

**PANNEAU TYPE CARTOGRAPHIC VISUALISATIONS - METHODOLOGICAL ASPECTS**

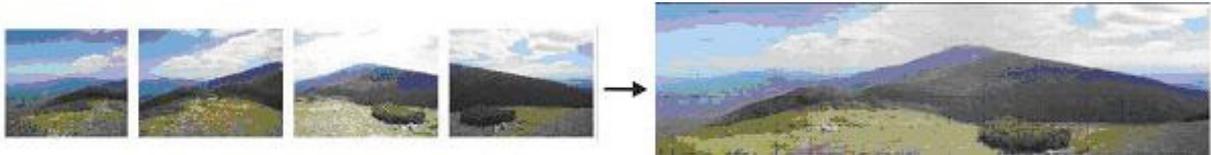
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A panoramic map of "panneau" type is a form of a view panorama of 360° horizon, projected on a flat plane in the form of a closed circle. Landscape "panneau" presentations are produced for characteristic points of observation, mostly in mountainous areas, but also for points of observation in cities and they are placed in those points on special viewing platforms.

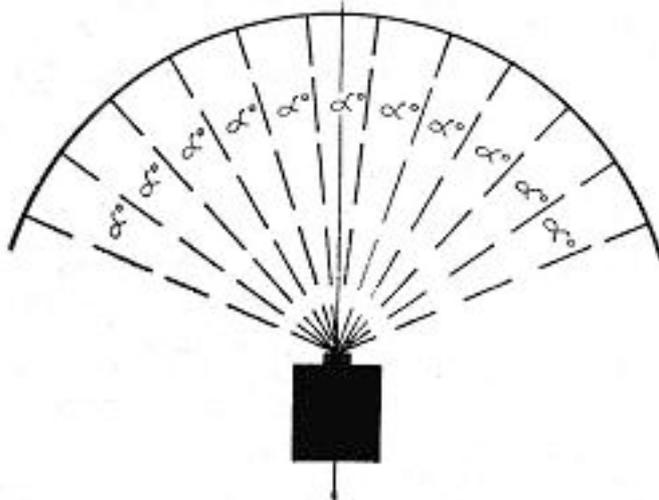
The starting point to create the "panneau" is the 360° rectangular panorama of a given horizon.

A panoramic image, acquired with a standard camera is photomontage of particular images, being the series of images, which composite the entire theme.



In the process of registration of panoramic images using standard, photographic cameras, usually the "feed" or the "turn" method, or registration with the use of coupled set of normal cameras are applied.

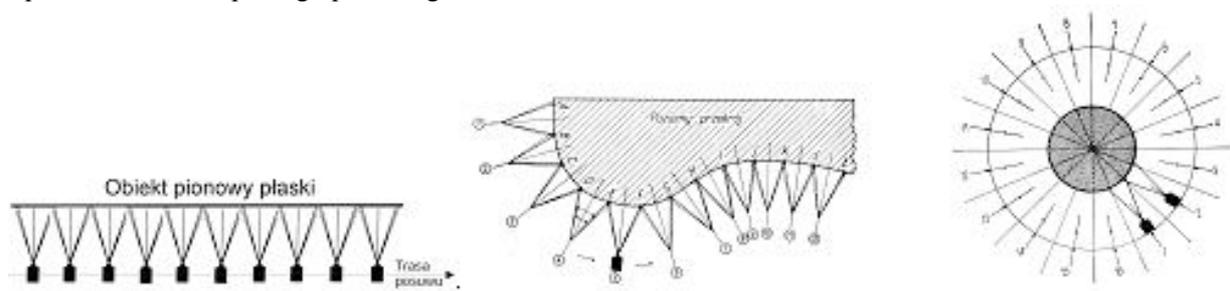
In the case of the turn method of image acquisition with a single camera, the axis of rotation of the camera is the centre of its optical system.



"Turns" of the camera for panoramic photographs

In the case of the "feed" method of image acquisition with a single camera, the following cases may be discussed:

- panoramic "feed" photographs along the straight line – of plain, horizontal surfaces and plain vertical surfaces;
- panoramic "feed" photographs along curved lines.



