'INTRODUCTION OF COMPOSITIONS AND DIVISIONS ON CURVE SURFACES' BY LEON MAREK SUZIN

Antonina ŻABA

Faculty of Civil Engineering
Silesian University of Technology
Akademicka st. 5, 44-100 Gliwice, Poland
e-mail: Antonina.Zaba@polsl.gliwice.pl

Abstract. In popular handbook for learning perspective 'Graphic perspective for architects', Leon Marek Suzin writes an extensive lecture on perspective and its usage. In one of the chapters he describes the process of preparation of the perspective graphics for introduction of painting composition on barrel and dome vaults, which author describes as curve surfaces. Both text and pictures in this chapter raise doubts, which author wanted to share with the readers. In this article, the problems connected with perspective construction on barrel vaults will be discussed.

Keywords: descriptive geometry, perspective, vault painting.

1. Introduction

Published in 1974 and 1998 'Graphic perspective for architects' by Leon Marek Suzin is one of the most popular handbooks for learning perspective. It is also one of a few in which the question of perspective construction on curve surfaces was brought up. In pages 128-130 the author described the preparation process of perspective graphics for 'introduction of compositions and divisions on curve surfaces'. Considered architectural rooms were limited to two, constructed on:

- square projection, covered with barrel vault called cradle (half of rotary cylinder with horizontal axis),
- circle projection, covered with dome (hemisphere).

In case of the room covered with cradle, perspectives constructed on horizontal surface, cradle and retina were described. There are also debates on subject of perspective perception marked on cradle.

For the room covered with the dome, only construction of net perspective on dome surface and development of this perspective were described.

Suzin describes only creation of new compositions. The lack of references to such problems as preservation and reconstruction of historic paintings on vaults cannot form objection, although such reference could be precious.

In the paper problems concerning perspective construction on cradles and their perception will be discussed.

2. Basic ideas and assumptions

The author reckons that at the beginning we should specify definitions used in Suzin's text. He mentions composition, painting surface and composition painting. We call composition the object, which image is being constructed on the surface crossing the vault base, called painting surface. The image of this object will be traditional, collinear perspective. Composition painting or painting that the author calls non-collinear perspective [2/ p.118-122] on cradle gained as the result of object central projection or central earlier defined object image.

In the article, the author used pictures referring to Fig. 222 from p.129 of the discussed handbook. Because of discussing few different perspectives, the author accepted other definitions than those in Suzin's. A rule has been accepted that particular points in central projection will be marked with subscripts referring to elements' names on which they will be projected. For example central projection of A point on:

  - the cradle will be marked as A_k,
  - painting's surface as A_p ,
  - retina as A_s .

Because of the necessary limitations of this paper's capacity, the pictures were simplified.

3. Projection of painting composition on the cradle

At the beginning of the chapter the author remarks that in case of marking any composition on the vault *'we should always consider picture deformations which result from perspective shortenings'*. A model of 6 x 6 x 6.5 m room is considered (Fig.1). Suzin proposed the following cradle division: semicircle being the cradle section called semicircle divided into eight equal parts, and cradle length divided into six equal parts. In this way we obtain a net on the cradle surface projected on α painting surface. The author suggests accepting the method of points perforation of α painting surface with vision rays brought out from 0 point. The detailed description concerns the points construction of one of the semicircles. Gained points in the mentioned method in longitudinal and transverse sections moved then to projection. The author pays attention that the line joining points 1_p, 2_p, … being the perspective of points 1, 2, … is a hyperbolic line. Perspectives of the remaining semicircles are also hyperboles, except the semicircle in surface III-III. Its perspective will be the section (straight in Suzin's). The author thinks that the problem generalization should be added in this place. The circles' central projection which is the supplement of the above described semicircles on painting surface, will be conic sections or sections. It depends on how many points the projected circle crosses the μ vanishing surface parallel to α painting surface and passing the eye. Let us put it in other words, the 0 observer's eye position in regard to the lowest circle point decides which conic section will be circle perspective. Such dependence is presented in Fig. 2. Three cases were examined, and the lowest points in the circles were marked with the letter D. If point 0 is:

  - above point D, the circle perspective will be hyperbole (case with D_1),
  - at the same level as D, the circle perspective will be parabola (case with D_2),
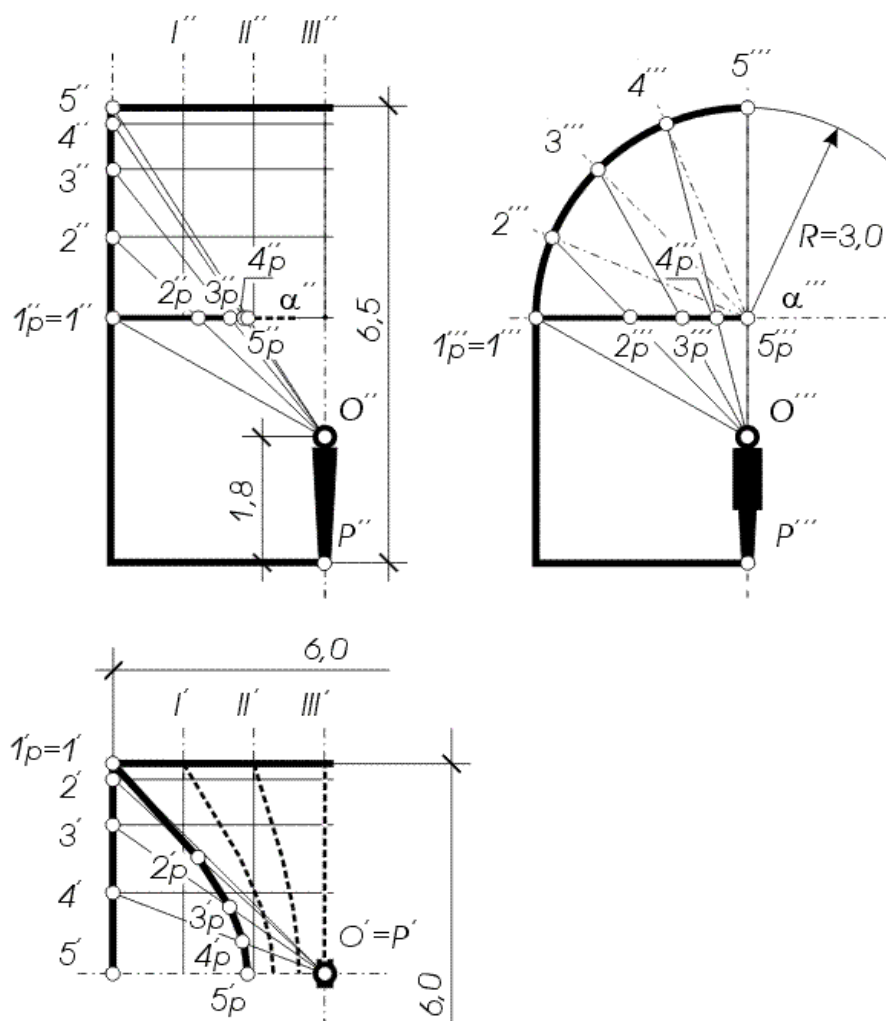 - below point D, the circle perspective will be ellipse (case with D_3).

Fig. 1: Accepted room and projection method by Suzin (acc. to. Fig. 222 A, B, C [1]), with given position of **P** observer and **α** painting surface on the level of vault base

4. Remarks on painting perception on the cradle.

Further, the author deals with '*significant phenomena',* which occur while watching the painting composition on the vault. The author writes: '*…vertical lines of such composition are parallel to lines I, II, III,…*'. On the cradle surface there cannot be any vertical lines obviously, the author probably writes about the lines which are vertical in vertical projection, and in reality they are circle arcs perpendicular to cradle axis. He further writes, that the lines will seem as hyperboles, and only in special cases as vertical lines. Such statement is not fully true, as such lines may also be perceived as ellipses and parabola arcs.

