19	100,64	109,88	217,37	100,60	109,82	217,26	0,04	0,06	-0,11
21	99,02	117,51	217,22	98,96	117,56	217,14	0,06	-0,05	0,08
23	100,39	126,41	217,32	100,45	126,40	217,41	-0,06	0,01	-0,09
29	94,22	142,09	217,45	94,25	142,03	217,52	-0,03	0,06	-0,07

Mean coordinates differences:
$\Delta Xm = \Sigma \Delta X / n = 0{,}002m$
$\Delta Ym = \Sigma \Delta Y / n = 0{,}020m$
$\Delta Hm = \Sigma \Delta H / n = -0{,}048m$

Affirmative result of this test confirms utility of showed method for quick collecting and updating of geoinformation data on local, small areas – like supplement of some others photogrammetric and direct methods.

This project is developing for now and for the future.

The author's suggestion is digital camera application. For more precision – before every photo-flight session – quick calibration of camera is recommended (photos of calibration image – for example like Topcon PI-3000 software) but not always needed (low altitude).

Visual control of flight (like the one tested by the author) is often insufficient, hence the idea of images parameters controlling in real time by TV or cellular 3-G UMTS system parallel to images collecting by main (basic) camera.

Additionally GPS (for centre of projection registration) and flight control system (realized pre-programmed flight path with centre of projection points of images) with 3-axial giro-sensors for flight stabilization - improving technological process of photogrammetric elaborating.

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THE DIGITAL ORTHOPHOTOMAP AS MATERIAL FOR EVALUATION OF CHANGES IN CULTURAL SCENERY

Application possibility of orthophotomap for evaluation of changes in cultural scenery was explored on an example village, Kasinka Mała .

INTRODUCTION

The scenery in the present interpretation applies to spatial and the material dimension of earthly reality and means a complex system composed of the following forms: relief ,vegetation and waters (Zonneveld 1990).

Cultural scenery, called also anthropogenical, is connected with man's cultural activity. It is an area of intensive man's activity, causing essential changes in arrangement of natural conditions of environment and introduction of spatial elements created by man (Ambrosiewicz, Mackiewicz 1998, Banaszak and Kasprzyk 1993, Mazur 1998, Meeus, 1995, Szczęsny, 1990,1982).

The investigations of scenery, and particularly its evaluation, as well as forecasting of desirable changes and the states of behaviour, belong to particularly difficult tasks of sciences. In the past they mostly had based on intuitive methods, that were often rather subjective. Complexity of questions, and particularly the scenery spatial parameters describing the landscape leads to necessity of support of its evaluation with different scientific fields, which often results in very subjective or even divergent results of scientific studies on its evaluation.

Orthophotomap as one of products of modern digital photogrammetry may be used to estimate changes in anthropogenical scenery.

The orthophotomap is corrected with regards to dislocation, consequential from form of terrain and the inclination of images in equal scale and exactitude not latter to traditional topographical map, but including many more information than traditional line map. The whole quantity of contained information on the aerial photograph is transferred directly without any significant losses on map without use of any cartographical symbols that generalize the content (Jarząbek, Żarkowski, 1997).

The scale of digital orthophotomap printout may be well considered as coefficient related to the level of presented details, required for the scale of topographical map. Image zooming (change of scale on-screen) causes the automatic generalization of the content while reducing the scale and achievement of maximum scale allowing to notice the pixels structure of images.

The main value of orthophotomap is the objective picture of state of use at the very moment of realization of the terrain images. Relation of images with particular moment of registration causes, that the orthophotomap executed in spring differs from the one taken in summer or autumn, which allows for monitoring of changes taking place in the environment. The orthophotomap is the superb material to distinguish different types of use. Urbanized areas, those used agriculturally and natural ones may be easily and effectively identified.

