

The Four Centuries of Polish Books for Land Surveying

Adam Łyszkowicz and Marcin Uradziński, Poland

Key words: history, geodesy

SUMMARY

In the time of Middle Ages, both in Poland and in many different countries of Europe, the knowledge was passed on to the next generations orally. In the time of Renaissance, the invention of the printing had changed this situation. In Poland first surveyor's book was written in Latin by Martin from Zurawica in 1450.

In the present work, development of the geodetic literature for the period 1450 – 1850 is described. The sources which were used in the study, comprise the old manuscripts, old hand writings and rare following editions. In total, 19 geodetic books were described giving their title, the authors, year of the printing, the place of storage and the short description of the content together with a suitable drawings.

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1. INTRODUCTION

The quick development and enormous role which plays technique in the present life, also results in the growing of an interest in its history. The main aim of the present work is description of the history of the Polish geodetic books in the period of 400 years, since the appearance of the first work about geodesy in the middle of XV century, up to the middle of XIX century when the number of geodetic books reached unusually large size.

Chronologically the paper was divided into three periods. First period begins in the half of XV century when appears the oldest geodetic book and lasts in 1764 because at that time comes immense economic and cultural changes in Poland, which causes the growth of the technical literature. Second period begins in 1764 and lasts to 1815 when on the considerable areas of the Polish Kingdom begins the quick growth of the industry and therefore the quick growth of technical literature too. Years since 1815 until 1850 make up third period finishing four hundred years from the date 1450.

2. FIRST PERIOD

In Poland first technical book was the book from the field of geodesy. It was written by Marcin from Żurawica professor of Jagiellonian University in Cracow. Marcin was the first Polish researcher working in the day of Renaissance in the field of sciences. He wrote the works from the field of astronomy and mathematics. However the book of the largest the interest was on the subject of geodesy. The book *Geometria* was written in 1450 as the result of the lectures of the Italian professor Beldomandiego, who Marcin listened surely in Padua. In this book, written in Latin, after the introduction including the explanation of the theoretical questions such as proportions, rectangular triangle, the relation of the periphery of wheel to its diameter etc. then follows the lecture on the height, distance and depth measurements. The content of the work shows on the high level of mathematical sciences at the Jagiellonian University in this time.

The first book written in Polish is the work of art from the field of geodesy *Geometryja to jest miernicka nauka...* (Geometry it is the science of measurements...) published in Cracow in 1566 r. The book was written by Stanisław Grzepski professor of Jagiellonian University prominent expert in the field of the Greek literature and already well known from the work on the ancient metrology.

The book *Geometryja to jest...* is written in Polish and is describing in the interesting and easy way pure technical questions, is already on the territory of Poland, after Marcin from Żurawica, the second attempt of writing the textbook on geodesy. It consists of the simplified lecture of the most important principles of geometry, necessary for the contemporary geodesist, from the chapters about the field units used in Poland, measurement of geometrical

figures and chapter describing the methods of the height, distance and depth measurement. Content is explained brightly, using the beautiful and correct language, with the use for the first time Polish terminology in this discipline. It is the synthesis of knowledge taken from classical mathematics, some new western authors and experiences of Polish geodesists.