"Feed" registration „Feed” registration“Feed” panoraming

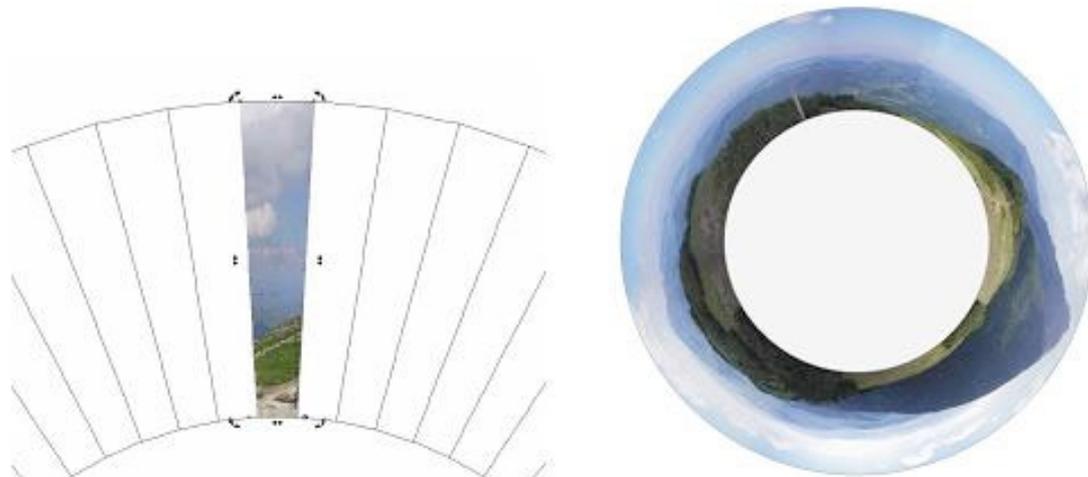
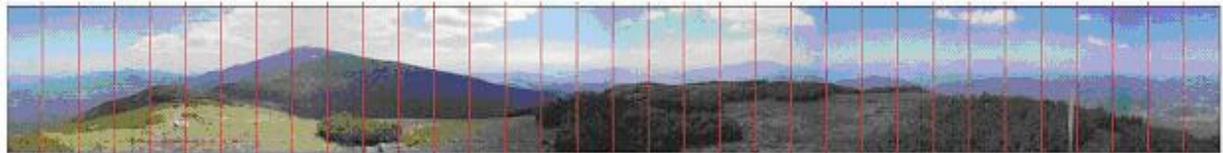
of a vertical plain feature of a vertical, non-plain feature of a cylindrical surface

Technology of photomechanical processing of "panneau".

At the first stage a series of photographs of the horizon are taken (360°) with an appropriate mutual overlapping of successive images (at least 30%), with the use of a special tripod with a panoramic head (and angular division) and accurately levelled. The photo panorama is produced using a series of photographs of the entire horizon, by their photomechanical or digital combination:



In order to transform the horizontal panorama into a closed circle of 360°, it should be divided into vertical rectangular segments, corresponding to equal angular sections of the horizon; after appropriate transformation onto the form of trapezoids they will allow for forming a closed, multi-sided ring, inscribed or circumscribed on the circle of the appropriate diameter. The minimum number of segments equals to 12. It should be added that it is important to determine an appropriate radius of the "panneau", as well as correct proportion of the height of the panorama with respect to the inner map and related numbers and sizes of panoramic segments and parameters of their transformation into trapezoids:



After connection of trapezoids a multi-sided ring is obtained, which may be cut to the form of a circular ring of the panorama.

Mathematical processing of "panneau"

Equidistant projection may be, among others, applied for the needs of transformation of rectangular panoramas to the circular form.

Then, a side of the cylinder of the following parametric equation

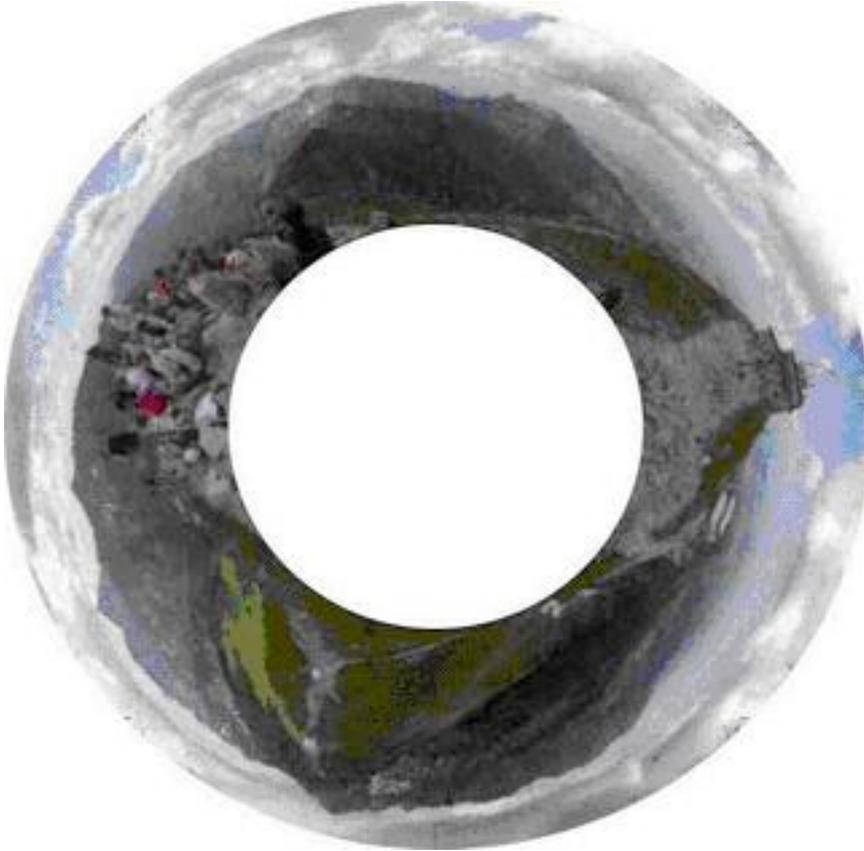
$$\vec{r} = [r \cos \alpha, r \sin \alpha, h]$$

may be assumed as the original surface, where  $r = \text{const}$  means the radius of the cylinder and  $\alpha$  and  $h$  are parameters, which determine point location on the side of the cylinder.

The following projection

$$\vec{r}' = [(h + r - h_0) \cos \alpha, (h + r - h_0) \sin \alpha]$$

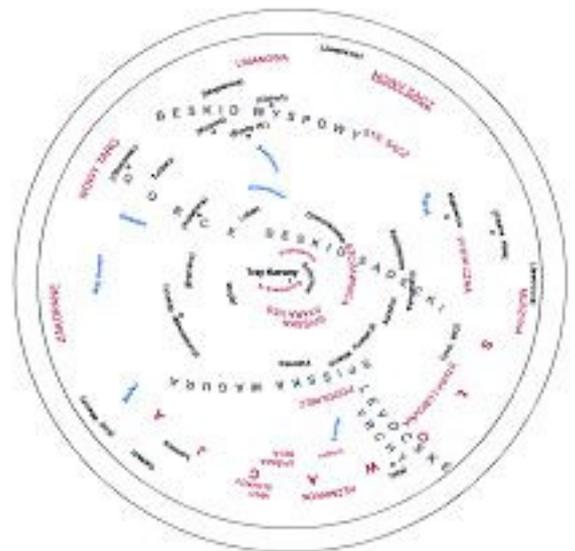
has been used for transformation; the function  $r(h)$  will be determined in such a way that lengths of lines will be maintained  $\alpha = \text{const}$ .