With very high probability it is possible to identify grasslands as well as areas with insufficient agricultural culture - the, bushes, self-sown plants, sandbanks, dumping grounds. Some problems arise at detailed functional qualification, mainly of urbanized areas (Pyka, Świeczek, Włodek, 2005).

AREA OF INVESTIGATIONS

The investigations on the possibility of digital orthophotomap use in evaluation of landscape changes in mountain-foot terrains were conducted on the area of Kasinka Mała village (photo1).

The object was chosen as an example of mountain-foot area with landscape changes.

Aerial colorful photographs in scale 1: 26 000, executed in 1995-1997 within PHARE programme as well as archival panchromatic images from sixties and seventies in scale 1:19 000 and 1:20 000 were used for the investigations.

DESCRIPTION OF INVESTIGATIONS

The proposed methodology of evaluation of scenery changes uses the photogrammetric method, with the concrete ways of qualification of the chosen parameters determining the changes of scenery. Digital orthophotomap is the material facilitating to determine location of analyzed changes, generated from both archival panchromatic images and aerial colorful photographs.

For orthophoto elaborating fully digital technology was applied, with the use of digital station Intergraph (ImageStation Z Model No: QQR273420).

Orthophotomap is composed of orthoimages generated with pixel size 0.50 m, recommended for scale map 1: 10000. The accept scale was 1:10 000 for orthoimages colorful from pictures 1:26 000 as well as 1: 5000 from panchromatic pictures.