L. M. Suzin did not give any useful method of the drawn net for practical composition drawing on cradle surface, he also completely omitted one of the most important problems of illusionary and architectural painting, namely the construction of composition elements marked on the cradle, which are about to cause the impression of vertical elements in the observer. Probably, the author assumed that the artist will use the indirect method. The artist will first make traditional perspective of composition on surface, then he will mark it on the cradle. The author thought it is worth carrying the discussion about the theses set by Suzin.
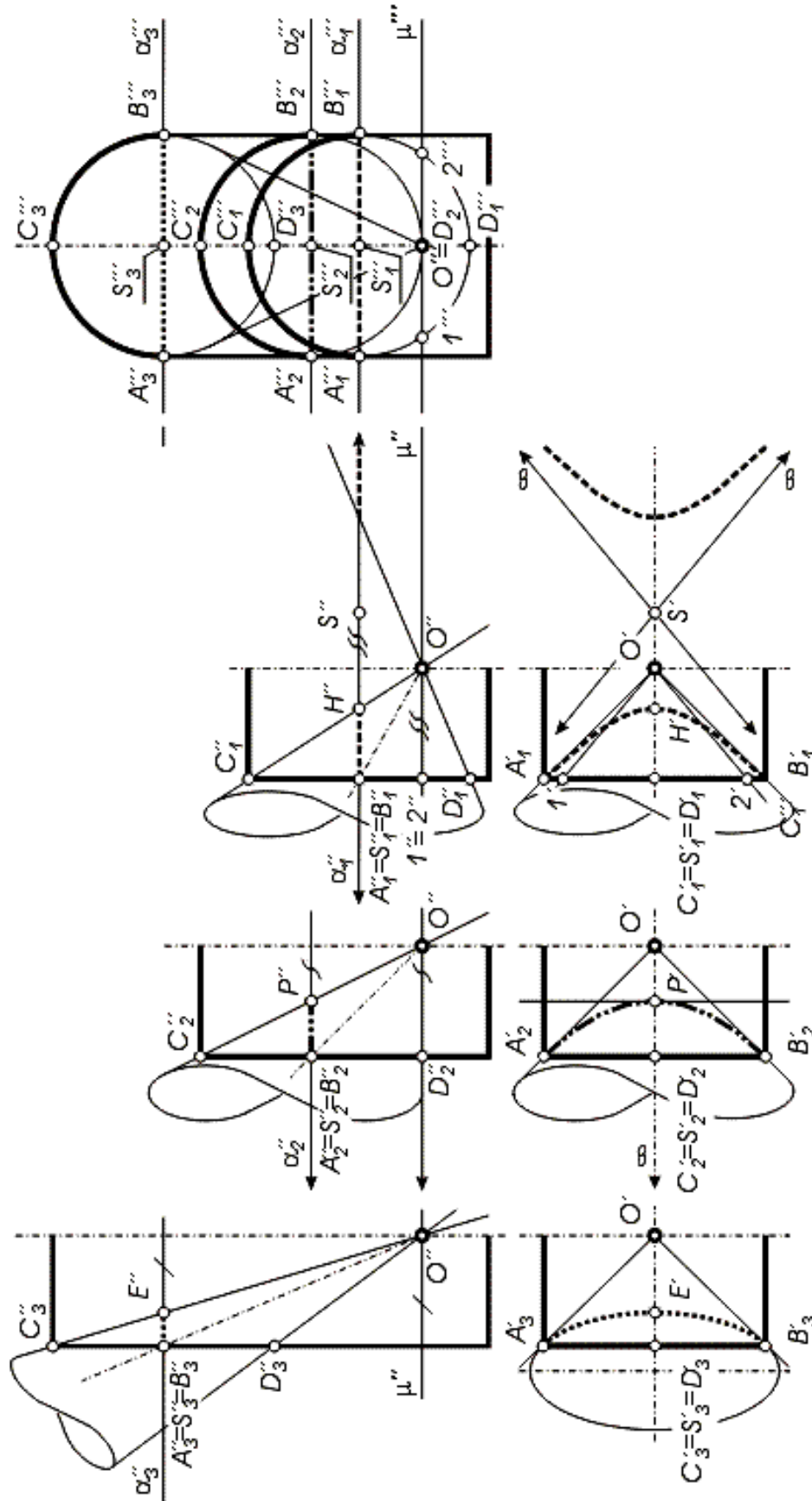
Fig. 2: The influence of the location of *0* projection centre regarding the lowest located points D_1, D_2, D_3 (in the circles of the same diameter and centers on different heights) on this circle's perspective on painting's surface

The example of the construction of vertical section presents Fig. 3. Generally, we can say that the perspective of the vertical section on the vault will be:

-   the piece of the ellipse arc in general case; where for the vertical adjusted on the perpendicular surface to roller axis and passing through 0 eye, it will be a piece of circle arc,
-   straight section in particular case, that is, when the vertical section will be on the surface passing through the observer's 0 eye and the highest located forming semi-roller (cradle).
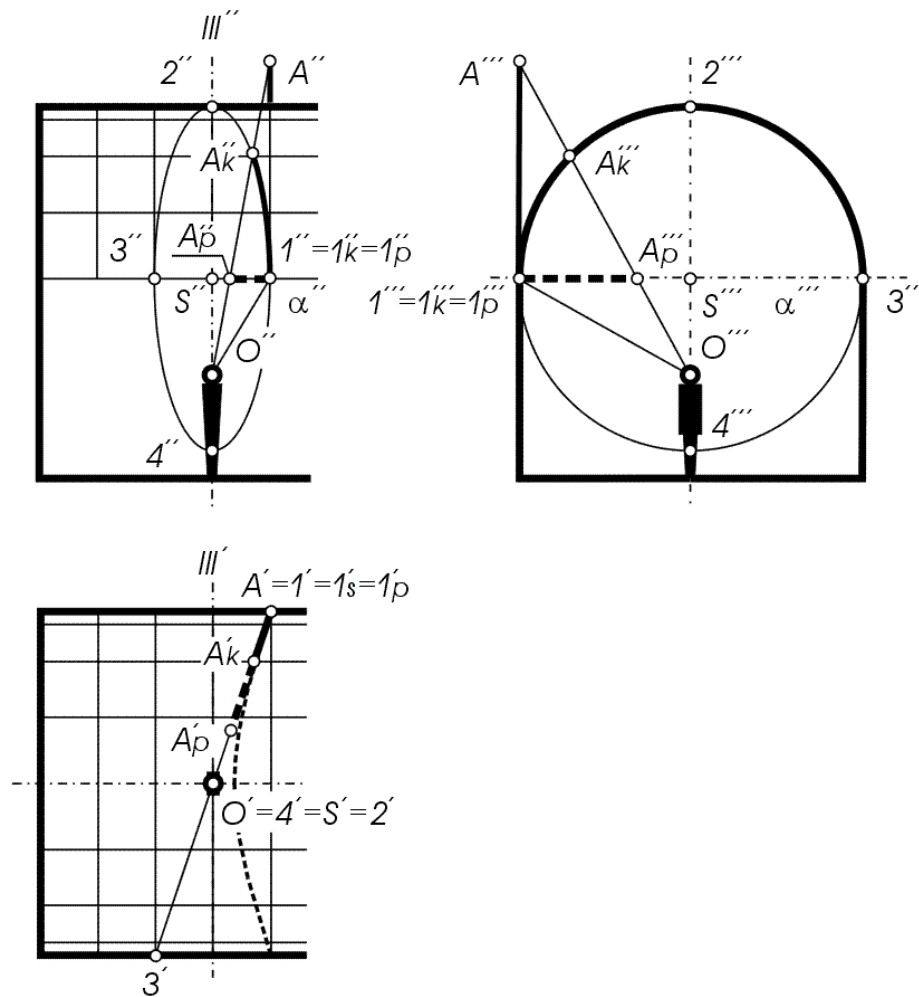
Fig. 3: Central projection of A_1 section on paintings surface (A_pI_p) and cradle (A_kI_k)

The author analyses the phenomenon of these elements' deformation, which should make impression of the vertical ones. Ignoring the lack of precision in the description of the observer and vertical positions which perspectives are still analyzed, it should be stated that the conclusions concerning deformation are incomplete. Suzin states that vertical perspectives marked on the cradle viewed form another position would be hyperbolic lines. Such statement is far too outright. It should be the case of conic section, but also straight section. Let's look at Fig. 4 and 5. In both cases it was assumed that:

-   the perspective marked on the cradle was constructed for the eye in location 0_1,
-   observer's eye looking at this perspective is in point 0_2,
-   the observer looks at point A_k on the cradle, being the A point's perspective belonging to chosen vertical.