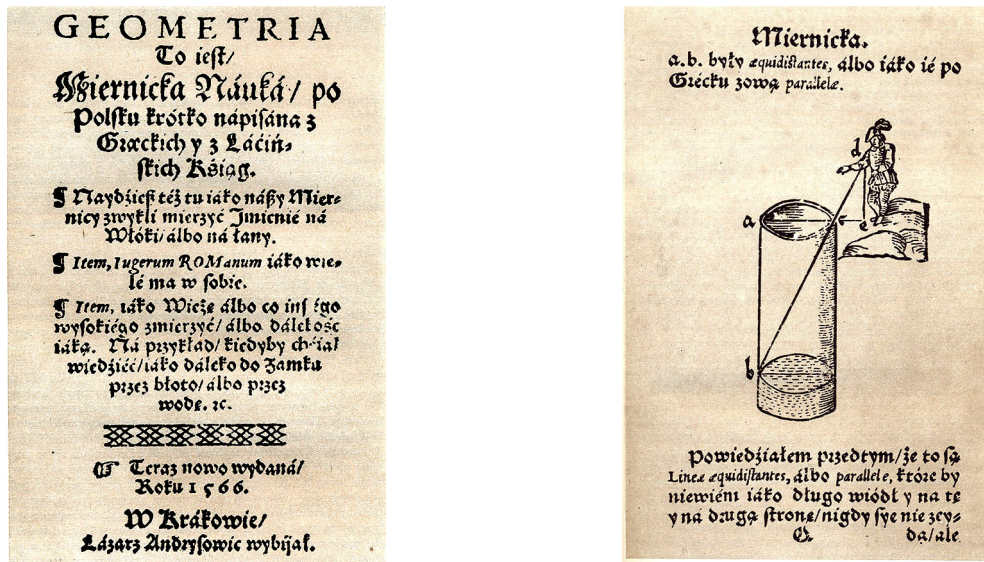


Fig. 1 The title page and page showing the method of depth measurement in the book *Geometryja* written by Stanisław Grzepski and published in Cracow in 1566

The next book in the field of geodesy was written by Jan Brożek. He studied at Jagiellonian University mathematics, astronomy and classic languages. Then he began his lectures at the university in 1610 and at the same time published his first work *Geodaesia distantiarum sine instrumento et Polybii locus obscurior geometricè explicatus* (Geodesy of distance without instruments and the Polybii problem geometrically explained). This essay written in Latin concerned to determination of the distance of the inaccessible point by the similarity of triangles and considered the question of the relation of the periphery of various figures to their surfaces.

Then thirty years later appeared his only essay written in Polish on geodesy, namely *Przydatek pierwszy do geometryjej polskiej Stanisława Grzepskiego* (First supplement to Polish geometry of Stanisław Grzepski). This work relates to geodetic measurements done using the magnetic needle.

Next booklet from the field of geodesy published between year 1643 and 1648 probably in Lubcz upon the Nemaen in Poland has the title *Geometria peregrinans* (Wandering geodesy). It is written in Latin and does not contain the date and the place of **release** neither author. This book was written by Maciej Głóskowski, author among others several rhymed literary works. This book contained 21 problems relating to the measurement of inaccessible distances by the means of the straight lines.

The *Geometria peregrinans* met with the big interest especially behind the borders and the prominent Dutch geodesist Frantz van Schooten in his book *Excercitationum*

mathematicorum libri quinque gave solutions of 16 problems described in Maciej Głoskowski's book.

Successive work from the field of geodesy *Księgi nauk matematycznych* (Book of mathematical sciences) was written in Polish in years 1655-1659 by Józef Naronowicz-Naroński. This book consists of three volumes. The first volume deals with arithmetic, the second volume deals with geometry and the last volume presents principles of the perspective and the science of fortification.



Fig. 2 The title page and cadastral map of Lubecz in the book *Geometria albo rozmiar* written by Józef Naronowicz-Naroński and published in Cracow in 1659

The second part of the work is dedicated geometry and contains a lot of very exact information relating geodesy and cartography. Thus the section IX deals with the use of the trigonometry to the measurements of distance and height. The sections X and XI concern the techniques of maps drawing. Section XII is about the astrolabe which is equivalent of our present theodolites. Sections XIII and XIV are about different measuring instruments and sections XV and XVI are about carrying out measurements in difficult conditions using special instruments.

The next book about technical subjects written by the prominent Polish writer Stanisław Soluski had the great meaning in the past times. Soluski being 16 years old entered to Jesus Society where he studied theologies and mathematics. Then he settled in Cracow where he wrote and published the number of religious and technical books. The book *Geometra polski, to jest nauka rysowania, podziału przemieniania i rozmieszczania linii, angułów, figur i brył pełnych* (Polish land surveyor...) his first bigger book about technical content. The book consists of three volumes and it counts 600 pages, over 20 tables with drawings and the explanation of practical geometry. The successive volumes were published in 1683, 1684 and

