

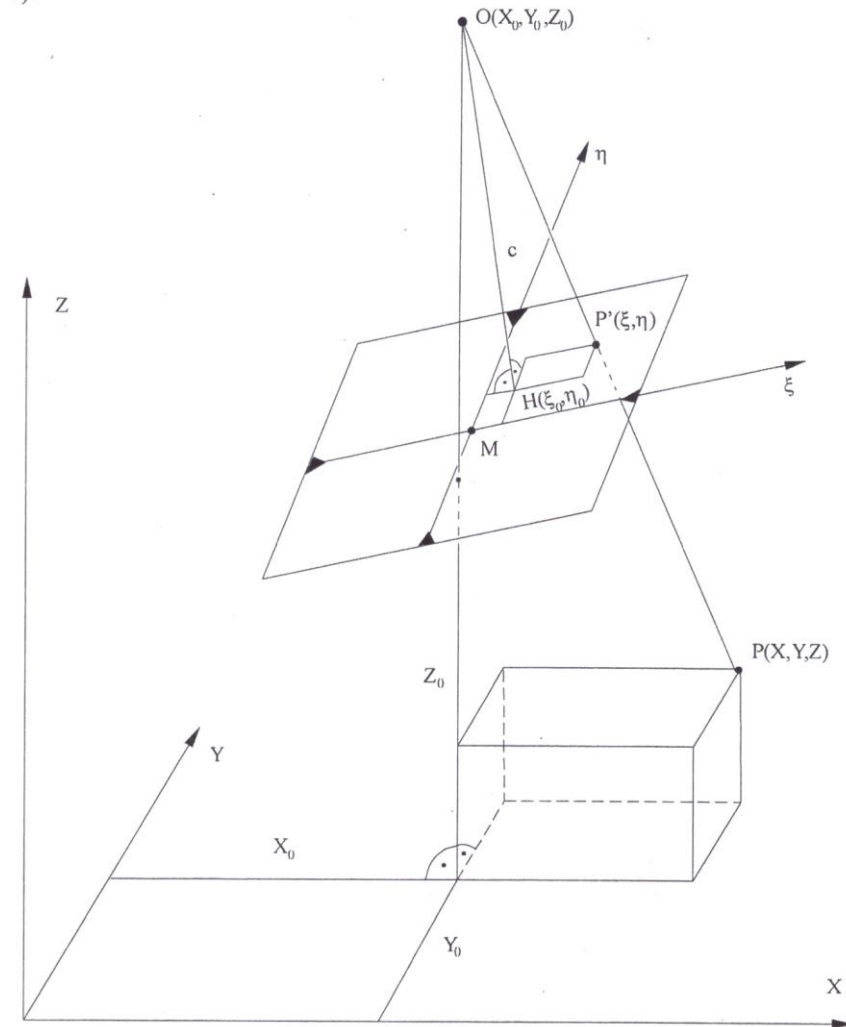
Fotogrammetria és lézerszkennelés

Offline Edition 2021

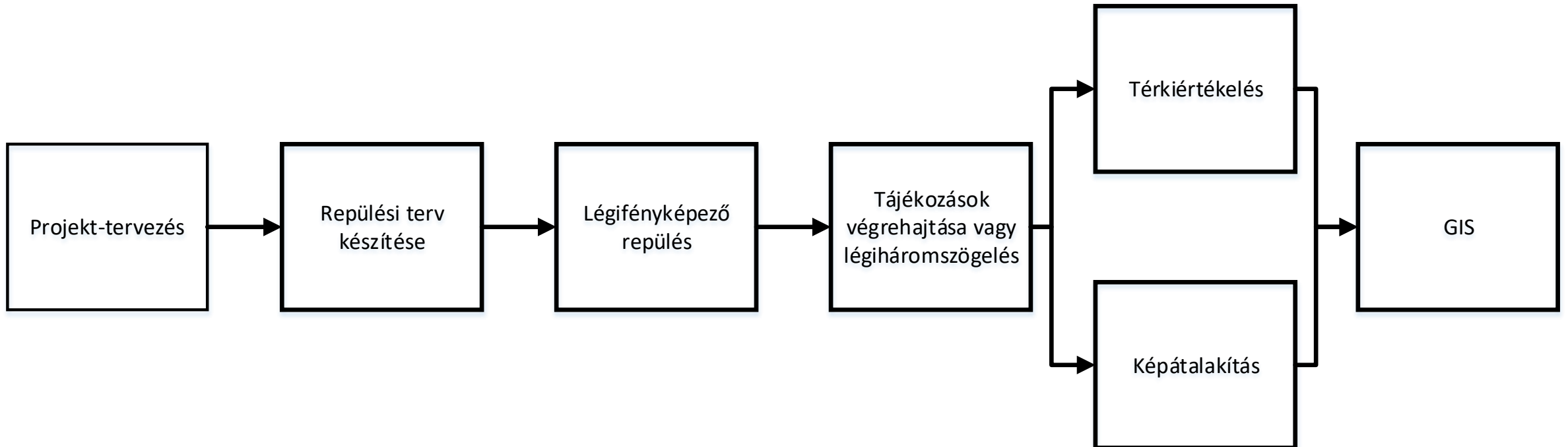
Belső tájékozás

A centrális vetítés - felelevenítés

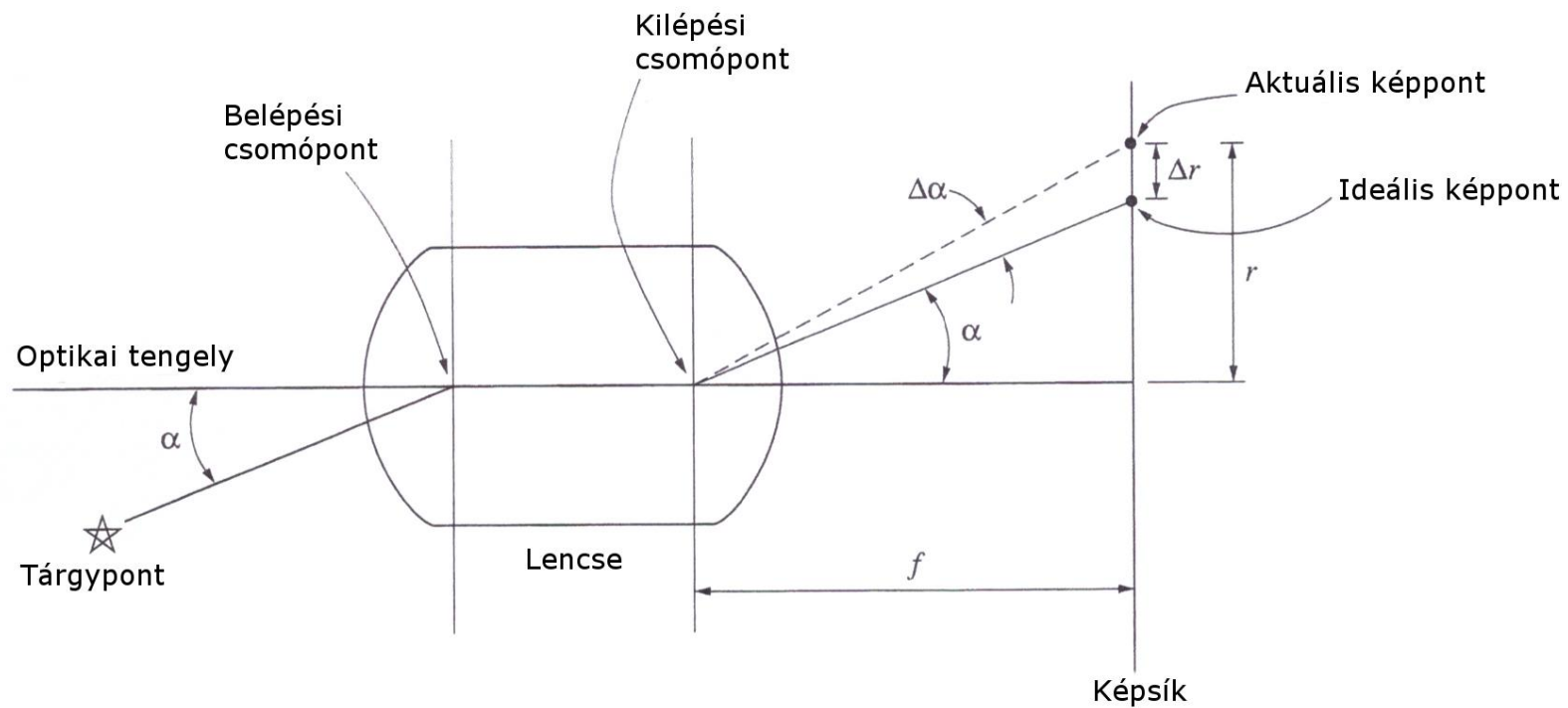
- Alapábra
 - Nevezetes pontok
 - Külső tájékozási elemek
 - Belső tájékozási elemek



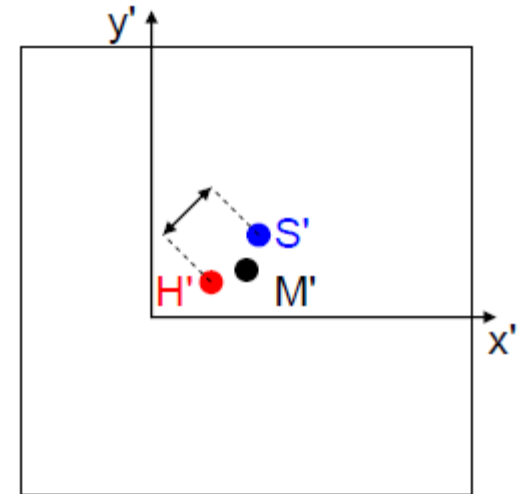
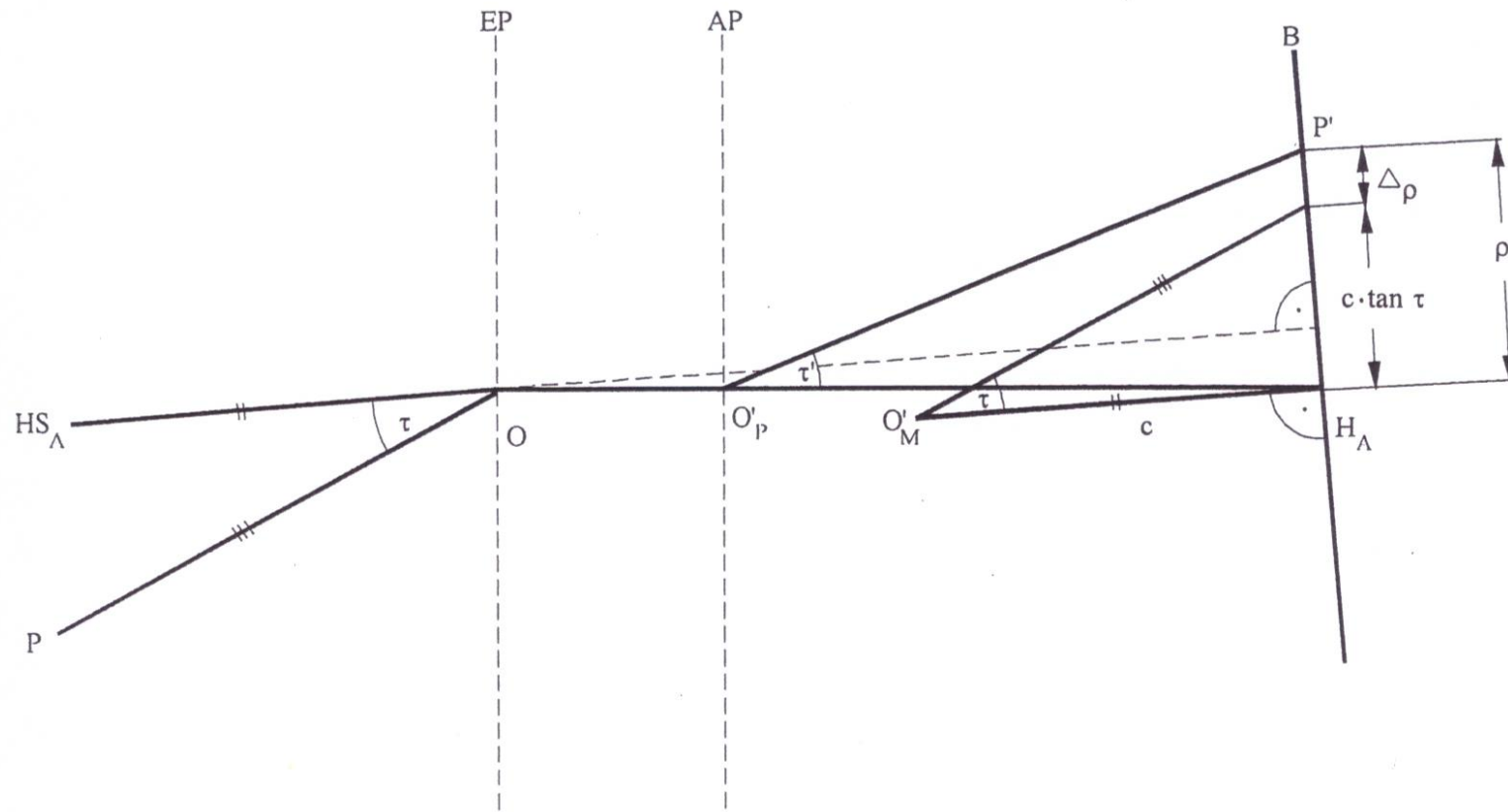
A légifotogrammetriai technológia



Ideális és aktuális leképezés



Leképezés a kamerakalibrációban



Autokollimáció – $H_A - c - \Delta_p - O'_P - O'_M$ – elrajzolások (radiális, tangenciális) – képközéppontok

