCALE UNMANNED AUTONOMOUS SYSTEMS FOR DECISION-SUPPORT IN SUBTERRANEAN ENVIRONMENTS: THE CASE OF OPERATOR SITUATIONAL AWARENESS ASSESSMENT</b> .....	46
<i>Minseop Choi; John Houle; Nathan Letteri; Thanuka L. Wickramarathne</i>	
<b>DETECTING NETWORK TRAFFIC INTRUSIONS ON MEMORY CONSTRAINED EMBEDDED SYSTEMS</b> .....	52
<i>Shiyu Su; Ebelechukwu Nwafor</i>	
<b>FEW-SHOTS LEARNING FOR FINE-GRAINED VEHICLE MODEL RECOGNITION</b> .....	57
<i>Landry Kezebou; Victor Oludare; Karen Panetta; Sos Agaian</i>	
<b>POST-COVID-19 MASK-AWARE FACE RECOGNITION SYSTEM</b> .....	66
<i>Shreyas Dharanesh; Ajita Rattani</i>	
<b>MACHINE-LEARNING PUF-BASED DETECTION OF RF ANOMALIES IN A CLUTTERED RF ENVIRONMENT</b> .....	73
<i>James Lu; Todd Morehouse; Jiawei Yuan; Ruolin Zhou</i>	
<b>AN ATTACK ANALYSIS FRAMEWORK FOR LORAWAN APPLIED ADVANCED MANUFACTURING</b> .....	80
<i>Mohammad Mezanur Rahman Monjur; Joseph Heacock; Rui Sun; Qiaoyan Yu</i>	
<b>A DEEP LEARNING APPROACH FOR UNDERSTANDING DEVICE BEHAVIOR IN SMART BUILDING NETWORKS</b> .....	87
<i>Maroun Touna; Isabelle Crawford-Eng</i>	
<b>BIOMETRICALLY TRUSTED PERSONAL HEALTH STATUS FOR PANDEMIC MANAGEMENT</b> .....	92
<i>Babak Poorebrahim Gilkalaye; Reza Derakhshani</i>	
<b>SECURE AUTHENTICATION USING A GARBLED CIRCUIT VARIANT FOR ARITHMETIC CIRCUITS</b> .....	99
<i>Babak Poorebrahim Gilkalaye; Reza Derakhshani</i>	
<b>INVESTIGATION OF REINFORCEMENT LEARNING-BASED ATTACK ON LOGIC LOCKING</b> .....	106
<i>Jake Mellor; Allen Shelton; Sara Tehranipoor</i>	
<b>CREATING ADVERSARIAL MALWARE EXAMPLES THROUGH GUIDED METAMORPHIC CHANGES</b> .....	113
<i>Rayan Mosli; Thomas J. Slota; Yin Pan</i>	
<b>LEVERAGING RESILIENCE METRICS TO SUPPORT SECURITY SYSTEM ANALYSIS</b> .....	120
<i>Susan A. Caskey; Thushara Gunda; Jamie Wingo; Adam D. Williams</i>	
<b>CHILDCARE IN COVID-19: ASSESSING RESILIENCE OF SERVICE CRITICAL INFRASTRUCTURES</b> .....	127
<i>Jessica Pardee; Jennifer Schneider; Cindy Lam</i>	

<b>PERFORMANCE COMPARISON OF DECENTRALIZED UNDIRECTED SWARMS VERSUS CENTRALIZED DIRECTED SWARMS AT DIFFERENT LEVELS OF QUALITY OF KNOWLEDGE</b> .....	133
<i>Ross Arnold; Elizabeth Mezzacappa; Melissa Jablonski; Jonathan Jablonski; Benjamin Abruzzo</i>	
<b>EFFECTIVENESS OF ENTROPY-BASED DDOS PREVENTION FOR SOFTWARE DEFINED NETWORKS</b> .....	142
<i>Cameron S. Whittle; Hong Liu</i>	
<b>LOCALLY-INFORMED CELLULAR AUTOMATA FOR EMERGENCY RESPONSE</b> .....	149
<i>Neel M. Raj; Jennifer Schneider; Carol Romanowski</i>	
<b>MINIATURIZED ZERO-POWER INFRARED SENSOR FOR PERSISTENT AND LARGE-SCALE HUMAN PRESENCE MONITORING AT BORDERS</b> .....	155
<i>Vageeswar Rajaram; Sungho Kang; Sila Deniz Caliskan; Antea Rizzo; Zhenyun Qian; Matteo Rinaldi</i>	
<b>SWARM MEASURES OF PERFORMANCE: SOCIAL NETWORK PARAMETERS</b> .....	162
<i>Elizabeth Mezzacappa; Ross Arnold; Melissa Jablonski; Jonathan Jablonski; Benjamin Abruzzo</i>	
<b>MODELING COMMAND AND CONTROL SYSTEMS IN WILDFIRE MANAGEMENT: CHARACTERIZATION OF AND DESIGN FOR RESILIENCY</b> .....	170
<i>Waseem Al Aqqad; Xuewei Zhang</i>	
<b>A STUDY OF POST QUANTUM CIPHER SUITES FOR KEY EXCHANGE</b> .....	175
<i>Daniel Garcia; Hong Liu</i>	
<b>COMPLEXITY OF INTERNATIONAL LAW FOR CYBER OPERATIONS</b> .....	182
<i>Nazli Choucri; Gaurav Agarwal</i>	
<b>A TRI-LEVEL OPTIMIZATION MODEL FOR INTERDEPENDENT INFRASTRUCTURE NETWORK RESILIENCE AGAINST COMPOUND HAZARD EVENTS</b> .....	189
<i>Matthew R. Oster; Samrat Chatterjee; Auroop R. Ganguly; Dennis G. Thomas; Jack Watson; Daniel Corbiani; Jennifer Webster; Feng Pan; Barton Gattis; Kyle Haynie</i>	
<b>ANALYSIS OF THE NECESSITY OF QUANTUM COMPUTING CAPACITY DEVELOPMENT FOR NATIONAL DEFENSE AND HOMELAND SECURITY</b> .....	192
<i>Dominic Rosch-Grace; Jeremy Straub</i>	
<b>A HIGH-FIDELITY CYBER-PHYSICAL TESTBED-BASED BENCHMARKING DATASET FOR TESTING OPERATIONAL TECHNOLOGY SPECIFIC INTRUSION DETECTION SYSTEMS</b> .....	200
<i>Aditya Ashok; Thomas Edgar</i>	
<b>HEALTH AND SAFETY INNOVATIONS TO REDUCE THE SPREAD OF CONTAGIOUS DISEASE</b> .....	207
<i>John P. McIntire; Felicia N. Harlow; Enoch May; Connor Wilson; Daniel D. Jensen</i>	
<b>HUVS: HETEROGENEOUS UV SWARM FOR HOMELAND SECURITY TASKS</b> .....	214
<i>Alberto Velazquez; Jorge Diaz; Tohid Sardarmehni; Lei Xu</i>	
<b>UNIFIED COGNITIVE RADAR FRAMEWORK FOR MULTITARGET ESTIMATION</b> .....	220
<i>Aleksandar Zatezalo; Ning Yang</i>	
<b>Author Index</b>	