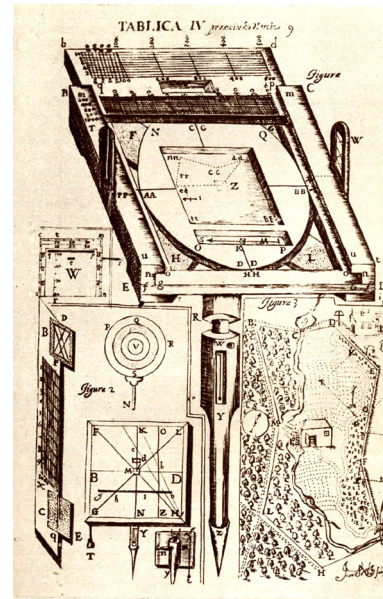
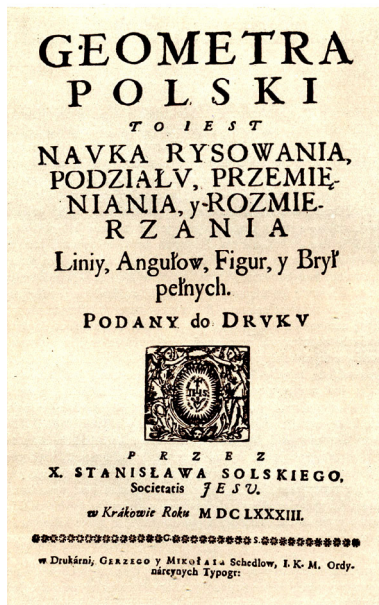


Fig. 3 The title page and page showing the plane table in the book *Geometra polski*, written by Stanisław Soluski and published in Cracow in 1683

In several years later Soluski wrote in Latin another one book relating geodesy, namely *Praxis nova et expeditissima geometricae mansurandi distantias, altitudines et profunditates* (New and excellent surveying practice of geometric distance measurement, heights and depths) in Latin. The book was published in 1688 in Cracow.

In the same time that Soluski in Poland lived and wrote Wojciech Tytkowski (1624-1695). He is the author about 60 works of mostly theological or philosophical content and except this he wrote several works about the technical character. Among them is *Geometria practica curiosa* (Curious practical geometry) in Latin, printed in Poznan in 1692. This book contains many information from the field of surveying.

3. SECOND PERIOD

On the wish of the king August civil engineer Stanisław Bakałowicz wrote a few works relating fortifications and cartography, and the most important from the historical point of view of technical literature are two of his books. First of them *Essai sur la fortification ou application de la fortification au terrain* was published in Warsaw in 1769. Second book from the field of geodesy was published in Warsaw in 1773. The *Traité sur le nivellement* has 13 chapters. First the theoretical questions, and then the practice of carrying out the levelling is described.

The best textbook in that time in field of geodesy was book *Jeometryja praktyczna* (Practical surveying) written by Ignacy Zaborowski. The author of this textbook received the education

at the school conducted by Piarist in Złoczów. Ignacy Zaborowski in the problems of geodesy was engaged probably by the king Stanisław August to whom he dedicated his textbook. The king, for writing this textbook, gave him the gold medal and appointed as an examiner of the Polish land surveyors.

The work *Jeometryja praktyczna* publishes in Polish first time in Warsaw in 1786 consists of eight chapters and “Przydatku” (supplement) speaking about carrying out measurements of the land boundaries. The principal text treats about measurements by the means of the simplest instruments, about the use of the plane table, about trigonometric calculations, about the use of the compass, about re drawing of the maps in the suitable scales, about measurement of the surface of land and its division and at last about the levelling. Tables enclosed to the work with the examples of the topographical drawings represent the great value.

Zaborowski’s work of art by the long time served as the textbook for education of Polish geodesists and its editions appeared in 1792, 1806, 1815 and 1820.

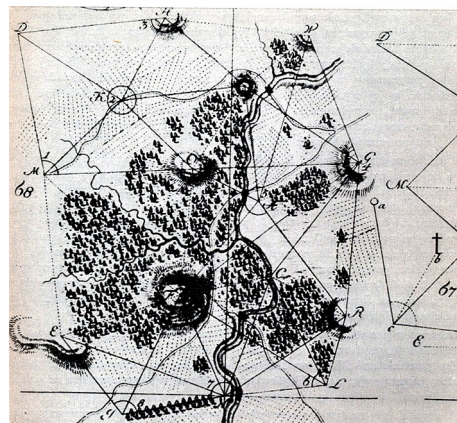


Fig. 4 The title page and example of map preparation in the book *Jeometryja praktyczna* written by Ignacy Zaborowski and published in Warsaw in 1786

4. THIRD PERIOD

Juliusz Kolberg was the most prominent expert in the field of geodesy in this time in Warsaw. He was born in German family in Woldegk in Meklemburg and studied land surveying in Schwerin and then civil engineering in Berlin. Soon then he worked at the establishment of the triangulation networks in Wielkopolska in Poland. In 1817 he became the professor of the

land surveying, levelling and topographical drawing at the Warsaw University.

