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Body – text – space. A Model of Spatial Extension of Methodological Triangulation

Abstrakt

Tekst prezentuje model przestrzennego rozszerzenia metodologicznej koncepcji triangulacji. W pierwszym rzędzie dokonana została rekonstrukcja historii pojęcia w geodezji i kartografii, z jednoczesnym wskazaniem na specyfikę metody triangulacji i jej techniczne aspekty. Następnie zaprezentowane zostało współczesne rozumienie triangulacji w metodologii badań empirycznych wraz z charakterystyką czterech płaszczyzn, o jakich mówi się zwykle w jej kontekście. Zwrócona została też uwaga na kluczowe własności, które w metodologii przypisywane są triangulacji. W rezultacie stało się to podstawą do opisania modelu przestrzennego rozszerzenia koncepcji triangulacji, w którym cztery jej płaszczyzny stanowią odrębne wymiary pozwalające modelować obraz badanego obiektu jako wypadkową możliwych punktów lokujących się w tej czterowymiarowej przestrzeni.

Introduction

The triad of concepts, i.e. body – text – space, creates a metaphorical context for a discussion on the idea of methodological triangulation[1], its model and the possibilities of extending the concept

[1] In the article the term methodological triangulation is used in a broader sense, with the adjective specifying a field of knowledge. However, we can also encounter a more narrow understanding, which reduces methodological triangulation to a combination of research methods.

of this method. The body, as an object of cognition, the text, as cognitive content which, under some circumstances, can be identified with the model of the object, and space, in this case an area where we become familiar with the object of study. This approach is not binding. We can analyse the corpus and space of the object of cognition and of the text itself or the corpus of cognition itself, along with the space where this cognition occurs. However, the former configuration serves as the starting point in the presented article. This is because, on the one hand, it reveals a complementary structure created by the primary components of cognition and, on the other, it brings out the complementariness of the elements described as part of the methodological triangulation theory.

The Geodesic Origins of the Concept of Methodological Triangulation

In the methodology of empirical studies the concept of triangulation means a combination of two or more sources of points of observation of a given phenomenon in order to mutually verify information gathered from alternative sources of cognition and, at the same time , to extend the possibilities of observing the studied object. However, the term was transferred to the methodology of empirical studies from the field of geodesy and cartography (Rothbauer 2008, p. 892). Showcasing the "geodesic" understanding of this term makes it possible to reconstruct possible traces of association made within the methodology of empirical studies.

In geodesy triangulation is a method of determining distances in a given area by means of angle measurement, in order to make maps. It is one of the oldest methods of horizontal positioning of points in terrain (Smith, 1988). It was invented and published by Dutch mathematician and cartographer Gemm Frisius in 1533, and was later developed to measure the globe by another Duchtman, also a mathematician, Willebrord Snellius in 1620 (Wójcik, 2011, p. 356–358).

Triangulation consists in determining points in an area (geodesic marks, e.g. in the form of triangulation pillars). At these points (of observation) theodolites, geodesic tools for measuring horizontal and vertical angles, are set up. The points are the apexes of triangles. These triangles are connected by straight lines in such a manner, that the side of one triangle is at the same time the side of another triangle. The effect is a triangular network, which covers the measured area. However, in order to begin drawing the triangular network, it is necessary to assign a "base" – the coordinates of at least one point and the line that goes from it in a given direction, with a properly determined azimuth (Smith, 1988, p. 52). Assigning a second point enables us to determine the length of the segment connecting the two points. Assigning the coordinates of the third point is based on that distance and the trigonometric calculation, using information on angle values between segments connecting the three points. The process of determining the base location shows that the point of reference, in this case the north, is of fundamental importance for the beginning of triangulation. The starting point and line determine the angular orientation of the other points and lines. This is how a triangulation network is drawn. The final point assigned is also of key importance for controlling the precision of the triangulation network. The length of one side is compared to the initial segment of the network, which makes it possible to determine the cumulated deviations of previous measurements. Trigonometric calculation coordinates the entire process of triangulation. The final objective of triangulation is to create a map of the area, however, in order for geodesic points to be assigned there needs to be a greater clustering of them in the plane. This is achieved through traversing, i.e. finding further points and measuring angles and distances between them, within the sectors created after the drawing the primary network. (Smith 1988, p. 59). Based on this secondary network another clustering is performed and another network is drawn within the sectors of the secondary one. The lines representing the sides of triangles or polygons (usually quadrilateral) in further rows of networks are increasingly shorter. This in turn facilitates proportional transferring of the dimensions of the plane onto a map in a given scale. Classical triangulation inspired two other types – trilateration and traversing (Smith, 1988). The former is similar to triangulation, though it begins with measuring the length of the sides of triangles instead of the angles. The latter, on the other hand, does not require the tedious determination of coordinates for the base. It is enough to determine the coordinates of points between which the angles are subsequently defined. Traversing is sometimes considered an element of triangulation.

In modern geodesy triangulation is regarded as imprecise and archaic (Blewitt, 2009, p. 354). It was replaced by numerous technologically advanced solutions. However, there is now a more modern version of triangulation, i.e. aerotriangulation, which uses radio wave reflection and photographs from various points in the Earth's atmosphere.

The Modern Concept of Methodological Triangulation

In the methodology of empirical studies triangulation is defined as connecting various data, methods of gathering this data, and theoretical perspectives in the course of conducting research on a given phenomenon, which is aimed at providing a wider and more profound view of this phenomenon. This has often been compared with mapping (Denzin, 1978, p. 28; Flick, 2008, p. 41; Fontana & Frey, 2005). It is hoped that this form of connecting will raise the quality of research, through mutual verification of the credibility of results obtained using various solutions and points of observation (Flick, 2004).

Triangulation, though usually associated with qualitative research, is a term employed by scientists who prefer qualitative solutions, by researchers who prefer quantitative gathering and analysis of data, and by researchers who use mixed research methods. One of the first complex triangulation procedures was suggested by Donald Campbell and Donald Fiske for the purposes of psychometry (Campbell & Fiske, 1959). It is known under the name “multitrait multimethod matrix”. At the same time, and earlier as well, postulates and applications of triangulation were presented by other researchers associated with the qualitative approach, grounded theory and anthropological studies (Flick, 2008, p. 37–40).

In empirical studies the term triangulation was initially used in the context of verifying information from independent sources (Denzin, 1978; Flick, 2009, p. 444), clearly referring to the work of Campbell and Fisk. To this day triangulation is identified with instrument and data validation procedures, and associated with the terms validity and reliability (Rothbauer, 2008). However, it is a mistake to limit triangulation to methods of confirmation of obtained study results. This narrows its capabilities and keeps it in the perspective of naïve realism (Bryman, 2012, p. 22; Hornowska et al., 2012, p. 75), fostering the treatment of cognition in terms of “geodesic” designation of points in a given terrain. This results in reducing inconsistencies in obtained information about a given object of cognition, even though this inconsistency could shed light on qualities which have not been noticed before. Triangulation displays not only confirmatory but also clearly exploratory features. Combining several sources of information in one project makes it possible to discover those aspects of a given phenomenon, which are not visible from the perspective of single methods or standpoints from which observations or analyses are conducted. As a result triangulation creates conditions for extending and advancing cognition, offering the creation of a multidimensional image of the studied phenomenon, while controlling the participation of the qualities of the method, the data format, the researcher and the theoretical standpoint, in the process of cognition and understanding.

Both classic (Denzin, 1978) and modern approaches (Davey, Davey & Singh, 2015; Lewis & Grimes 1999; Ndanu & Syombua, 2015) assume that triangulation can occur on at least four levels: data from observation (the type of empirical material), researchers, methods of gathering and analyzing data, and theory. Its particular advantage lies in the possibility of reducing mistakes and distortion occurring on each level, and in providing conditions for extending and advancing cognition of a given phenomenon, through applying more than one method, type of data, theory and standpoint from which observations and analyses are conducted. In subsequent sections, regardless of the level, each element will be referred to as a point of observation. I have chosen this approach in order to avoid having to signal each time that I am speaking of data, researchers, methods or theories.

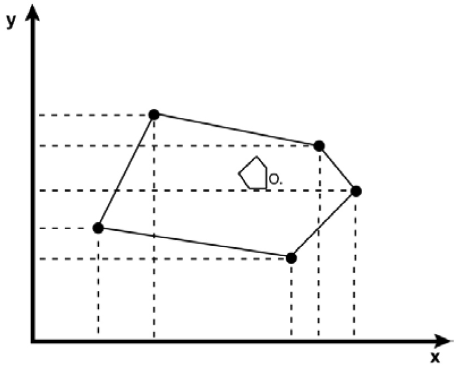
Combining various points of observation and various levels shows that triangulation is based on the principle of providing variety, which makes it possible to draw both common and different elements from the sources of information. It is emphasizing that this principle links triangulation to the idea of contextual cognition or at least cognition aware of the context in which it occurs (Hornowska et al. 2012, p. 76). This context is created by various factors which can be classified in reference at least to the four levels mentioned earlier.

It is currently stressed that methodological triangulation has the qualities of a validation strategy, a method extending the cognition of the studied phenomenon, and an approach which generalizes study results, consisting in confirming the obtained effects through discovering their presence in various contexts, in which the studied phenomenon occurs (Flick, 2004). These three qualities of triangulation are raised in methodological literature, however, within the theory of methodological triangulation itself it is difficult to find a model which would provide a complex illustration of them (cf. Flick, 2008; 2009). Thus, our ideas concerning the essence of methodological triangulation are still based on the term "geodesic". It imposes associations primarily connected with procedures of verifying effects of observation using successively obtained results, which is focused on rejecting or at least reducing information which stands out and eliminating mistakes in cognition.

Methodological Triangulation in the Model of Spatial Extension

The origin of the methodological concept of triangulation is connected with geodesy and cartography. However, if we return to the meanings of this concept invented earlier in geometry, the scope of possible associations clearly gains several elements. This particularly applies to the multidimensionality of the cognition of the object of study (observation). The geodesic term of triangulation refers to the plain, on which new positions are identified based on already known positions. This enables us to create a map of the terrain. In the case of methodological triangulation the terrain could by our object of observation, however, based on definitions and descriptions by the authors mentioned earlier, we cannot exclude the possibility that the terrain also includes an entirety created by the studied phenomenon, along with the points of observation and the whole inventory at its disposal. This metaphor additionally limits modeling in a two-dimensional system (cf. Blewitt 2009, p. 353). A view from a two-dimensional plane of many points, regardless of how many there are, does not allow us to correctly model objects with more than two dimensions. We can say that we see an object from more than one angle, but even a polygon (a plane figure with many angles) still provides a view in two-dimensional space, i.e. where every point of observation is determined using two coordinates (Figure 1). Although advances in technology made it possible to develop new mapping methods in geodesy, through the introduction of three-dimensional triangular measurements, this does not constitute the analogy which is at the base of the methodological concept of triangulation, which in turn refers directly to the classical theory of measurement by Frisius and Snellius.

Figure 1. Polygon created by the merged observation points of object O in two-dimensional space



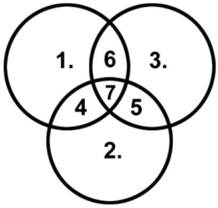
Source: own construction.

If we discard for a moment the "geodesic" version of triangulation, while remaining interested in determining the angle of vision towards a given object, we gain an additional perspective on the notion of methodological triangulation. If the object is big enough the system it creates together with the observer can be described using 3 angles: the angle of vision, the angle between the object and the point of observation on the left side of the angle of vision, and the same angle on the right side. The size of the angles will differ depending on the distance between the object and the observer, though the sum of angles will remain constant, and the angle value on the left and the right side of the angle of vision will remain equal. The researcher will obtain different information when he/she is very close to the object, and different when he/she is very far. The angle of vision will become smaller as the point of observation departs further.

If we continue in this manner, by adding another dimension (as on the Figure 1) we can look around the object. If the distance between the object and observer remains the same, the points of observation can be marked on a circle. The number of observation points, and at the same time the number of images of the object, will become multiplied if we also take into consideration the dimension created by the distance. Thus the number of circles will be equal to the number of distance points between observer and object. However, in order to make the issue of the number of images of the object more clear, I will refer to the example of the number of observation points and leave out, for now, the issue of dimensions.

If we observe an object from two observation points, we get three results. The image from point 1 (O_1), point 2 (O_2), and the sum of these images (ΣO_{12}). When observation occurs from three points, the number of possible images rises to 7 (O_1, O_2, O_3, ΣO_{12}, ΣO_{13}, ΣO_{23}, ΣO_{123}). Adding another observation point increases this number to 15, and a total of five would result in 31 images. Therefore, each image would have to be viewed as 1-element, 2-element, 3-element, 4 element and finally 5-element. It is easy to calculate the number of images for a set of 6 observation points. We would have to use a formula for a combination without repetition for every possible number of elements in a given set of 6 observation points, and add the results. This way we will obtain the values 7, 15 and 31. The multiplication of the number of images, depending on the number of observation points, is easier to show using illustrations of sets and their common elements. The common elements are products (ratio) of sets, not sums. However, for the illustration to be clear, the common elements are highlighted, and the number of observation points is limited to 3 (Figure 2). In the Figure 2, the numbers 1, 2 and 3 symbolize collections of information which are separate images of the object. This was emphasized by inserting a dot after the number. In turn, the numbers 5, 6, 7, are the products of these sets.

Figure 2. Images of the object as the relationship between sets of information

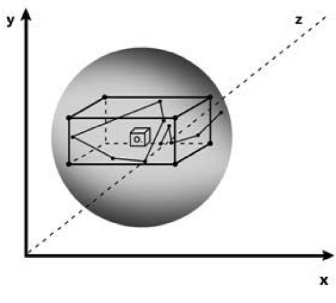


Source: own construction.

It is worth bearing in mind that the weight of the images is not equal. Sums usually have more information value than images obtained from particular observation points. Although knowledge concerning individual objects, in accordance with the idea of possible observation points, can be modeled well enough using a circle (a two-dimensional sphere), at least two issues cannot be excluded. Firstly, images from close observation points can overlap or even double. Secondly, not all observation points within this two-dimensional sphere can be reached. Thus, in order to avoid confusion with respect to cognition and in a general sense, for this cognition to occur, it seems that we have to resort to approximations and idealizations, and with constant readiness to change the observation point. A ready concept of these approximations, leaving the possibility of making changes in the object image, in the course of establishing new observation points, is suggested in the idealizational theory of science by Leszek Nowak (1977). However, detailing the model of the observed object does not have to occur, when the next observation point does not bring changes to the image of the object. It is nevertheless desirable to move between observation points. Remaining in one position can be considered what Gaston Bachelard (2000) called an epistemological obstacle. Lack of movement limits vision to one perspective.

The presented extension of the notion of methodological triangulation still uses the idea of two dimensions. The three-dimensional model creates a space (Figure 3) in which knowledge concerning an object, depending on the number of observation points, can be presented not only using a curve or a plane (on the Figure 3: the curve is on the right side of the object of observation O, while the set of points forming plane surrounds the object O), but also with a geometric body within a three dimensional sphere. The sphere symbolizes the ideal set of all possible observation points, where the border of sphere are determined by the points farthest from the object O. Depending on the distribution points the body can take a symmetrical or amorphous shape. It is also possible to imagine a distribution of observation points which would produce a sphere which is smaller than the model sphere. This can bring to mind an association with the metaphoric notion of methodological crystallization, achieved through the emergence of a symmetrical whole, not an amorphous one, as a result of acquiring further images of some phenomenon (Richardson & St. Pierre, 2005, p. 963). Particular observation points can be found at various distances from object O, but on the same plane. The model also show that points located at the same distance from O can be on the different planes.

Figure 3. A three-dimensional model of the triangulation space



Source: own construction.

This model is not perfect, for it does not provide an answer to the question how we can determine the similitude in the distance of points found on different planes. Furthermore, it becomes less clear when the number of dimensions is more than 3. With 4 dimensions the model of knowledge concerning the object (images, their sums, products) takes the form of a hypersphere. It is easy to imagine that an object will yield to observation in a multidimensional space created by many variables which determine that observation. Among them special attention should be devoted to time, which determines the dynamics of cognition and of the object under observation. This model should also be treated only as a suggestion to extend the notion of triangulation, based on a term taken from geodesy, which limits the modeling of knowledge concerning the object of study to a map regarded, at best, as a two-dimensional plane. A suggestion which is still in need of further development. Such a limited perspective, in accordance with the standpoint presented by Bachelard, reduces opening the sphere of cognition in other dimensions of the object of study, which makes it impossible to perceive its other qualities. What is more, it does not correspond with the number of dimensions to which the theory of methodological triangulation refers in its classic form. The triangulation of data, researchers, methods and theory can be seen as independent dimensions, which seems a lot more promising than adhering to their intuitive perception as types of triangulation. That last approach makes it difficult to notice, that in the course of triangulation we obtain cognitive positions which may be determined by the coordinates of observation (data, methods, researcher, theories, time, etc.), not isolated modes of vision. Cognition, most of all scientific, undertaken by specific people or groups, has more chances of succeeding, when it is done in accordance with a holistic approach.

Conclusion

From the point of view of a spatial extension model, triangulation clearly presents itself as displaying what is common ("product") but also as a complementary element, which fills the image with data unavailable from one specific point of observation ("sum"). This model can decrease or even remove tension between viewpoints, e.g. that various methods provide insight into different aspects of the observed object, and that various methods provide data of varying quality, which is not identical or even approximate (Rothbauer, 2008). Various aspects and various data are elements of a multidimensional space of cognition towards a given object. However, attention should be drawn to the primary difference between the "geodesic" understanding of methodological triangulation, and its notion which stems from the model of spatial extension. The former refers to the construction of mapped terrain. The latter, to the reconstruction of its observation space. In the first case points are established on the object, and in the second case, in the space surrounding the object. Spatial extension facilitates modeling triangulation in relation to the contextuality of cognition. This in turn inclines one to remain distanced from the dichotomy of object-observer – a position which is gaining support among theoreticians, who reject the opinion that an image obtained from cognition can only be a realistic representation of the observed object.

Triangulation of what was described earlier as "body", "text" and "space", driven by the principle of complementarity, is rooted in the idea of multidimensionality, dynamics, variety, and diversity of phenomena, which are all eventually part of some entirety. Thus, we should not be surprised at the unabated interest expressed by humanities and social sciences towards the issue of what they came to describe as triangulation.

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