The *μ* vanishing surface, perpendicular to the main *p* ray (joining *0₂* with *Aₖ*) and passing through *0₂* is:
-   in first case, it passes through the ellipse (which arc piece is the perspective of *Aₖ1ₖ* vertical) in two points, which means that its perspective is hyperbole on *τ* surface or perspectives parallel to it (Fig. 4),
-   in second case, it does not intersect described ellipse, which means that its perspective is ellipse on *τ* surface or surfaces parallel to it (Fig. 5)
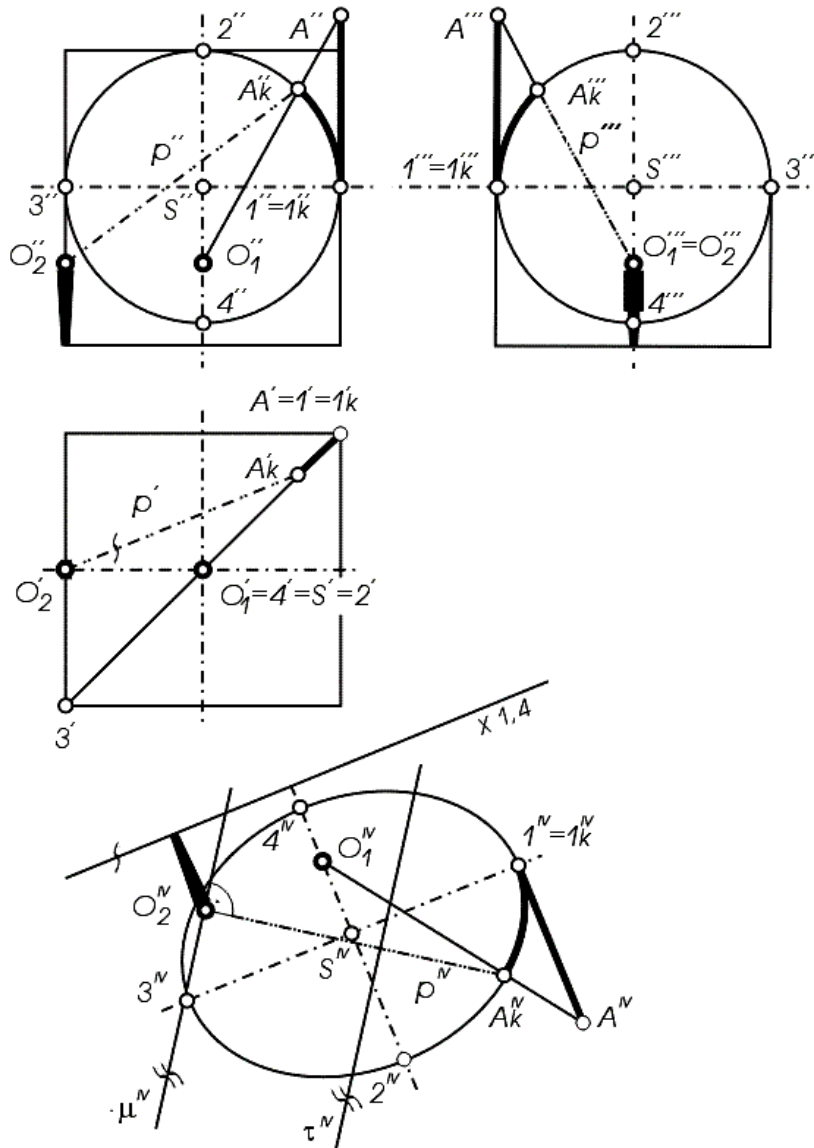

Fig. 4: The construction of μ vanishing surface for defining the curve being the perspective watched by the ellipse observer. The intersection of the ellipse with the vanishing surface in two points means that the ellipse perspective is hyperbole

Maybe Suzin assumed that the perspective background for *0₂* will be the earlier mentioned α surface. In this case, his statement about hyperbolic lines as curve perspectives painted on the cradle does not include all cases of vertical sections and circles' locations (similarly as in cases presented in Fg. 2).

The author also presents '*he perspective's development*' in Fig 222 D. It is hard to say how it was constructed and what purpose it serves. The element of rectangle net development

marked on the cradle projection is obvious. Whereas, the relationship between such developed rectangle nets with curve net closed to the ellipse is vague and groundless.
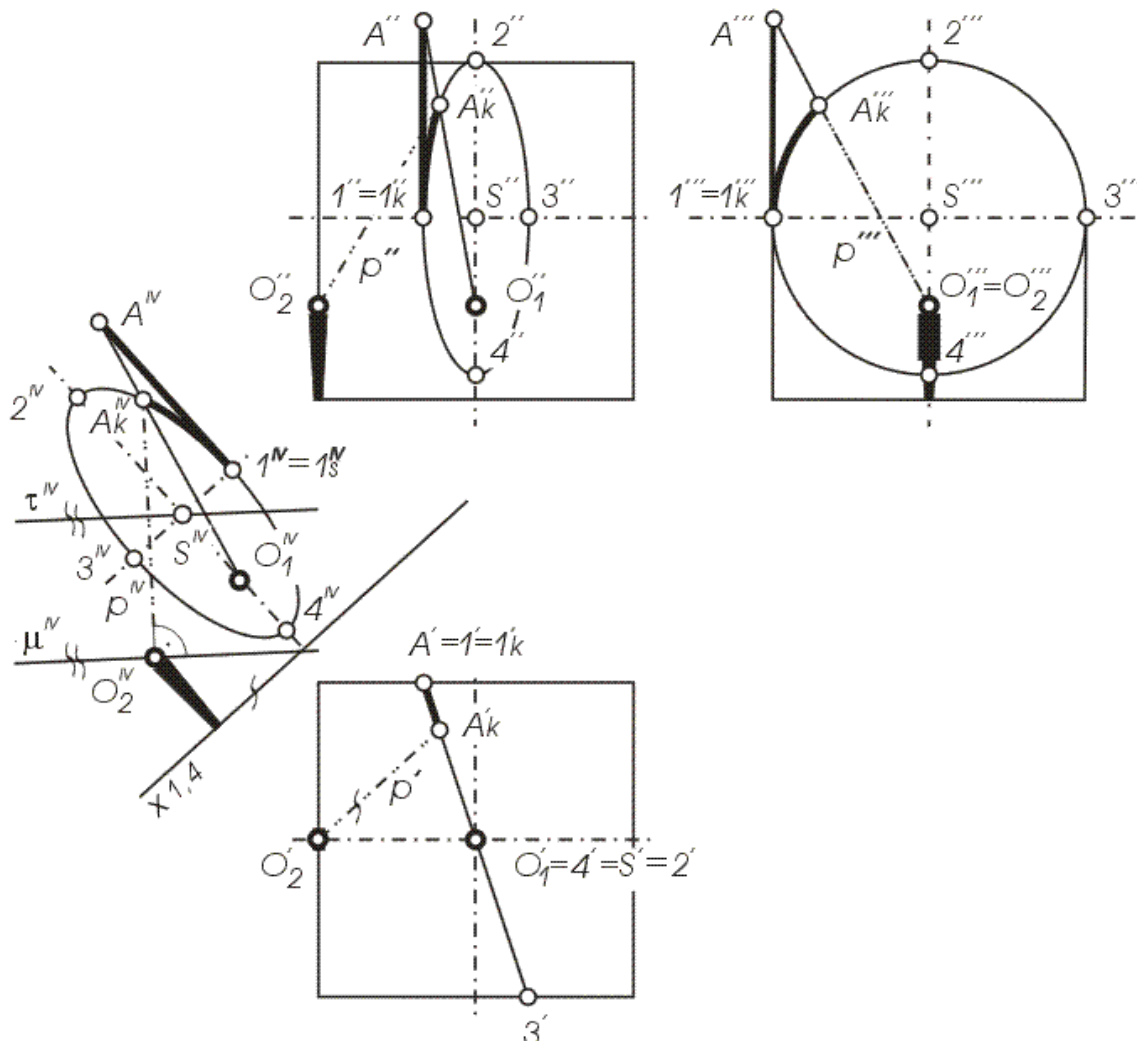

Fig. 5: The construction of μ vanishing surface for defining the curve being the perspective watched by the ellipse's observer. The lack of mutual vanishing perspective with the ellipse means that ellipse perspective will be the ellipse