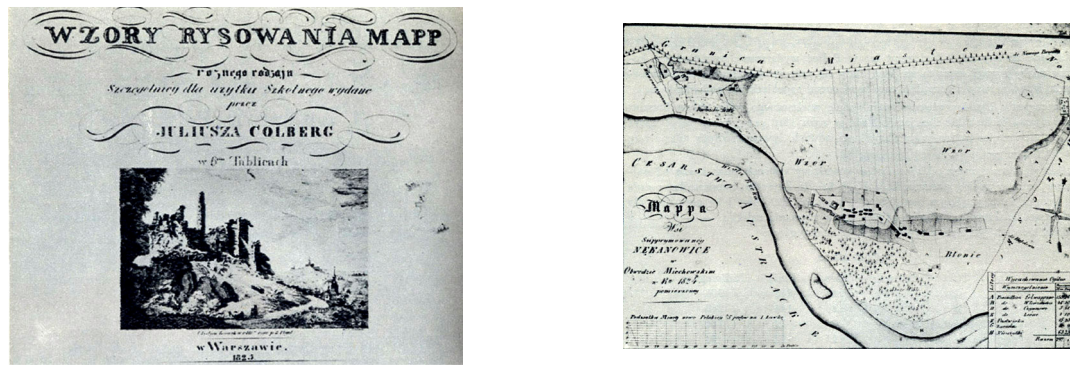


Fig. 5 The title page and page showing the example of map plotting in the book *Wzory rysowania map różnego rodzaju, szczególnie dla użytku szkolnego*, written by Juliusz Kolberg in Warsaw in 1825

Juliusz Kolberg got degree of the doctor of the philosophy for the dissertation about invented planimeter and described in *Opisanie składu i użycie planimetru, wynalezionej nowo mierniczego narzędzia do dochodzenia powierzchni płaskich figur* (Description and use of a new constructed planimeter...). Juliusz Kolberg is the author of numerous works from the field of geodesy. The part of them as e.g. the textbook *Geodezja* (Geodesy) for land surveyors practically remained in the manuscript. Another books were the printed. Two of his books first of all draw our attention, namely: *Porównanie terażniejszych i dawniejszych miar i wag w Królestwie Polskiem używanych* (Comparison of present and old measures and weights in Polish Kingdom used) published in Warsaw in 1819 and the next *Wzory rysowania map różnego rodzaju, szczególnie dla szkolnego użytku* (Examples of various map drawing especially for the use in schools) published in Warsaw in 1825 .

The question of the improvement of the existing and constructing new geodetic instruments in these time was very important. So ten years after constructing the planimeter by Julisz Kolberg, John Zaremba constructed the improved planimeter. This planimeter was recognized by experts for the best in the country and the abroad. John Zaremba published the results of his work in 1829 in Puławy in the book *Planimetr - narzędzie jeometryczne wymierzające powierzchnię wszelkich figur prostokreślnych bez wykreślenia i rachunku* (Planimetr as the surveying instrument...).

In the same time in Vilnius worked in the field of geodesy Antoni Szahin. He finished in 1816 the Vilnius University and in 1816 began works in the local astronomical observatory and next was the head of Chair of Geodesy at this university. Antoni Szahin wrote number of articles from the fields of astronomy and geodesy which were published Vilnius Journal, and wrote two textbooks, namely: *Jeodezję wyższą* (Higher geodesy) and *Miernictwo i równoważenie* (Surveying..) both printed in Vilnius in 1829. These textbooks show the contemporary state of knowledge in the field of geodesy and contain the detailed description of the methods and instruments from the simplest to the advanced problems applied e.g. in triangulation.