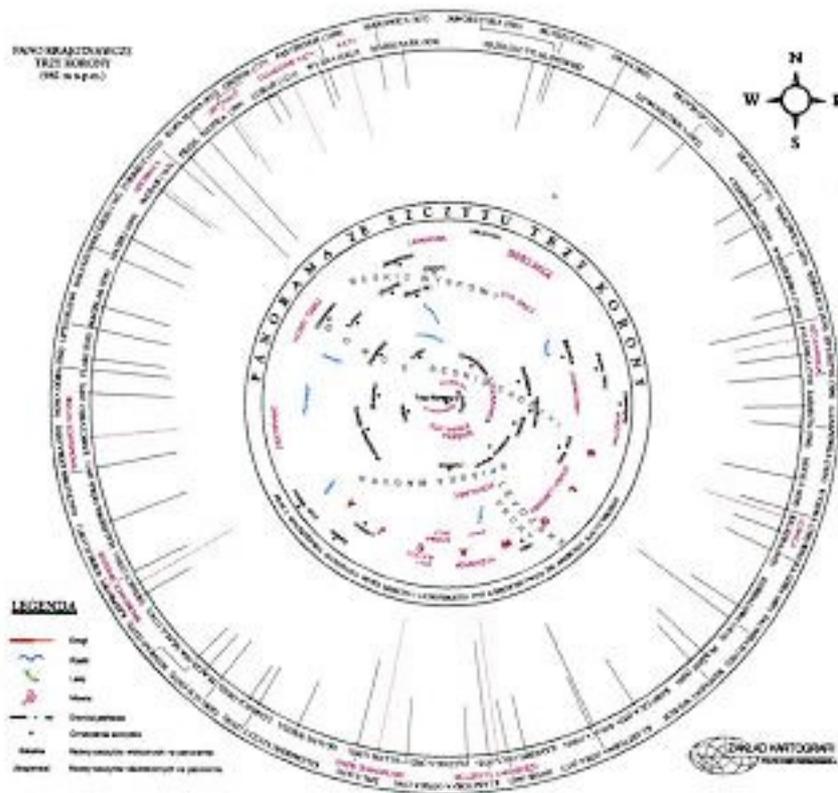
Panorama from Kasprowy Wierch Peak in Tatras, in the rectangular and circular forms after mathematical transformation

Cartographic editing of viewing "panneau"

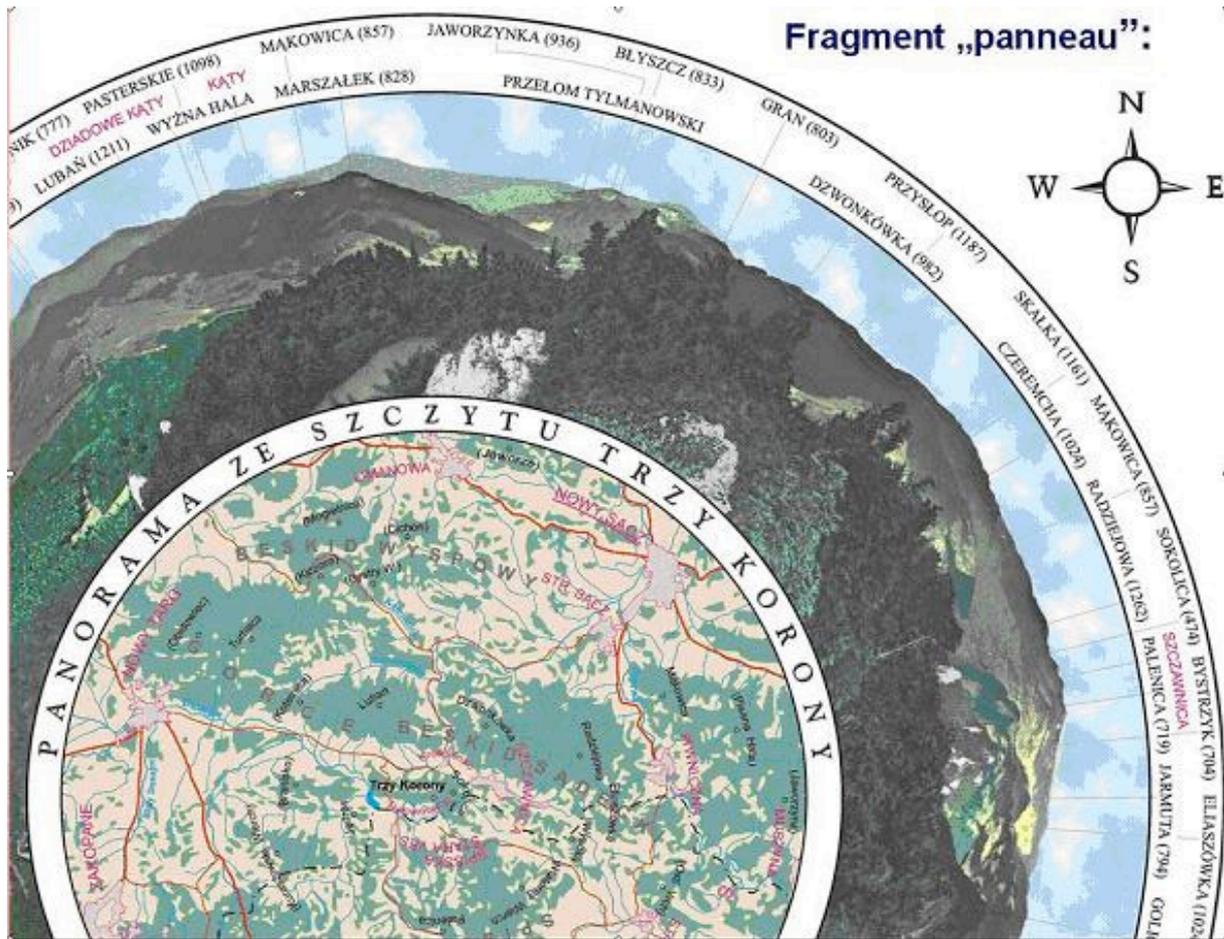
The inner hatched map, in the circular form, is edited at the next stage:



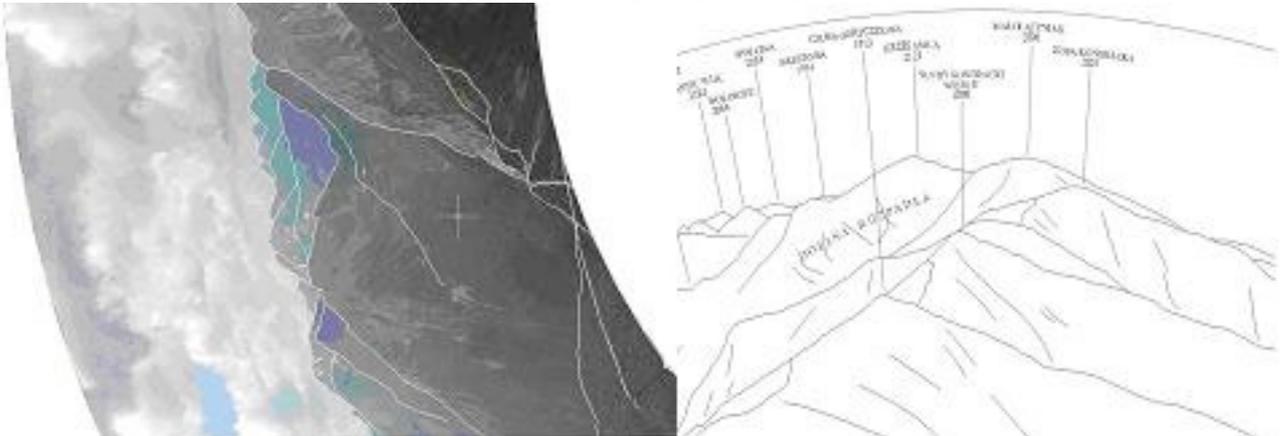
Then, hatched components of the "panneau", being the names of geographical features with appropriate indicators, referred to those features, as well as marginal data are edited with the legend:



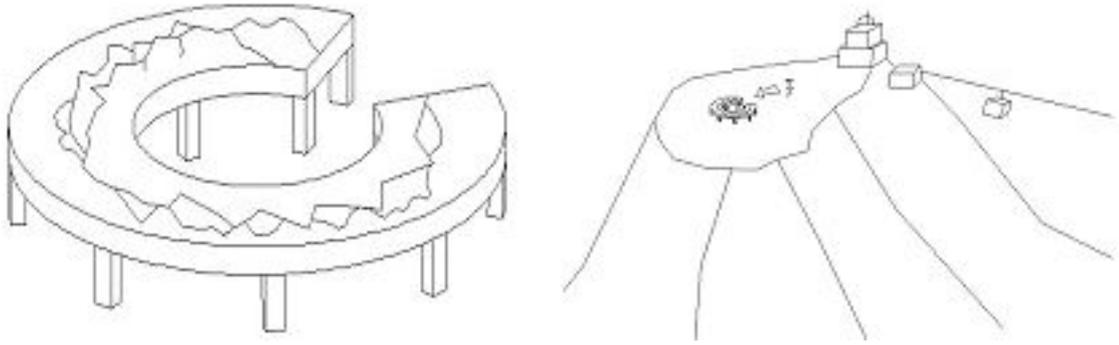
After combination of all elements, the final form of the "panneau" map for the peak Trzy Korony (Three Crowns) in Pieniny Mountains looks in the following way:



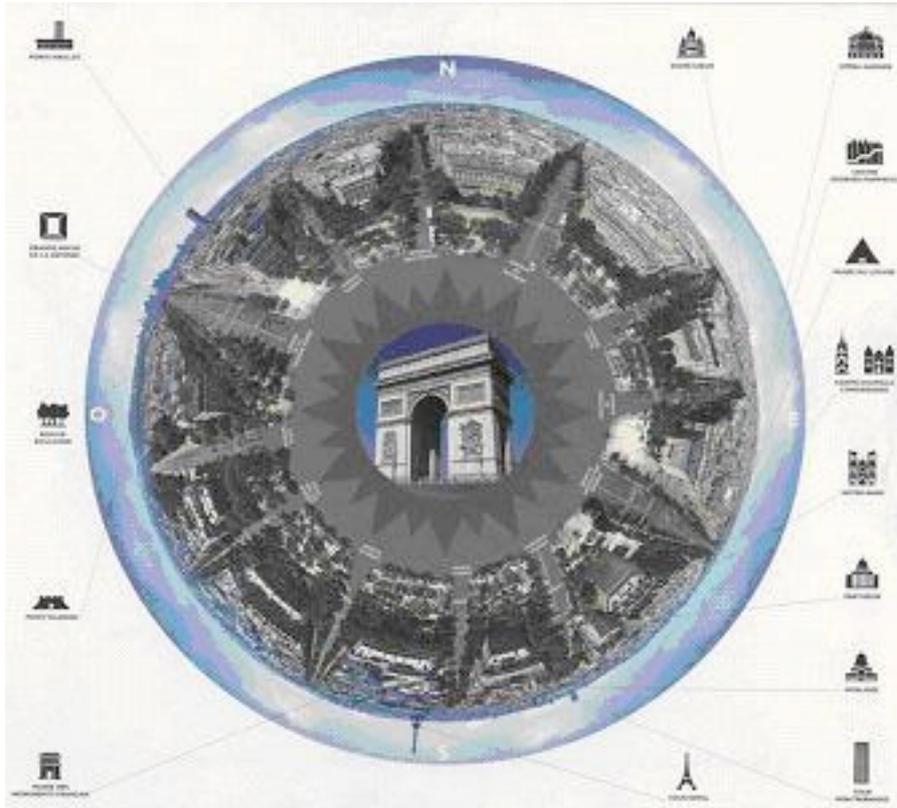
A tonal "panneau" image may be transformed into a hatched image, in order to serve as a pattern to transfer onto a metal plate or onto another surface. The objective of that stage was to reflect the reality in such a way that a tourist, who uses this image, is able to explicitly identify all features.



