# **2018 Baltic Geodetic Congress** (BGC Geomatics 2018)

Olsztyn, Poland 21 - 23 June 2018



**IEEE Catalog Number: CFP18F89-POD ISBN**:

978-1-5386-4899-5

## Copyright $\odot$ 2018 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:
 CFP18F89-POD

 ISBN (Print-On-Demand):
 978-1-5386-4899-5

 ISBN (Online):
 978-1-5386-4898-8

#### **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



### 2018 Baltic Geodetic Congress BGC Geomatics 2018

### **Table of Contents**

BGC-Geomatics 2018 Conference Committees xi BGC Geomatics 2018 Acknowledgments xiii
Technical Papers
4D Models in World Wide Web
A Model for Risk Assessment and Management of Construction Projects in Urban Conditions 7 Agata Siemaszko (Gdansk University of Technology), Beata Grzyl (Gdansk University of Technology), and Adam Kristowski (Gdansk University of Technology)
A Rigorous and User-Friendly Algorithm for Global Congruency Test in Geodetic Deformation  Analysis
A Spatial Analysis of Selected Categories of Offences in Krakow Based on Data from the  National Safety Risk Map
A Structural Analysis of a Small Arch Viaduct
Accuracy of Precise Point Positioning with GPS and GLONASS Satellites Constellation Using Online Web Services
An Algorithm for Optimizing the Determination of Cycling Routes on the Example of the Gdansk Agglomeration
Analysis of Possibilities How Collision between Kraslava and Atlantic Lady Could Have Been  Avoided
Analysis of the Accuracy of Quasi-Geoid Models Used in GNSS Altitude Measurements

Appliance of High Speed Camera during Industrial Exploitation on the Example of Static and  Dynamic Tests of Steel Probes  Pawel Tysiac (Gdansk University of Technology) and Marek Przyborski	i1
(Gdansk University of Technology)  Application of Mixed-Effect Regression Models for Compiling a Land Value Map	7
Application of Robust Estimation in Polynomial Modelling	:2
Application of the Optimum Dataset Method in Archeological Studies on Barrows	7
Application of UAV Imagery for Inventory Mapping – A Case of Industrial Estate	'2
Assessing the Significance of Displacements Using Local Coefficients of Variance as an  Alternative to the Classical Approach	'7
Assessment of the Water Budget from GLDAS Model	6
Assessment Procedure of Suburban Land Attractiveness and Usability for Housing	)1
Automatic Photography Device FocusSphere for Micro Close Range Photogrammetry	17
Autonomous Vessel with an Air Look	12
Autonomous Vessels' Pathfinding Using Visibility Graph	)7
Calculations of Crack Widths in Bent Reinforced Concrete Sections with a High Reinforcement Ratio	2
Marek Jedrzejczak (University of Warmia and Mazury in Olsztyn) and Krzysztof Klempka (University of Warmia and Mazury in Olsztyn)	
Cartographic Generalization of the River Network Including Standards of the Objects Recognition	7

Cartographical Presentation of BIM Models	121
Central Park in Olsztyn — An Evaluation of Revitalisation as a Factor Shaping the  Development of Sustainable Cities	127
Combined Neural Approach to Deterministic and Probabilistic Assets Cost Valuation	132
Comparison of Accuracy of Kinematic Methods for Localization of Mobile Targets	138
Cultural Parks in the Spatial Planning System in Poland	145
Determination of Intensity and Directions of Environmental Changes of o Space Based on Coverage Area Analysis  Iwona Cieslak (University of Warmia and Mazury in Olsztyn), Karol Szuniewicz (University of Warmia and Mazury in Olsztyn), and Szymon Czyza (University of Warmia and Mazury in Olsztyn)	150
Differences in the Mapping of the Southern Coastline of the Baltic Sea on Historical Maps, in the XVI-XX Centuries	154
Digital Documentation of Heritage Objects on Non-Developable Surfaces	159
DSM Based on ALS Data for Needs of Urban Space Analysis	164
Empirical Influence Functions of Hodges-Lehmann Weighted Estimates Applied in Deformation Analysis	169
Energy Constraints in Operation of Autonomous Transit Networks	174
Environmental Assessment of Anthropogenic Effects on Recreation Zones: Osetr River in the Moscow Region	181

Evaluation of the Effectiveness of Methods for Delimitation of the Boundaries of Registered Parcels in the Process of Modernization of Land and Building Registration	186
Evidence-Based Risk Management for Civil Engineering Projects Using Bayesian Belief	
Networks (BBN)  Agata Siemaszko (Gdansk University of Technology), Beata Grzyl (Gdansk  University of Technology), and Adam Kristowski (Gdansk University of  Technology)	191
Examining the Performance of the Sentinel-3 Coastal Altimetry in the Baltic Sea Using a Regional High-Resolution Geoid Model  Elzbieta Birgiel (Tallinn University of Technology), Artu Ellmann  (Tallinn University of Technology), and Nicole Delpeche-Ellmann  (Tallinn University of Technology)	196
Geocentric Changes of the Mean Sea Level of the Baltic Sea from Altimeter and Tide Gauge	ഹഹ
Data	202
Georeferencing Methods for IFC	207
GNSS-Based Detection of Polar Patches with Relative STEC Values - The Impact of Elevation Cut-off Angle	212
Harmonization of Datasets in the Frame of Spatial Data Infrastructure Using ETL Tools: A Case Study of BDOT500 and BDOT10k Databases	217
Housing Deprivation in Poland – A Regional Approach	221
Hydrodron — New Step for Professional Hydrography for Restricted Waters	226
Hydrographic Multisensory Unmanned Watercraft	231
Impact of Climate Change on a Runoff Formation in Seaside Catchment Area on the Example of the Babica River Catchment	236
Increasing Reliability of Basic R-Estimates in Deformation Analysis	241

Infrastructure Development and Quality of Life in Selected Communes of the Province of Warmia and Mazury	246
Iwona Cieslak (University of Warmia and Mazury in Olsztyn), Karol Szuniewicz (University of Warmia and Mazury in Olsztyn), Szymon Czyza (University of Warmia and Mazury in Olsztyn), and Michal Ogrodniczak (University of Warmia and Mazury in Olsztyn)	
Laser Scanning of a Soil-Shell Bridge Structure  Pawel Tysiac (Gdansk University of Technology)	. 250
Life Cycle of a Building (LCC) in the Investment Process - Case Study	254
Methodology for Comparing Maps of Spatial Error Distribution of Digital Terrain Models	260
Micronetwork for Shift Determinations of the New Type Point Stabilization	. 265
Mitigation of the Ionospheric Disturbances in GNSS Relative Positioning: A Case Study in Southern High Latitudes	.270
Modeling of Sacral Objects Made on the Basis of Aerial and Terrestrial Laser Scanning	275
Modelling Coarse Particulate Matter PM10 Concentration in the Tricity Area Using GIS	283
Multibeam Echosounder and LiDAR in Process of 360-Degree Numerical Map Production for Restricted Waters with HydroDron	288
Multiple-Valued Method as an Assessment of Tourist Attractiveness of Urban Areas on the Example of Dobczyce	. 293
Satellite Constellation Dependent Periodicities in PCC Models  Karol Dawidowicz (University of Warmia and Mazury in Olsztyn)	. 299
Ship Movement Prediction Using k-NN Method  Petra Virjonen (Turku University), Paavo Nevalainen (Turku  University), Tapio Pahikkala (Turku University), and Jukka Heikkonen  (Turku University)	.304
Single Point Positioning Using GPS, Galileo and BeiDou System	310

Structural Bionic Systems in Civil Engineering	316
The Concept of Anti-Collision System for Underwater Vehicles Based on Forward Looking Sonar	321
Witold Kazimierski (Maritime University of Szczecin) and Grzegorz Zaniewicz (Maritime University of Szczecin)	021
The Impact of Generalised Spatial Data on the Incidence Density of Selected Offences in Krakow	328
Agnieszka Polonczyk (Pedagogical University of Cracow) and Andrzej Lesniak (AGH University of Science and Technology)	
The Influence of Natural Areas on Investment Opportunities - Analysis with the Use of GIS	225
Tools	333
The Inventory and Recording of Historic Buildings Using Laser Scanning and Spatial Systems  Agnieszka Skwirosz (University of Warmia and Mazury in Olsztyn) and  Krzysztof Bojarowski (University of Warmia and Mazury in Olsztyn)	340
The Possibilities of Water Hazard Managements in Transformed Area with Open Geographical Information System (QGIS)  Alicja Tama (AGH University of Science and Technology) and Agnieszka  Malinowska (AGH University of Science and Technology)	344
The Use of Gravimetric Measurements to Determine the Orthometric Height of the Benchmark in the Port of Gdynia	349
The Use of Photogrammetry in Archaeology and Multimedia Open-Air Performance in the Castle	
Square of Kato Paphos	353
TLS Technology in Brick Walls Inspection	359
Tree Detection around Forest Harvester Based on Onboard LiDAR Measurements	364
UAV Design and Construction for Real Time Photogrammetry and Visual Navigation	368
Using Terrestrial Laser Scanning in Documentation of Antique Vehicles  Izabela Piech (University of Agriculture in Krakow), Boguslawa  Kwoczynska (University of Agriculture in Krakow), and Dominik Slowik  (University of Agriculture in Krakow)	373
Author Index	377