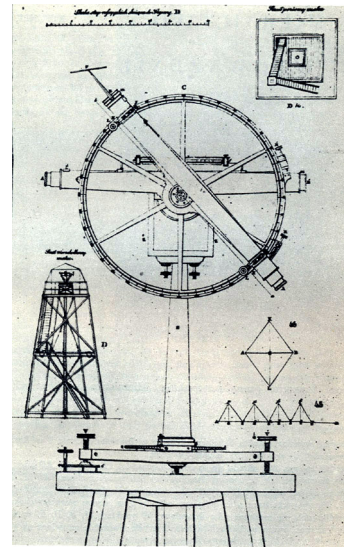
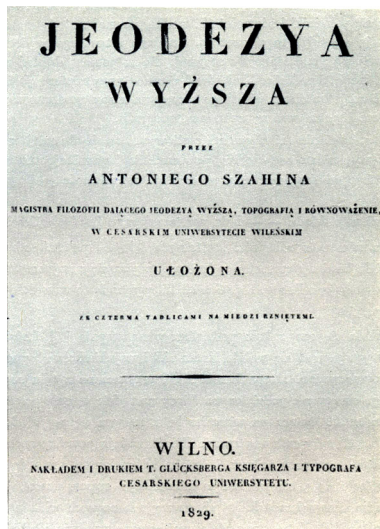


Fig. 6 The title page and page showing the instrument with the Borda's circle in the book *Jeodezyja wyższa* written by Antoni Szahin and published in Vilnius in 1829

Wilhelm Kolberg was a son of previously mentioned Juliusz Kolberg and in the first period of his professional activity he published in Warsaw in 1837 a new *Wzory rysowania map i planów* (Examples of maps and plans drawing) with descriptions in Polish, French, Russian and German and in 1838 the second enlarged and completed edition of his father's work. In the later years he was involved in the rivers regulations and roads and bridges construction.

The next textbook was written by Wincenty Koprzywnicki who was born in Koprzywnica in 1800. He studied first at university in Cracow and then in Warsaw where he got a degree of master of philosophy. Finally he got a post as the lecturer in college in Radom where he taught mathematics and surveying. In 1841 he published a very good textbook *Miernictwo niższe* (Surveying).

5. SUMMARY

In Poland since 1450 up to 1850 nineteen books from the field of geodesy were published. The first book on geodesy and land surveying written in 1450 was the first technical book in Poland. It was handwritten in Latin and we have only two copies from the end of XV century. The remaining eighteen books were printed first in Cracow then in Warsaw and Vilnius and were connected with the development of the universities.

The first university in Poland called *Jagiellonian University* was founded in 1364 by King Casimir III the Great in Cracow. It is the oldest university in Poland and is the second oldest university in Central Europe and one of the oldest universities in the world.

The second university *Vilnius University* was founded in 1579 as the Jesuit Academy (College) of Vilnius (Vilna, Wilno). It was the third oldest university in the Polish-Lithuanian Commonwealth.

