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# SURFACE DEVELOPMENT OF QUADRIC SURFACE BASED ON GEOMETRICAL PLACES WITH THE AID OF CABRI II PLUS

Computer techniques incline for searching automatic capability of drawing curves defined by a large number of points, as examples development line of quadric surfaces can be given. In general case these curves are point pattern coming at generating line or curve section (or line of intersection).

It is the authors' intention to elaborate algorithms which determine location of points of curve development of surface section and employ them by CABRI II PLUS. This program includes options which allow automatic transformation of segments or arcs to vectors or arcs of other curves as well as generation of geometric place of points.

This program enables creation of macroconstructions which facilitate recognition and then automatic reconstruction of the needed result elements, after having fed preliminary data.

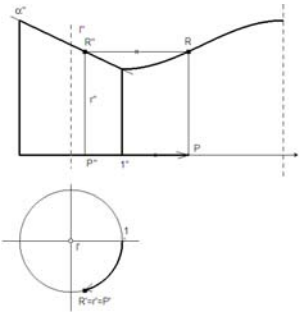
This paper discusses issues concerning development cylinder of revolution and noncirculars surfaces as well as cones of revolution and noncirculars conic ones.

It shows examples of surfaces whose both axes and cutting plane are in special position.

## 1. Cylinder surface

### 1.1. Revolution cylinder surface

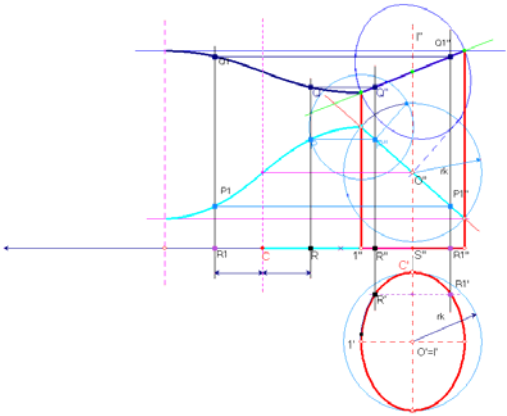
It is determined by axis $l$ , contour generatrixes and cutting plane $\alpha$.



Possibility of automatic drawing of extension is given when movable point *R* is introduced on plane α. (generatrix *RP*). Location of movable point *P* on the development is obtained by measuring the length of arc $\overline{1P}$. Using 'geometric place' function, half of the development curve of intersection by plane α is obtained.

1.2. Noncircular cylinder surface

Noncircular cylinder elliptic surface has been determined by basis ellipse and vertical axis *l* cut by plane α.



For determination of points' location on the development, circular intersections have been used. As movable element point *R* has been introduced on the basis ellipse and points *P* and *Q* of generatrix *r* intersection with respective circle surfaces have been determined.

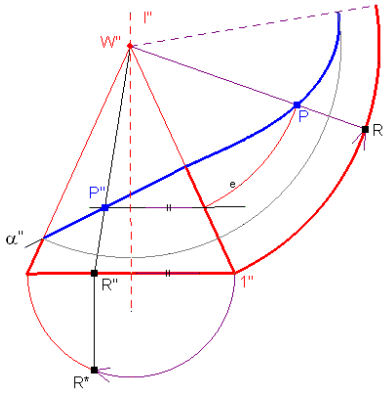
Determination of point *Q* when knowing of the length of the circle measured by means of 'compass' function is also possible. In order to determine development lines of circle intersection and ellipse intersection by plane α, geometrical place function for points *P* and *Q* with movable point *R* has been used.

In this way elements belonging to one fourth of a cylinder have been obtained whereas the rest is acquired by the existing symmetry.

2. Cone surface

2.1. Cone of revolution surface

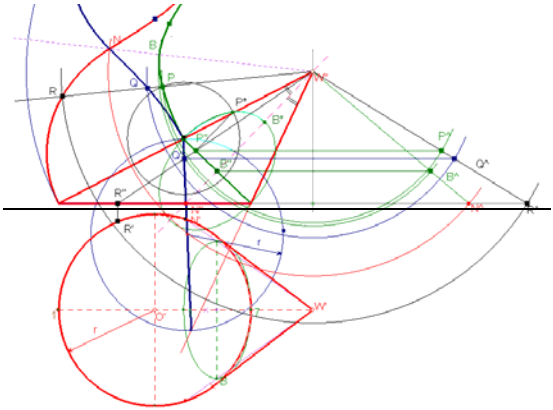
It accepts surface defined by direct in the circle, axis *l* and cutting plane α.




Possibility of automatic drawing of development is given when in vertical projection of plane α, movable point *R* is introduced. Location of movable point *P* on the extension is obtained by measuring the length of segment $\overline{1P}$. Using the option 'geometric place' half of the curve development by plane α is obtained.

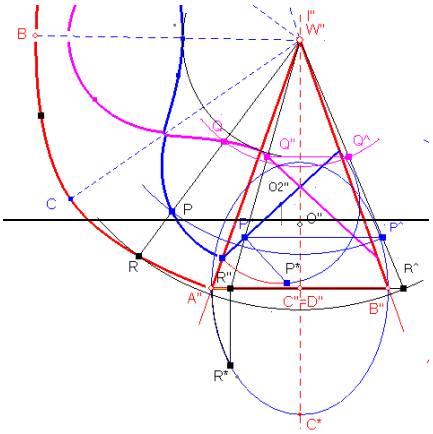
2.2. Noncircular cone surface

2.2.1. It accepts surface defined by direct in the circle and vertex *W* (segment $OW // \pi_2$). Cutting ellipses in plane α perpendicular to bisector angle between generating line in vertical view is direct right conic surface. In order to create surface development, ellipse development was used employing curve symmetry on the development. Movable point *R* has been assumed on ellipse basis, assigning it point *P* on plane α. For finding point *P* in development, turn of segment *WR* was exploited and revolved ellipses in plane α.



Assuming length of arc ellipses to curved chord in development (in one quarter) and length of generating received on development location of movable point *P* together with generatrix *r* has been achieved. Knowing the length of segments WR and WQ we are able to determine the shape of basis and intersection circle development curves in the second circle. Using the option 'geometric place', shape of the line development of normal intersection and lines of developed circles are obtained for point *P*.

2.2.2. As second example right conic surface defined by direct in the ellipsis and vertex *W* (segment $OW//\pi_1$) has been presented.



Progressing like in case 2.2.1. movable point $R$ on the ellipse basis has been assumed, assigning it point $P$ and $Q$ which belong to cutting planes in the circles, and similarly to example 2.2.1. development lines on basis ellipse and circles have been determined.

The ability to construct elements of intersection curve line which is geometric place results in attempts to use the function which allows creation of microconstructions including other elements of developed planes.