

# **2021 Congreso Internacional de Innovacion y Tendencias en Ingenieria (CONITI 2021)**

**Bogota, Colombia  
29 September – 1 October 2021**



**IEEE Catalog Number: CFP21M41-POD  
ISBN: 978-1-6654-0222-4**

**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:	CFP21M41-POD
ISBN (Print-On-Demand):	978-1-6654-0222-4
ISBN (Online):	978-1-6654-0221-7
ISSN:	2768-0630

**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>MANAGEMENT MODEL TO IMPROVE THE ESTIMATION OF THE DELIVERY TIME OF THE CONCESSION AREAS BASED ON THE ANALYSIS OF THE RISK FACTORS OF EXPROPRIATION IN PROJECTS OF THE LIMA AND CALLAO SUBWAY LINE.....</b>	<b>1</b>
<i>Leonardo Puente; Julio Vargas; Julio Farje</i>	
<b>RISKS MANAGEMENT MODEL INTEGRATING THE ANALYSIS MODE AND FAILURE EFFECTS WITHIN THE LAST PLANNER SYSTEM TO IMPROVE THE TIME OF REAL ESTATE CONSTRUCTION PROJECTS.....</b>	<b>7</b>
<i>Dary Velasquez; Samuel Carhuamaca; Julio Farje</i>	
<b>OPTIMIZATION OF THE USE OF CONSTRUCTION EQUIPMENT THROUGH THE DEVELOPMENT OF A DIGITAL TOOL .....</b>	<b>13</b>
<i>Rocio Chipana; Indira Portilla; Sandra Rodriguez; Alexandra Hinostraza</i>	
<b>AN ANALYSIS OF LEED CERTIFICATION'S ADAPTATION TO DESIGN AND CONSTRUCTION OF SUSTAINABLE BUILDINGS IN PERU .....</b>	<b>19</b>
<i>Marck Regalado Espinoza; José Gutiérrez Manrique; Marina Huamani Loreña; Gabriela Loarte Coz;Álvaro Mendoza Machaca; Renzo Monteza Valdivia; Christopher Núñez Varillas; César Quijaite Andía; David Romero Asto</i>	
<b>FREE VIBRATION ANALYSIS OF FUNCTIONALLY GRADED BEAMS BY THE FINITE ELEMENT METHOD .....</b>	<b>25</b>
<i>Benjamín Marquina; J. Pablo Domínguez; Roman Arciniega</i>	
<b>ANALYSIS OF SWIMMING POOL WATER DISINFECTION TECHNOLOGIES IN THE PISCILAGO WATER PARK GIRARDOT – CUNDINAMARCA .....</b>	<b>31</b>
<i>Diana Vega; Yuly Sánchez</i>	
<b>NUMERICAL MODELING OF EXCAVATIONS IN THE SOFT SOILS OF BOGOTA .....</b>	<b>36</b>
<i>Angie Melissa Paredes; Cristian Camilo Marroquín; Camilo Herrera</i>	
<b>ANALYSIS OF THE EVOLUTION OF THE DYNAMIC SHEAR MODULUS THROUGH THE DIFFERENT LEVELS OF AN ASPHALT MATERIAL .....</b>	<b>41</b>
<i>Eduardo J. Rueda; Juan G. Bastida; Jhonathan Jaramillo</i>	
<b>PERFORMANCE OF A HOT ASPHALT MIXTURE BY REDUCING THE COMPACTION TEMPERATURE .....</b>	<b>47</b>
<i>Juan G. Bastidas-Martínez; Camila Jaramillo Monroy; Eduardo J. Rueda; Juan C. Ruge; Diego M. Polaina Andrade</i>	
<b>PREVENTIVE MEASURES PERTAINING TO COVID-19 IN SWIMMING POOLS AND HOT SPRINGS IN EUROPE, CANADA, UNITED STATES, AND COLOMBIA.....</b>	<b>51</b>
<i>Yuly Sanchez; Mehrab Mehrvar; Lynda McCarthy; Edgar Quiñoñes; Luis Cheu; Jairo Romero</i>	
<b>EVALUATION OF CHLORIDE PENETRATION IN CEMENT MORTARS REINFORCED WITH DIFFERENT PROPORTIONS OF RECYCLED PET FIBERS.....</b>	<b>55</b>
<i>Camilo Higuera-Flórez; Jhon Cárdenas-Pulido; Adriana Vargas-Aguilar</i>	
<b>SYSTEM DYNAMICS MODEL FOR THE SUSTAINABILITY OF EDUCATIONAL RESOURCES IN INFORMATION AND COMMUNICATIONS TECHNOLOGIES .....</b>	<b>60</b>
<i>José Arturo Amezquita Mejía; Ginna Marcela Leguizamón Nonsoque; Mauricio Becerra Fernandez</i>	
<b>OPTIMIZATION OF WATER USE IN RESIDENTIAL BUILDINGS.....</b>	<b>66</b>
<i>Laleska Alarcón; Cesar Astorima; Sandra Rodriguez; Katia Melendez</i>	
<b>COMPARATIVE STUDY OF IOT TECHNOLOGIES FOR A GEOLOCALIZING DEVICE FOR PEOPLE WITH EARLY-STAGE DEMENTIA.....</b>	<b>72</b>
<i>Nicolas Vargas; Erika Velandía; Juan Torres</i>	
<b>A MATHEMATICAL MODEL FOR THE OPTIMIZATION OF E-COMMERCE LOGISTICS OPERATIONS IN THE FACE OF THE SPREAD OF COVID-19 .....</b>	<b>77</b>
<i>Andrés García-Pérez; María Alejandra Millán; Cindy Marcela Lobo</i>	
<b>METHODOLOGY TO USE THE GEOPACKAGE INTERFACE AS A MANAGEMENT TOOL WITH GEOREFERENCED CONDITION INDEX DATA.....</b>	<b>82</b>
<i>Kelly Nole Dávila; Yordan Sotomayor Solano; Aldo Bravo; Donald Gustavo Llerena</i>	
<b>REDUCTION OF DEFLECTIONS AT THE PAVEMENT BASE THROUGH THE COMBINED USE OF NON-WOVEN GEOTEXTILES AND MACADAM BASE .....</b>	<b>88</b>
<i>Lizette Lopez; Angel Gallardo; Enrique Huaroto</i>	
<b>COMPARISON OF THE DYNAMIC RESPONSE OF 3 FRAMES SUBJECTED TO OPTIMIZATION OF THE GLOBAL WARMING POTENTIAL EMITTED BY CONCRETE .....</b>	<b>93</b>
<i>Luisa Fernanda Monroy-Cardenas; Keiner Lucero-Sanchez; Oscar Contreras-Bejarano</i>	

<b>PROPOSAL TO IMPLEMENT THE BIM METHODOLOGY IN ROAD INFRASTRUCTURE PROJECTS OPTIMIZING WORKFLOWS</b> .....	97
<i>Paola Hinostraza; Jose Granados; Aldo Bravo</i>	
<b>EVALUATION OF THE LEVEL OF SERVICE OF “VÍA EXPRESA PASEO DE LA REPÚBLICA” (PERU); CANADA - JAVIER PRADO SECTION</b> .....	103
<i>Edward Santa María Dávila; Marck Regalado Espinoza; Eli Beltrán Ccanto; Israel Maravi Contreras; Jhoel Huamani Torre; Lesly Ortiz Galindo; Sandra Rojas Rodriguez</i>	
<b>DIAGNOSIS OF LABOR COST VARIATION AT RESIDENTIAL BUILDINGS DURING THE COVID-19 PANDEMIC</b> .....	108
<i>Luisa Fernández; Sebastián Cabrera; Sandra Rodriguez</i>	
<b>ADVANCES AND CURRENT TRENDS ON THE USE OF 3D PRINTED CONCRETE FOR BUILDING FABRICATION</b> .....	114
<i>Sebastián Uribe-Pinzón; Mariana Mosquera; Jhon Cárdenas-Pulido; Camilo Higuera</i>	
<b>IMPLEMENTATION OF IMPROVEMENTS IN THE PROCESS OF REQUESTS, COMPLAINTS, CLAIMS, SUGGESTIONS AND CONGRATULATIONS OF A HEALTH SECTOR ORGANIZATION IN COLOMBIA</b> .....	120
<i>Jenny Paola Ramírez Puentes; Carolina Prada Vargas</i>	
<b>GUIDE OF PRINCIPLES AND GOOD PRACTICES FOR SOFTWARE SECURITY TESTING IN WEB APPLICATIONS FOR A PRIVATE SECTOR COMPANY</b> .....	124
<i>Eliana Catherine Robayo Bautista; Hector Dario Jaimés Parada</i>	
<b>COMPARATIVE ANALYSIS OF THE LIFE CYCLE OF THE CONVENTIONAL TREATMENT PROCESS AND THE ADVANCED OXIDATION PROCESS OF WASTEWATER IN THE TEXTILE INDUSTRY</b> .....	131
<i>María Alejandra Céspedes Arcila; Jennyfer Daniela Sánchez Achury; Wilfredo Marimón Bolívar; Laura Pulgarín</i>	
<b>SECURITY ASSESSMENT OF NOSQL MONGODB, REDIS AND CASSANDRA DATABASE MANAGERS</b> .....	136
<i>Ricardo Andrés González Sánchez; Davor Julián Moreno Bernal; Hector Dario Jaimés Parada</i>	
<b>EVALUATION OF THE PSYCHOPHYSICAL BEHAVIOR OF CYCLISTS IN THE CALIBRATION AND VALIDATION PROCESSES USING THE WIEDEMANN AND SOCIAL FORCE MICROSIMULATION MODELS</b> .....	143
<i>Helena Guerrero; Jose Huamanchumo; Manuel Silvera</i>	
<b>STUDY OF A HOT-MIX ASPHALT WITH RICE HUSK ASH</b> .....	149
<i>Camila Jaramillo Monroy; Juan Gabriel Bastidas Martínez; Omar Felipe Lizcano Garzon; Deyber Andrés Ramos Felix</i>	
<b>DETERMINATION OF WATER STORAGE VOLUME THROUGH SYSTEM DYNAMICS</b> .....	154
<i>César David Quintana Cabeza</i>	
<b>BASE CONTENT FOR PUBLIC CIVIL WORK AUDITING REVIEW</b> .....	158
<i>César David Quintana Cabeza</i>	
<b>DIAGNOSIS AND IMPROVEMENT OF THE LEVEL OF IMPLEMENTATION OF THE LAST PLANNER® SYSTEM IN A CONSTRUCTION PROJECT</b> .....	163
<i>Andrews A. Erazo-Rondinel; Diego Alonso Quispe-Alegria; José Salgado</i>	
<b>EVALUATION OF MECHANICAL INFLUENCE OF DIFFERENT METHODS OF ENCAPSULATION OF BACILLUS SUBTILIS BACTERIA IN THE MANUFACTURE OF SELF-HEALING CONCRETE - SYSTEMATIC LITERATURE REVIEW</b> .....	169
<i>Maria Camila Castillo Romero; Flor Nancy Diaz Piraquive; Martin Eduardo Espitia Nery</i>	
<b>CARYA ILLINOINENSIS SHELL FOR MAKING BIODEGRADABLE FOOD-SAFE PACKAGING</b> .....	174
<i>Katherine Lady Campos Garay; Yolanda Matilde Castro Toledo; Carlos Alberto Castañeda Olivera; Jhonny Wilfredo Valverde Flores; Elmer Gonzales Benites Alfaro</i>	
<b>REMOTE SENSING OF SOLID WASTE CRITICAL POINTS IN PUBLIC SPACES</b> .....	178
<i>Josselyn Rosales; Eldy Coa; Carlos Castañeda; Elmer Benites</i>	
<b>MITIGATION PROPOSAL FOR ENVIRONMENTAL IMPACTS ON THE WATER RESOURCES SOURROUNDING EL SANTUARIO MINE, MUNICIPALITY OF UBALÁ</b> .....	184
<i>Viviana Carolina Chala Uruña; Daniel Andrés López Sabogal; Laura Pulgarín Morales</i>	
<b>PROPOSAL TO IMPROVE PRODUCTIVITY IN COMPANIES OF A WOODEN FURNITURE CLUSTER IN PERU</b> .....	190
<i>Jose Miguel Baca Garay; Fabrizio Giovanni Sanchez Rivera; Percy Castro; Eloy Marcelo; Jose Carlos Alvarez</i>	
<b>COST DEVIATION CAUSES IN COLOMBIAN CONSTRUCTION PROJECTS: A FREQUENCY AND SEVERITY ANALYSIS</b> .....	194