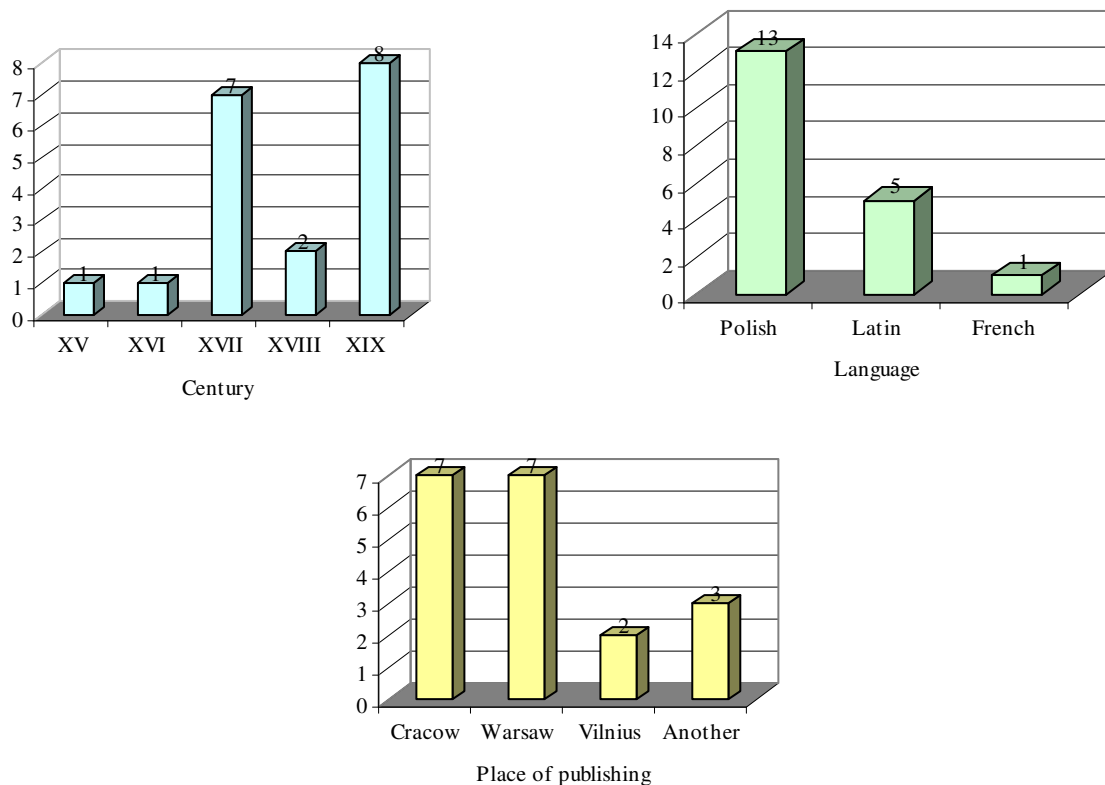


Fig. 7. Statistics of the published geodetic books

The *University of Warsaw* was established in 1816, when the partitions of Poland separated Warsaw from the oldest and most influential Polish academic center, in Cracow. Presently it is the largest university in Poland and after *Jagiellonian University* one of the most prestigious.

Therefore the first geodetic books (seven) were printed in Cracow, seven books in Warsaw and three books in another places. First book were written in Latin - 5 books, then in Polish – 13 books and one in French (Fig. 7).

Presently old books and manuscripts are scanned and published by the libraries in an electronic way. However, from the geodetic old books only *Geometria to jest miernicka nauka...* written by Stanisław Grzepski is available in an electronic way at http://geoforum.pl/upload/files/site_catalog_text/2208_GS_72.pdf.

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BIOGRAPHICAL NOTES

Prof. Adam Łyszkowicz

Education and previous appointments

M.Sc. – Warsaw Technical University, 1967, Poland

Ph.D. – Agricultural and Technical University in Olsztyn, Poland, 1975

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Adam Łyszkowicz and Marcin Uradziński

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1967-68 – Assistant, Institute of Geodesy and Cartography, Warsaw, Poland
1968-82 – Lecturer, Agricultural and Technical University in Olsztyn, Poland
1982-87 - Expert, Organisation for Surveying and Cartography "Geokart", Warsaw, Poland
1984-86 – Lecturer, University of Zambia, Zambia
1993 – Senior Lecturer, University of the West Indies, Trinidad
1986-2002 - Professor, Space Research Centre PAS, Warsaw, Poland
Since 2002 – Professor, University of Warmia and Mazury in Olsztyn, Poland

Interest

Geodesy, gravity field, geodetic networks, surveying

Dr. Marcin Uradziński is an assistant professor in the Department of Geodesy and Land Management, University of Warmia and Mazury in Poland since 2006. He has been involved in GPS research since 2000. His main research topics are: integrated navigation systems and digital mapping. In 2007-2008 he was a postdoctoral fellow at the University of New Brunswick, where he carried out research related to Internet-based RTK positioning for precise navigation. In 2009-2010 he was a postdoctoral fellow at the Wuhan University where his research topic was the usefulness of moving base station for vehicle tracking systems.

CONTACTS

Prof. Adam Łyszkowicz
Chair of Land Surveying and Geomatics
University of Warmia and Mazury in Olsztyn, Poland
10-957 Olsztyn
12 Jana Heweliusza St.
Poland
Tel. +48 89 523 4878
Fax +48 89 523 4878
Email: adaml@uwm.edu.pl
Web site: www.uwm.edu.pl

Dr Marcin Uradziński
Chair of Land Surveying and Geomatics
University of Warmia and Mazury in Olsztyn, Poland
10-957 Olsztyn
12 Jana Heweliusza St.
Poland
Tel. +48 89 523 4878
Fax +48 89 523 4878
Email: marcin.uradzinski@uwm.edu.pl
Web site: