2016 Baltic Geodetic Congress
(BGC Geomatics 2016)

Gdansk, Poland
2-4 June 2016
# Table of Contents

Message from Scientific Committee Chair ............................................................................................................ ix  
Message from University Deans ........................................................................................................................................ x  
Conference Organization ............................................................................................................................................. xi  
International Scientific Committee ............................................................................................................................ xii  
Acknowledgments ...................................................................................................................................................... xiii  

## BGC Geomatics 2016

### A New Approach to Geodata Storage and Processing Based on Neural Model of the Bathymetric Surface  
Jacek Lubczonek and Mariusz Borawski  
1

### Accuracy of Visual Ego-Motion Estimation — A Bike Mapping System Case Study  
Jakub Kolecki, Agnieszka Moskal, and Elzbieta Pastucha  
8

### Analysis of High Resolution Clouds of Points as a Source of Biometric Data  
Katarzyna Bobkowska, Artur Janowski, Marek Przyborski, and Jakub Szulwic  
15

### Analysis of the Usefulness of LiDAR DEM to Update the River Network in the Topographic Database  
Sylwia Szlapinska, Radoslaw Piskorski, and Krystian Pyka  
22

### Analyzing the Geometry of the Turnouts and Their Adjustment Basing on the Tacheometer Measurements  
Michal Strach and Karolina Makowska  
28

### Application of Geofencing Technology for the Purpose of Spatial Analyses in Inland Mobile Navigation  
Natalia Wawrzyniak and Tomasz Hyla  
34

### Application of Regression Line to Obtain Specified Number of Points in Reduced Large Datasets  
Wioleta Blaszczak-Bak and Anna Sobieraj  
40

### Application of RSSI Based Navigation in Indoor Positioning  
Joanna Janicka and Jacek Rapinski  
45
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application of Web-GIS and Cloud Computing to Automatic Satellite Image Correction</td>
<td>51</td>
</tr>
<tr>
<td>Marek Moszynski, Pawel Czarnul, Marcin Kulawiak, Michael Bishop, Tomasz Bielinski, and Iliyana Dobreva</td>
<td></td>
</tr>
<tr>
<td>Cartographic Analyzes in GIScience</td>
<td>56</td>
</tr>
<tr>
<td>Agnieszka Bitner</td>
<td></td>
</tr>
<tr>
<td>Coastal Cliffs Monitoring and Prediction of Displacements Using Terrestrial Laser Scanning</td>
<td>61</td>
</tr>
<tr>
<td>Pawel Tysiac, Aleksander Wojtowicz, and Jakub Szulwic</td>
<td></td>
</tr>
<tr>
<td>Comparison of Selected Machine Learning Algorithms for Sub-Pixel Imperviousness Change Assessment</td>
<td>67</td>
</tr>
<tr>
<td>Wojciech Drzewiecki</td>
<td></td>
</tr>
<tr>
<td>Comparison of Selected Reduction Methods of Bathymetric Data Obtained by Multibeam Echosounder</td>
<td>73</td>
</tr>
<tr>
<td>Marta Wlodarczyk-Sielicka and Andrzej Stateczny</td>
<td></td>
</tr>
<tr>
<td>Considerations on Indoor Navigation Based on Cheap Mobile Devices</td>
<td>78</td>
</tr>
<tr>
<td>Artur Janowski and Michal Bednarczy</td>
<td></td>
</tr>
<tr>
<td>Cultural Heritage in Spatial Planning</td>
<td>85</td>
</tr>
<tr>
<td>Krzysztof Rzasa, Marek Ogryzek, and Marcin Kulawiak</td>
<td></td>
</tr>
<tr>
<td>Detecting Fog and Stratus in MODIS Data</td>
<td>90</td>
</tr>
<tr>
<td>Janusz Jasinski, Karolina Krawczyk, Dariusz Chaladyniak, and Slawomir Pietrek</td>
<td></td>
</tr>
<tr>
<td>Detection of Gross Errors in the Elements of Exterior Orientation of Low-Cost UAV Images</td>
<td>95</td>
</tr>
<tr>
<td>Michal Kedzierski, Anna Fryskowska, Damian Wierzbicki, Aleksandra Grochala, and Paulina Nerc</td>
<td></td>
</tr>
<tr>
<td>Developing Tools for Image-Based 3D Reconstruction: Palace Pena Case Study</td>
<td>101</td>
</tr>
<tr>
<td>Jakub Kolecki</td>
<td></td>
</tr>
<tr>
<td>Elaboration and Modeling of the Railway Infrastructure Using Data from Airborne and Mobile Laser Scanning</td>
<td>106</td>
</tr>
<tr>
<td>Boguslawa Kwoczynska, Wojciech Sagan, and Katarzyna Dziura</td>
<td></td>
</tr>
<tr>
<td>Krzysztof Bruniecki, Andrzej Chybicki, Marek Moszynski, and Mateusz Bonecki</td>
<td></td>
</tr>
<tr>
<td>Examples of Applications of Common Baltic Sea Datums in Analyzes of Extreme Sea Level Change</td>
<td>122</td>
</tr>
<tr>
<td>Tomasz Wolski and Bernard Wisniewski</td>
<td></td>
</tr>
<tr>
<td>Free Public Geodata Services - Theoretical Studies of Approach in Lithuania and Poland</td>
<td>128</td>
</tr>
<tr>
<td>Ina Živatkauskiene, Birute Nenortaite, Marek Ogryzek, and Krystyna Kurowska</td>
<td></td>
</tr>
</tbody>
</table>
Free Satellite Imagery for Monitoring Reclaimed Sulphur Mining Region

Tarnobrzeg, Poland ..........................................................................................................................134

Beata Hejmanowska, Ewa Glowienka, and Krystyna Michalowska

Full Implementation of the River Information Services of Border and Lower Section of the Odra in Poland ........................................................................................................................................140

Andrzej Stateczny

Hierarchical Development of the Spatial Data Infrastructures as a Globalization Trend ..........................................................................................................................................................147

Agnieszka Dawidowicz and Ryszard Zrobek

Identifying the Effects of Selected Road and Roadside Parameters on Road Safety Using Geodetic Techniques ..........................................................................................................................................................154

Marcin Budzynski, Kazimierz Jamroz, Jerzy Pyrchla, Wojciech Kustra, and Krzysztof Pyrchla

Integration and Visualization of the Results of Hydrodynamic Models in the Maritime Network-Centric GIS of Gulf of Gdansk ........................................................................................................................................................................159

Jerzy Pyrchla, Marek Kowalewski, Martyna Leyk-Wesolowska, and Krzysztof Pyrchla

Integration of Spatial Data from External Sensors in the Mobile Navigation System for Inland Shipping ........................................................................................................................................................................165

Grzegorz Zaniewicz, Witold Kazimierski, and Izabela Bodus-Olkowska

Method of Parameter Reduction in the Transformation of Oblique Photographs and Proposal of Its Implementation in Unmanned Aerial Systems ..........................................................................................................................................................171

Grzegorz Stepień, Józef Sanecki, Andrzej Klewski, and Ewa Zalas

Modeling Spatial Relationships between Geodetic Control Points and Land Use with Regards to Polish Regulation ........................................................................................................................................................................176

Krzysztof Pokonieczny, Beata Calka, Elżbieta Bielecka, and Paweł Kaminski

Performance of the Automatic Bundle Adjustment in the Virtualized Environment ........................................................................................................................................................................181

Mariusz Twardowski, Elżbieta Pastucha, and Jakub Kolecki

Processing of LiDAR and Multibeam Sonar Point Cloud Data for 3D Surface and Object Shape Reconstruction ........................................................................................................................................................................187

Marek Kulawiak and Zbigniew Lubniewski

Research into the Movements of Surface Water Masses in the Basins Adjacent to the Port ........................................................................................................................................................................191

Lech Kasyk, Monika Kijewska, Martyna Leyk-Wesolowska, Marek Kowalewski, Jerzy Pyrchla, and Krzysztof Pyrchla

Schreiber's Differencing Scheme Applied to Carrier Phase Observations in the MAFA Method ........................................................................................................................................................................197

Dawid Kwasniak, Sławomir Cellmer, and Krzysztof Nowel

Selection of Geocomposition Components for the Mobile Inland Water Navigation System Based on Users' Need ........................................................................................................................................................................205

Izabela Bodus-Olkowska, Witold Kazimierski, and Grzegorz Zaniewicz
Selection of Optimal Measurement Point Density in Travel Time Mapping:
Warsaw Airport Case Study ............................................................211
   Albina Moscicka, Krzysztof Pokonieczny, and Joanna Tomala

Self-Acting Data Gathering for Travel Time Analysis: Warsaw Airport
and Central Railway Station Case Study ......................................217
   Krzysztof Pokonieczny, Albina Moscicka, and Joanna Tomala

Spatial Modeling of Crime by Using of GWR Method .....................222
   Somayeh Nezami and Ehsan Khoramshahi

Structural Health Monitoring of Composite Shell Footbridge for Its Design
Validation ......................................................................................228
   Mikolaj Miskiewicz, Lukasz Pyrzowski, Jacek Chroscielewski,
   and Krzysztof Wilde

Synthetic Landscape Differentiation Index a Tool for Spatial Planning 234
   Anna Bober, Beata Calka, and Elzbieta Bielecka

The Application of Geoinformation Theory in Housing Mass Appraisal 239
   Beata Calka and Elzbieta Bielecka

The Digital Image Correlation System in Experimental Tests of Beam
Deflection ......................................................................................244
   Edyta Kowalska, Andrzej Rutkiewicz, and Malgorzata Szumilo

The Importance of Contextual Topology in the Process of Harmonization
of the Spatial Databases on Example BDOT500 ............................251
   Adam Inglot and Krystian Koziol

The Use of Free Adjustment and Msplit-Estimation for Determination of
the Vertical Displacements in Unstable Reference System ...............257
   Daria Filipiak-Kowszyk and Waldemar Kaminski

The Use of Terrestrial Laser Scanning in Surveying Historic Buildings 263
   Boguslawa Kwoczynska, Urszula Litwin, Izabela Piech, Piotr Obirek,
   and Jakub Sledz

Towards Building Data Semantic Similarity Analysis: OpenStreetMap
and the Polish Database of Topographic Objects ...........................269
   Joanna Nowak da Costa

Transformation of the PerpetualUsufruct Right Into the Ownership of
a Real Property Estate ....................................................................276
   Pawel Wysocki

Urban Street Network Analysis Using Space Syntax in GIS — Cracow
Case Study ....................................................................................282
   Agnieszka Telega

Using Cartographic Sources in Studying the Development of Cities ....288
   Bogdan Wolak

Author Index ..................................................................................295