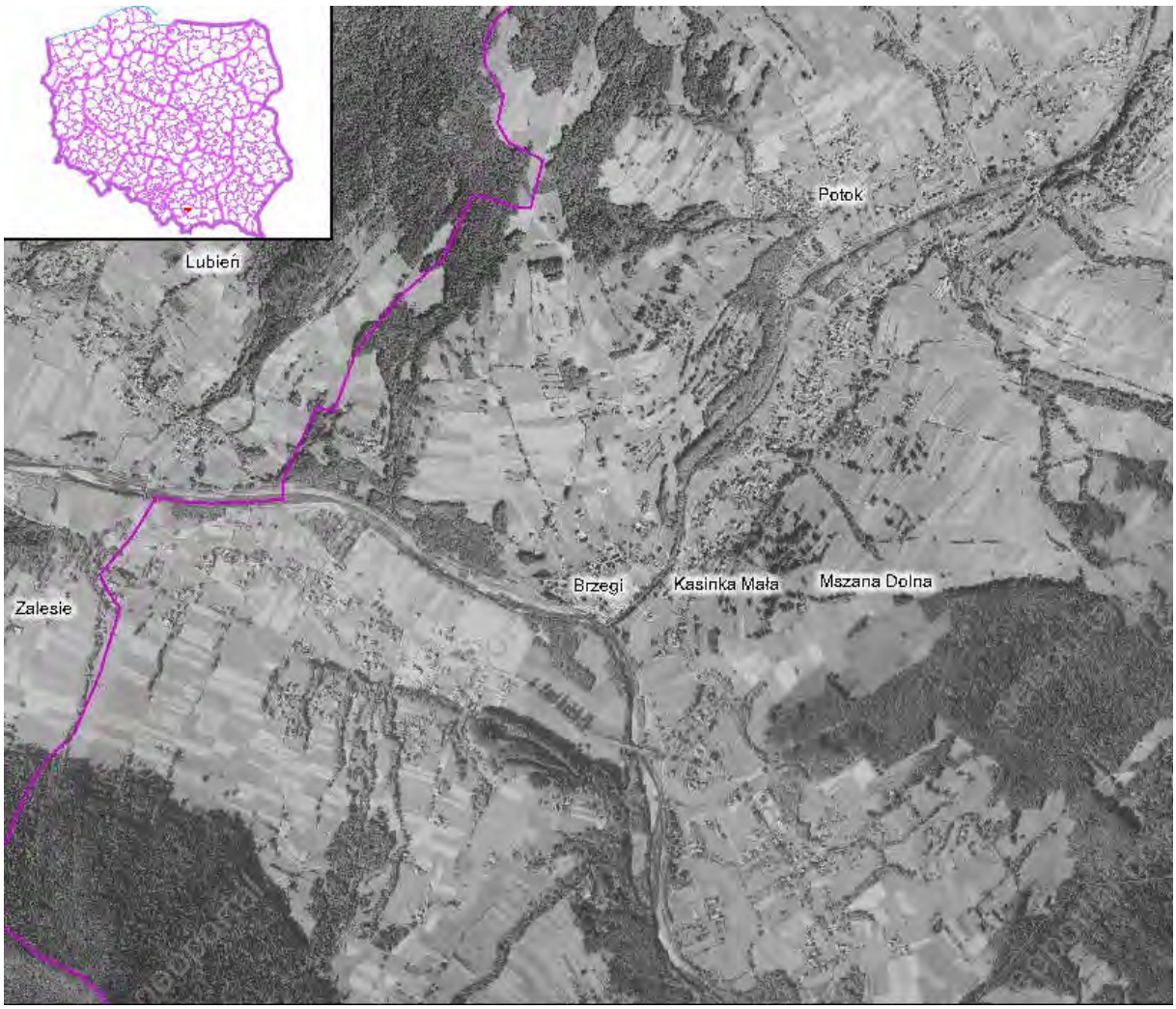

Photo1. Zone of investigations –Kasina Mała
Source: Web site - Geoportal

Analysis of orthophotomap was carried out in the environment of MicroStation with the use of software, which made possible simultaneous tailing landscape changes, that had appeared on studied terrain in the years 1963,1977,1997.
These elements may be divided into the following groups:

- linear elements of the communication draughts, lot lines, buildings
- superficial elements: croplands , forests,
- spatial elements: the form the terrain (connected with form relief perpendicular scenery, slope).

Observed changes

LINEAR ELEMENTS

The communication draughts - the increase in the quantity of roads of studied period, recognizable on aerial photographs by a characteristic linear shape as well as the connection and coexistence with the settlement - net (photo 2,3) was observed in the studied period.
Elements of the communication infrastructure often contrast from surroundings by color or phototone depending on the type of surface and the category of a road. Usually local roads are masked with wayside trees, which can be the indirect feature facilitating the locations of roads. Part of field ways covered with grass is not perceptible on orthophotomap, because of weak contrast in relation to surroundings.