<i>Omar Sánchez; Karen Castañeda; Rodrigo F. Herrera; Eugenio Pellicer; Laura Almanza; Ricardo Cadavid</i>	

<b>EVALUATION OF A BICYCLE LANE AS A SUSTAINABLE MEANS OF TRANSPORT IN CITIES WITH AN EXCESSIVE PRESENCE OF MOTORCYCLE TAXIS</b> .....	200
<i>Angel Cabezas Rios; Erick Salcedo Alvarado; Manuel Silvera Lima; Fernando Campos De La Cruz</i>	
<b>OPTIMIZATION OF USER'S TRAJECTORIES WITHIN A BRT STATION TO REDUCE TRAVEL TIMES AND DENSITY</b> .....	206
<i>Jesus Arenaza; Enrique Miranda; Manuel Silvera; Fernando Campos</i>	
<b>SECURITY ISSUES OF A DECENTRALIZED BLOCKCHAIN-BASED MESSAGING SYSTEM</b> .....	212
<i>Christian Elías Cruz González; Francisco Javier Cuadros Romero</i>	
<b>TRANSDISCIPLINE IN ENGINEERING TRAINING AN INNOVATIVE PROPOSAL</b> .....	216
<i>Cristina Laplagne; Liliana Martínez</i>	
<b>EXPERIMENTAL EVALUATION OF DIFFERENT ADDITIVES APPLIED IN A HOT DENSE MIX ASPHALT MDC — 19</b> .....	221
<i>Shepany Avila Parra; Fernando Velasco Diaz; Carlos J. Slebi Acevedo; Juan C. Ruge Cardenas</i>	
<b>APPLICATION OF JOINT CONFIDENCE LEVEL ANALYSIS AND DECISION TREES METHOD IN QUANTITATIVE RISK MANAGEMENT FOR PUBLIC INVESTMENT PROJECTS IN PERU</b> .....	227
<i>Engel A. Espinoza Cuiro</i>	
<b>EVALUATION OF ROAD INTERSECTIONS IN AREAS OF HIGH COMMERCIAL ACTIVITY THROUGH THE IDENTIFICATION OF VEHICLE-PEDESTRIAN CONFLICTS USING THE BLACK SPOTS METHODOLOGY</b> .....	233
<i>Luciana Carrasco Lonkina; Cinthya Coloma Carril; Manuel Silvera Lima; Fernando Campos De La Cruz</i>	
<b>USE OF THE EARNED SCHEDULE TO SUBCONTRACTORS CONTROL IN CONSTRUCTION PROJECTS</b> .....	239
<i>Erick J. Flores; Rodrigo F. Herrera</i>	
<b>MOBILE APP TO GIVE NOTICE OF HEALTH AND SAFETY EMERGENCIES</b> .....	245
<i>Michell Dayann Mora Melo; Juan Carlos Barrero Calixto; Miryam Liliana Chaves Acero</i>	
<b>EVALUATION OF THE VICIA FABA SEED FLOUR EFFICIENCY FOR TURBIDITY REMOVAL IN DRINKING WATER TREATMENT. CASE STUDY: COPACABANA, BOLIVIA</b> .....	251
<i>Diego Morales; Carolina Garvizu; Freddy Soria</i>	
<b>AUTOMATIC METHOD FOR THE PREDICTION OF THE COMMERCIAL APPRAISAL OF A PROPERTY IN BOGOTA CITY</b> .....	255
<i>Nicolás Martínez; Juliana Téllez; Juan Barrero; Liliana Chaves</i>	
<b>A FRUGAL WIRELESS CARDIOVASCULAR MONITORING SYSTEM FOR SENIOR DOGS</b> .....	261
<i>Carlos Baltazar Nina Pastor; Baker Josben Chihuan Cayllahua; Jimmy Armas-Aguirre; Paola A. Gonzalez</i>	
<b>CYBERSECURITY ARCHITECTURE FUNCTIONAL MODEL FOR CYBER RISK REDUCTION IN IOT BASED WEARABLE DEVICES</b> .....	266
<i>Giancarlo Gómez; Enrique Espina; Jimmy Armas-Aguirre; Juan Manuel Madrid Molina</i>	