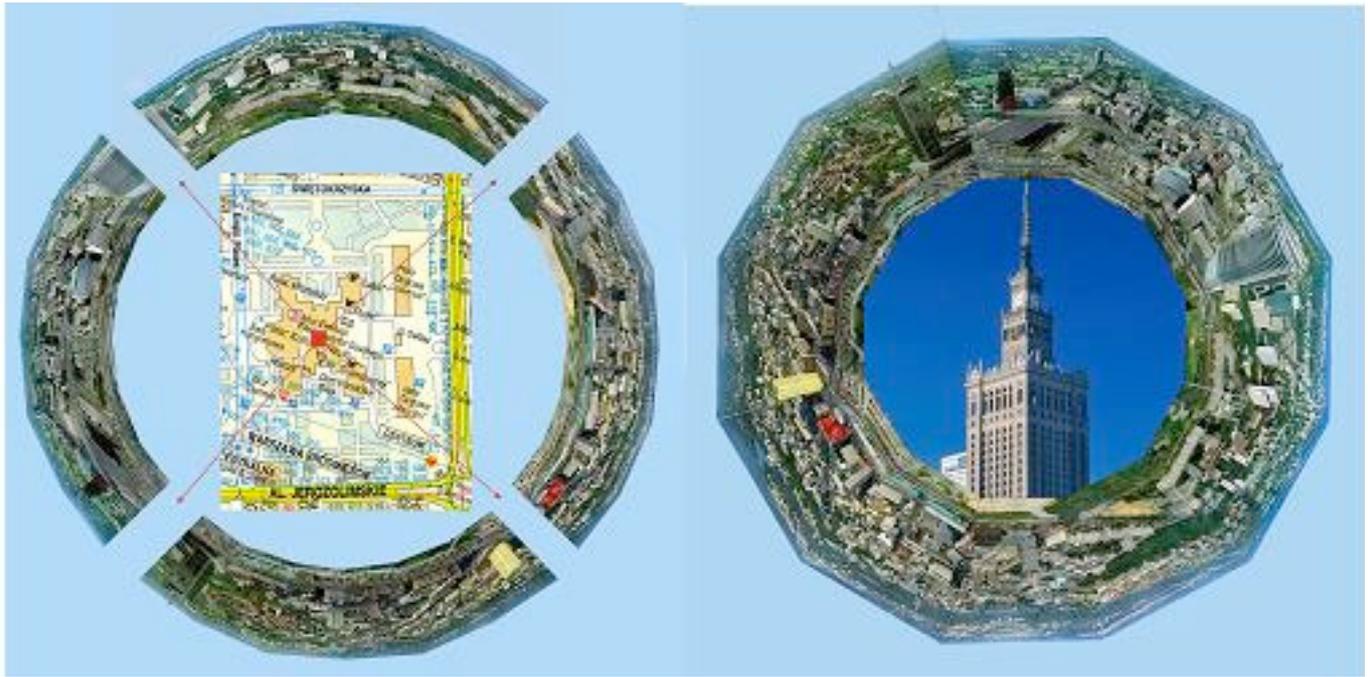
Finally, the "panneau" should be a target or a ring with an image of the visible horizon, cartographically processed and etched in a stainless metal plate or in china, appropriately oriented, placed on a support, similar to a round table, located on a heavy foundation (foundations) made of stones or concrete. This support is located on the point of observations:



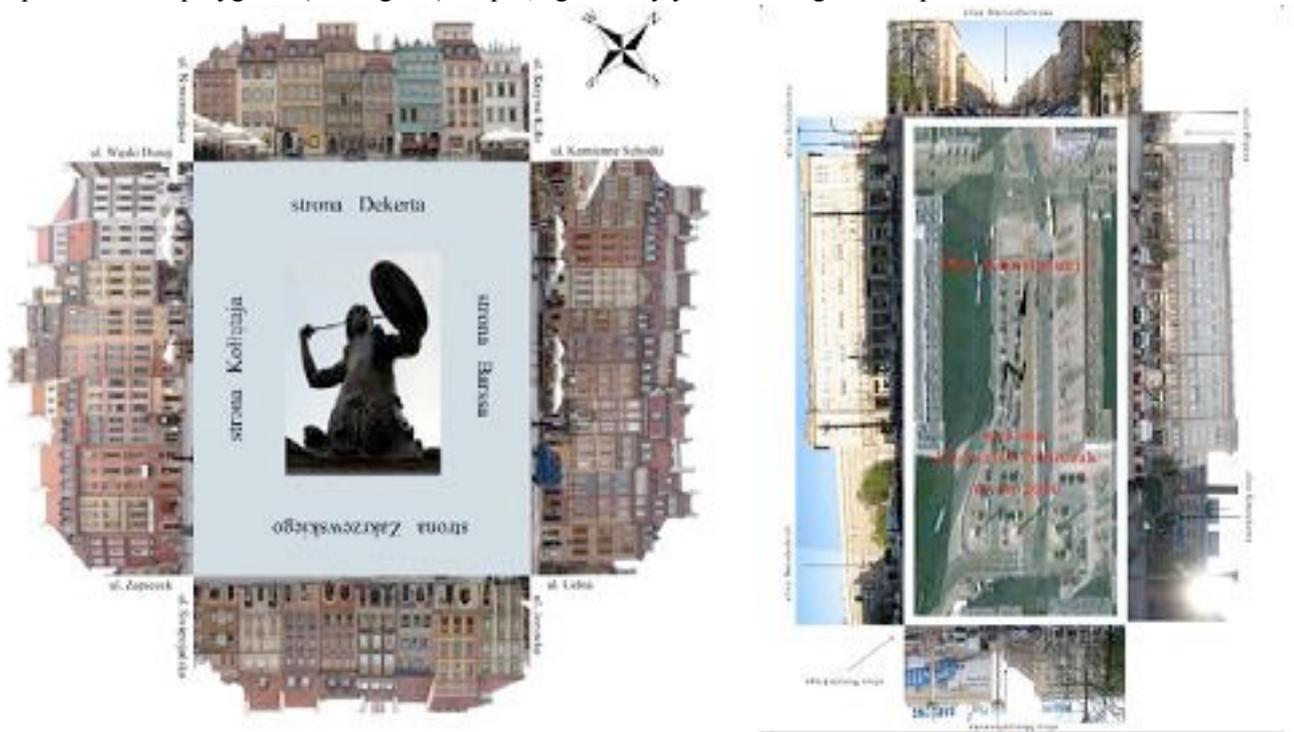
A certain alternative solutions are "panneau" type images for urban landscapes, as views from high constructions (panneau 3600) – for example, the view from the Arc de Triomphe in Paris:



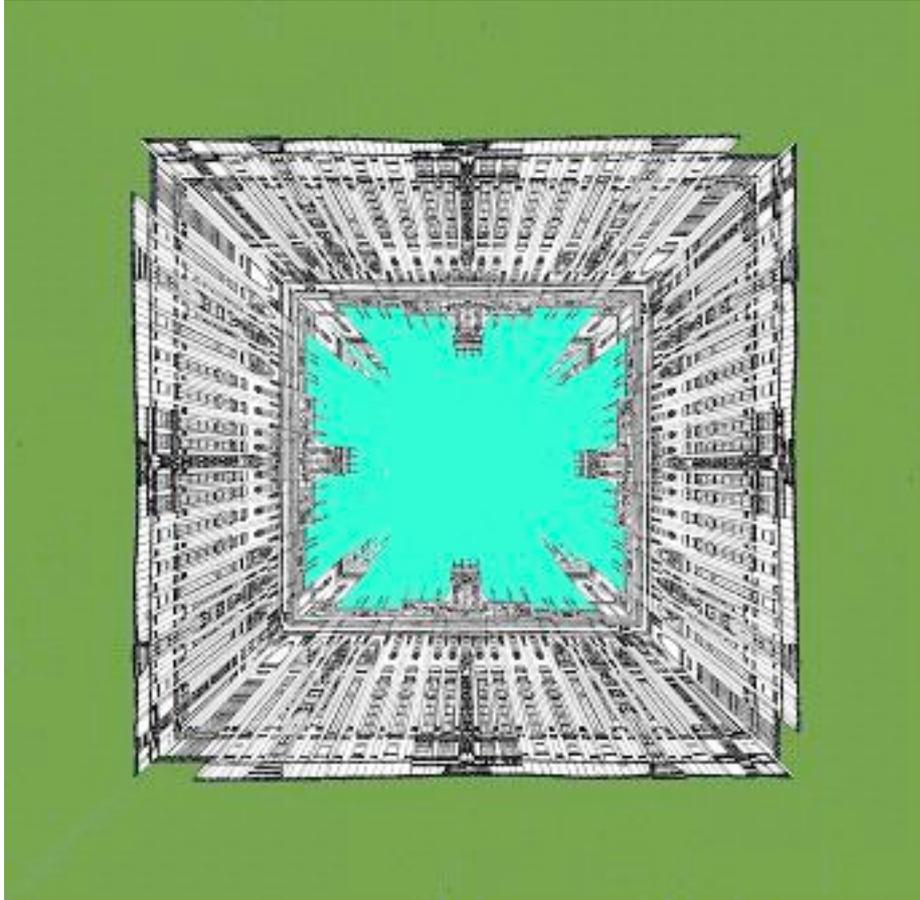
Other alternative solutions are  
 · image in panneau forms, of the narrower horizon :



· 360 panoramas of polygonal (rectangular) shapes, eg. for city yards of the given shape:



· or constructions of the, so-called, outer panneau for compact and closed structures, such as castles, palaces, round buildings or multi-wall structures etc.:



Final remarks

Research and experimental works concerning such images have been performed at the Chair of Cartography of the Warsaw University of Technology for more than ten years. Numerous projects are developed in that field, including master thesis of students. At present, the technology of mathematical transformation of horizontal photo panoramas into circular ones has been also developed.