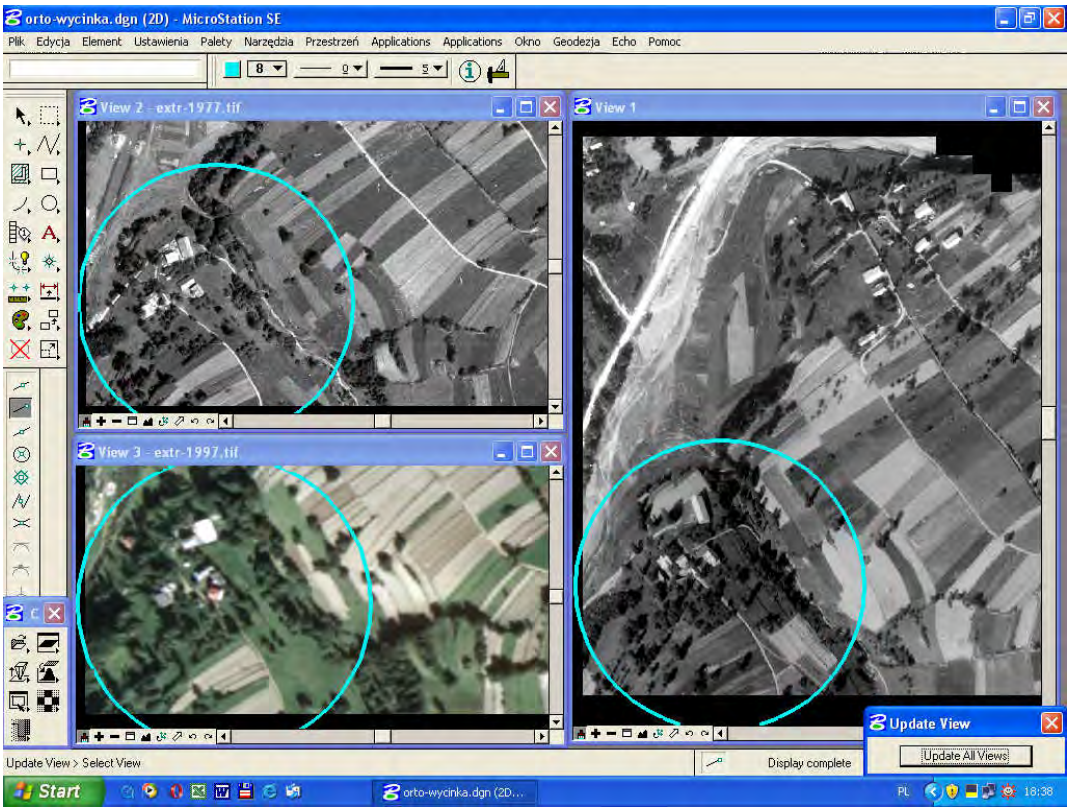

Photo2. Observed changes in course of roads in the years 1963, 1977, 1997

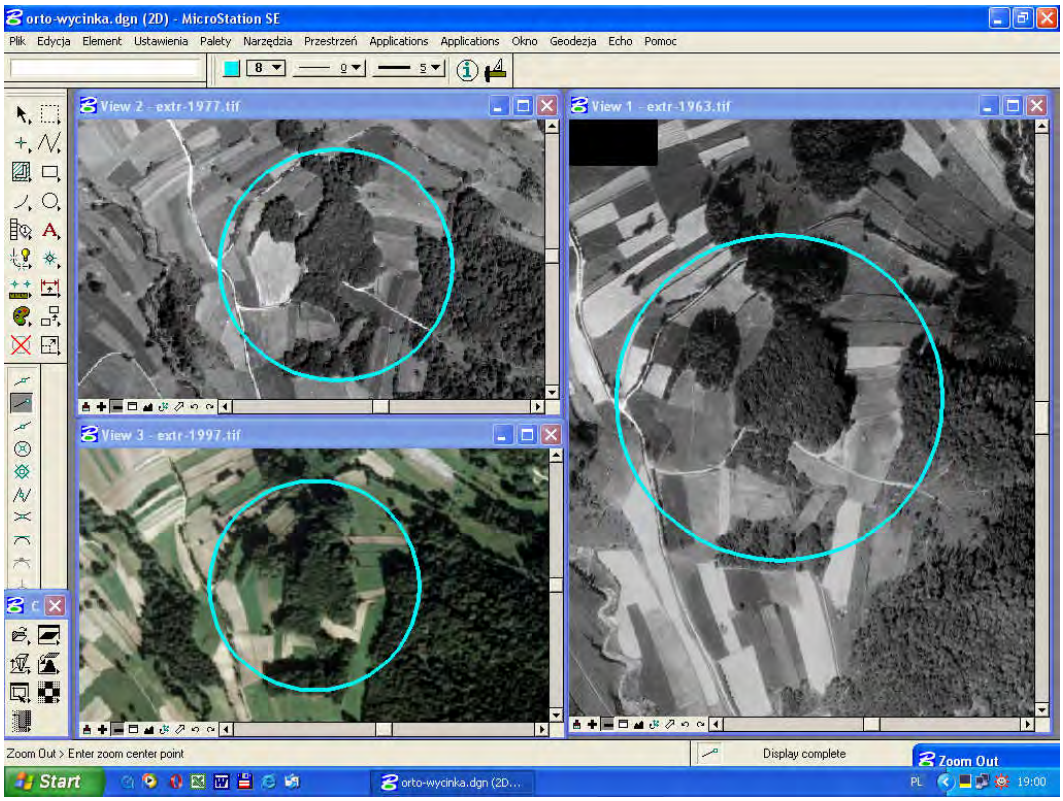

Photo3. Observed changes in course of local roads in the years 1963, 1977, 1997

The lot lines - parcels are not visible on aerial photographs for they are often overgrown with shrubs (photo 4). We can however recognize boundary strips by tonal differentiation of the photographic image of neighbouring tillages.

Photo4. Changes in visibility of parcel borders (covered with shrubs)
Source: Own investigations

Buildings

Changes in the use of the ground, caused the transformation in colonization, which results in the more intensive building development (the increase in the number of new buildings), (photo 5,6). New directions of more intensifying tillages more as well as enlargement of the surface of orchards and gardens.

Photo5,6. Visualization of new buildings
Source: Own investigations

SUPERFICIAL ELEMENTS

Land use - are important element that influences on scenery differentiation. Anthropogenical activity is visible here, the natural conditions, which influenced the way of use (photo 7).

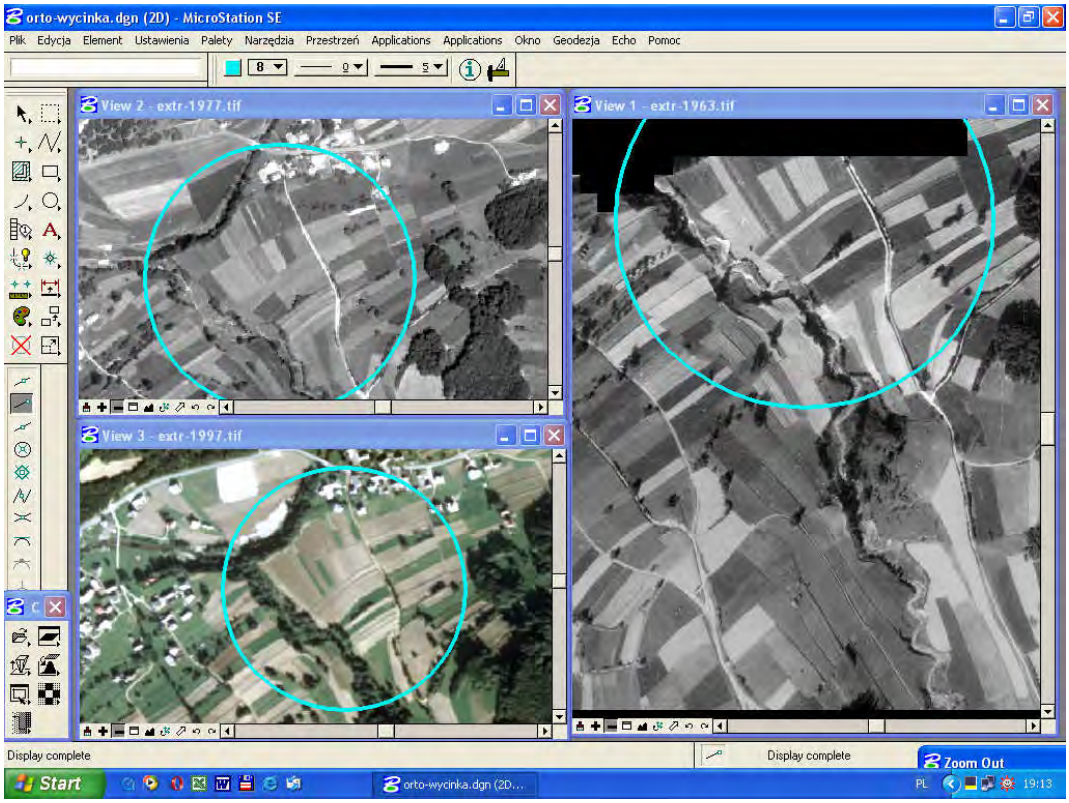

Photo7. Changes of course of cropland borders
Source: Own investigations

Forests - On the forest areas the spatial structure of scenery is modified by changes in use of inforest of agricultural areas, ocured mainly as a result of purposeful afforestation or natural process of forest succession after cessation of the agricultural tillage. As the result, the forests areas underwent changes (photo 8).