The completion of this perspective study is net perspective on the surface of retina curvature. The construction method of this perspective was not described by the author. Only projection and sections in Fig. 222 from page 129 of discussed chapter give information about this method. The author decided to present this problem on separate picture (Fig. 6. Suzin encircles on the rooms' sections the arcs s'' and s''' with centers in points $0''$ and $0'''$ and passed through points $1''$ and $1'''$. Then, on one of this s'' arcs he 'projects' points $1''$, $2''$, $3''$, $4''$, $5''$, obtaining the points $1_s''$, $2_s''$, …etc. Next despite introducing the s''' circle's arc he projects points $1'''$, $2'''$, … on the painting's surface and obtains points $1_p'''$, $2_p'''$, … . Next step is to construct the projection based on the points constructed on the sections. These points were marked as $1_{s,p}'$, $2_{s,p}'$,…After the construction of these points, the author states that the curve led through these points is the hyperbole, which is not true. Proposed method of perspective construction on retina is not any of known method described in literature. Additionally, the fact of giving another method of perspective construction on retina in the same handbook is quite interesting and makes one think about it.

5. Summary

To summarize, it should be stated that both in text and picture concerning the introduction of the composition and sections on cradle and the elements of their perception many transgressions and incoherence slipped. Those two pages about the perspective study on curve surfaces concern narrow group of addressees and therefore they do not underrate the handbook value in a significant way.
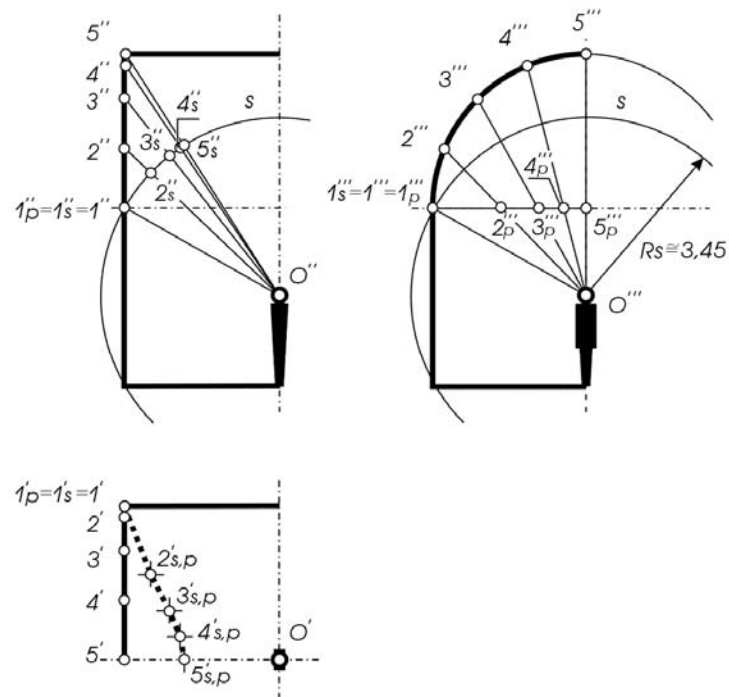

Fig.6: Accepted by Suzin assumptions and methods of semicircle projection on retina
(acc. to il. 222 A, B, C [1])

References

[1] Suzin L. M.: *Perspektywa wykresowa dla architektów*. Arkady, Warszawa 1974 i 1998.
[2] Vogt O.: *Zagadnienia związane z zapisem przestrzeni w architekturze – Metody odwzorowania przestrzeni jako podstawa budowy nowych modeli graficznych*. Seria: Architektura: Monografia 197, Politechnika Krakowska, Kraków 1995.

LEONA MARKA SUZINA „WPROWADZENIE KOMPOZYCJI I PODZIAŁÓW NA POWIERZCHNIE KRZYWE"

W popularnym podręczniku do nauki perspektywy *„Perspektywa wykresowa dla architektów"* Leon Marek Suzin prowadzi obszerny wykład o perspektywie i jej zastosowaniach. W jednym z rozdziałów książki opisany jest proces przygotowania wykresu perspektywicznego dla wprowadzenia kompozycji malarskiej na sklepienia kolebkowe i kopuły, które autor nazywa powierzchniami krzywymi. Zarówno tekst jak i rysunki w tym rozdziale budzą wątpliwości, którymi autorka chciała podzielić się z Czytelnikami.

W artykule omówione zostały tylko zagadnienia związane z konstruowaniem perspektyw na sklepieniach kolebkowych.