<b>CYBERSECURITY MATURITY MODEL FOR PROVIDING SERVICES IN THE FINANCIAL SECTOR IN PERU</b> .....	270
<i>Jorge Gutierrez Alayo; Paul Necochea Mendoza; Jimmy Armas-Aguirre; Juan Madrid Molina</i>	
<b>SECURITY OF THE INFORMATION MODEL ON PROCESS MINING: CASE STUDY OF THE SURGERY BLOCK</b> .....	274
<i>Ilche Park Cardenas; Miguel Espinoza; Jimmy Armas-Aguirre; Hugo Aguirre-Mayorga</i>	
<b>SEISMIC PERFORMANCE DESIGN OF THE REINFORCEMENT OF A 60+ YEAR OLD CONFINED MASONRY HOSPITAL RETROFITTED WITH L-SHAPED END CONCRETE WALLS</b> .....	279
<i>Anilú Altamirano Huachuñilca; Xiomara Massiel Criales Valer; Guillermo Huaco Cárdenas</i>	
<b>A MODEL BASED ON THE TECHNOLOGY READINESS LEVEL (TRL) SCALE TO MEASURE THE MATURITY LEVEL OF RESEARCH PROJECTS THAT CAN BECOME SPINOFFS IN HIGHER EDUCATION INSTITUTIONS</b> .....	285
<i>Maithe Pérez Cobos; Viviana Farfan Quezada; Levis I. Zerpa Morloy; Paola Vintimilla Alvarez; Silvia Peña González</i>	
<b>EEG SENSOR PROTOTYPE FOR RECORDING THE ATTENTION UNDER ANT METHOD</b> .....	291
<i>Andrea Liseth Acosta; Holman Bolivar; Fredy Pardo; Beatriz Gallo; Sonia Rios; Maria Luisa Barreto-Zambrano</i>	
<b>HYDROLOGICAL MODELING OF HIGH JUNGLE AREA SUB-BASIN, USING THE GR2M, TEMEZ AND LUTZ SCHOLTZ MODELS</b> .....	297
<i>José Carlos Canales Orozco; Maria Fernanda Gonzales Aranzana; Sissi Santos Hurtado</i>	
<b>STRUCTURAL ANALYSIS OF ADOBE HANDMADE HOUSE WITH THIN WALLS IN HUARANGAL SETTLEMENT</b> .....	303
<i>Hugo Aarom Quiroz Huaraya; César Augusto Tena Gutierrez; Guillermo Huaco Cárdenas</i>	

<b>APPLICATION OF THE FLOW LINE METHOD IN A SEWERAGE NETWORK PROJECT IN PERU</b> .....	309
<i>Raúl Omar Lavado-Guzmán; Andrews A. Erazo-Rondinel; Rodrigo F. Herrera; Andre Ramirez-Valenzuela; Diego Alonso Quispe-Alegría</i>	
<b>AN ALTERNATIVE CONSTRUCTION FOR THE DISTRICT INSTITUTIONAL DEVELOPMENT INDEX (IDID) OF BOGOTA USING DEA-CCR</b> .....	314
<i>Norvey Rodriguez; Juan Barrero; Diego Rincon-Yanez</i>	
<b>A STUDY ON VIDEO STREAMING QUALITY OF DASH SCHEME IN MULTIMEDIA SERVICES</b> .....	320
<i>Luis R. Solano-Hurtado; Martin M. Soto-Cordova</i>	
<b>INFORMATION SYSTEM FOR AUTOMATED MONITORING OF PATIENTS IN HOSPITAL INTERMEDIATE CARE UNITS</b> .....	324
<i>Martin M. Soto-Cordova; Raquel M. Sotomayor-Parian; Sarella Palma-Soto</i>	
<b>TOWARDS A MODEL OF SOCIAL RESPONSIBILITY FOR PERUVIAN COMPANIES IN RESPONSE TO THE COVID-19 PANDEMIC: THE CASE OF FARVET SAC</b> .....	330
<i>Martin M. Soto-Cordova; Raquel M. Sotomayor-Parian</i>	
<b>PROTOTYPE OF AN AUTOMATED MICROCLIMATE CHAMBER FOR BIOMATERIAL TEST PROCESSES</b> .....	334
<i>Martin M. Soto-Cordova; Carlos A. Mitma-Ramirez; Raquel M. Sotomayor-Parian; Sarella Palma-Soto</i>	
<b>Author Index</b>	