The interpretation of forest composition of choice has not been the object of investigations.

To make preliminary evaluation of changes in scenery components it is useful to utilize the direct identification of structure and texture features because they reflect the character of photographed surface of an object. The most frequently the structure is defined as smooth, fine-grained or coarse-grained. Texture represents spatial arrangement in particular pattern, figure or tint. of individual elements whether tint. Mosaic texture characterizes farmland, spotty are soils with different degree of moisture), trench, lamb (deciduous forests).

Photo8. Growth of surface of afforested areas
Source: Own investigations

SPATIAL ELEMENTS

The form of terrain area - character of ground relief on images is usually recognized on the base of the following features:

- variability of color (the tonality),
- shadows of elevated forms,
- changeability of vegetable cover,
- change of moisture of ground basis,
- character of hydrographic net and erosion – drainage net,
- type of use of terrain,
- character and course of communication net,
- stereoscopic effect (i.e. detailed analysis of stereoscopic model obtained in suitable scale).

The stereoscopic model of terrain allows for unambiguous identification of changes not only in relief, but also the recognition of microrelief elements. By comparison of images of the same terrain executed in defined intervals of time it is possible to determine the successive changes of morphology and of relief forms, and even reproduce stage of their development. The following kinds of morphological changes in course of comparative analysis of aerial photographs were noticed: the position and outline of slopes, course of axis of morphological forms, geometrical parameters, borders the fields under the cultivation, the ways of use of curtilages, rise of numerous slopes.

The changes of analyzed scenery components do not set simultaneously and in the same time. The anthropogenical deformation concerns firstly order of the weakest, the most plastic components and later more resistant elements of scenery. However this is not a rule because the sequence depends on the forms of the space use.

CONCLUSIONS

It is possible to use digital orthophotomap effectively to metric and plastic imaging of landscape space, and also to design scenery changes according to our the sensitivity and possibilities of sensorial and intellectual perception.

Visualization with the help of photos, makes possible identification of objects as well as performance of their spatial distribution. This is of very essential meaning with regard to complexity of spatial phenomena and their temporary changeability. On displayed image it is easy to find required objects where changes in time occurred (digital orthophotomap fulfils these expectations).

1. Ambroziewicz M., Mackiewicz J., 1998. Rozpoznanie i waloryzacja krajobrazu kulturowego. Acta Geogr. Łódź., 74:11-14. 2. Banaszak J., Kasprzyk K. 1993 Krajobraz w naukach przyrodniczych. w: Banaszak J. (red.) Krajobraz ekologiczny. Wyd. WSP Bydgoszcz. 17-52. 3. Jarząbek J., Żarkowski A., 1997. Archiwum Fotogrametrii, Kartografii i Teledetekcji, Kraków, vol.6, s.97-105. 4. Mazur F., 1998. Środowisko przyrodnicze – zagrożenia, ochrona i kształtowanie. Wyd. Uniwersytetu Szczecińskiego. Szczecin, ss. 222. 5. Meeus J.H.A., 1995. Pau – European landscapes. Landscape Urb. Plann. 31: 57-79. 6. Pyka K., Świeczek P., Włodek J., 2005. Ortofoto dla odważnych. Geodeta nr 7. 7. Szczęsny T., 1982. Ochrona przyrody i krajobrazu. PWN Warszawa ss.199.

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