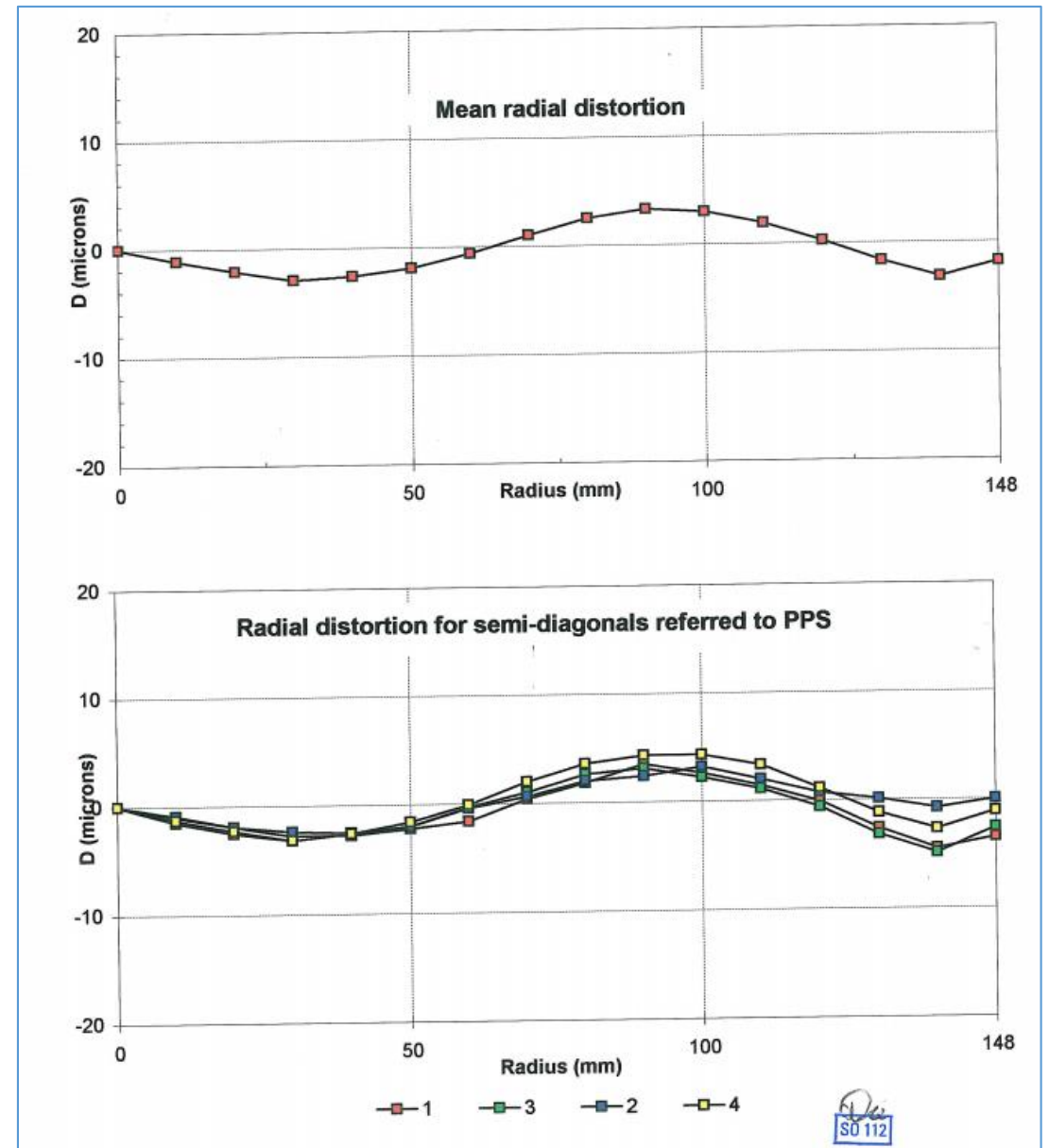
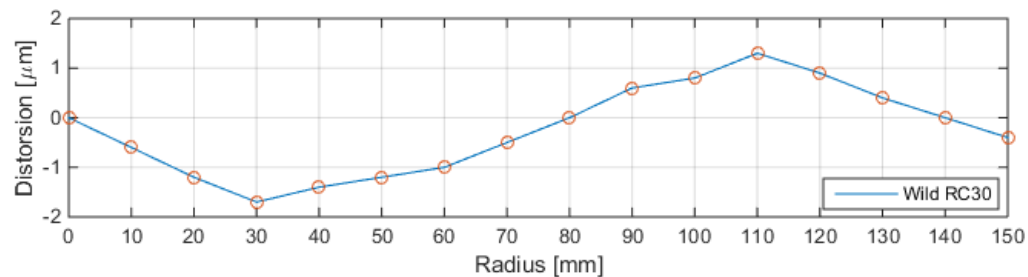
Radiális elrajzolás

$$\Delta r_e = k_0 r + k_1 r^3 + k_2 r^5 + k_3 r^7$$

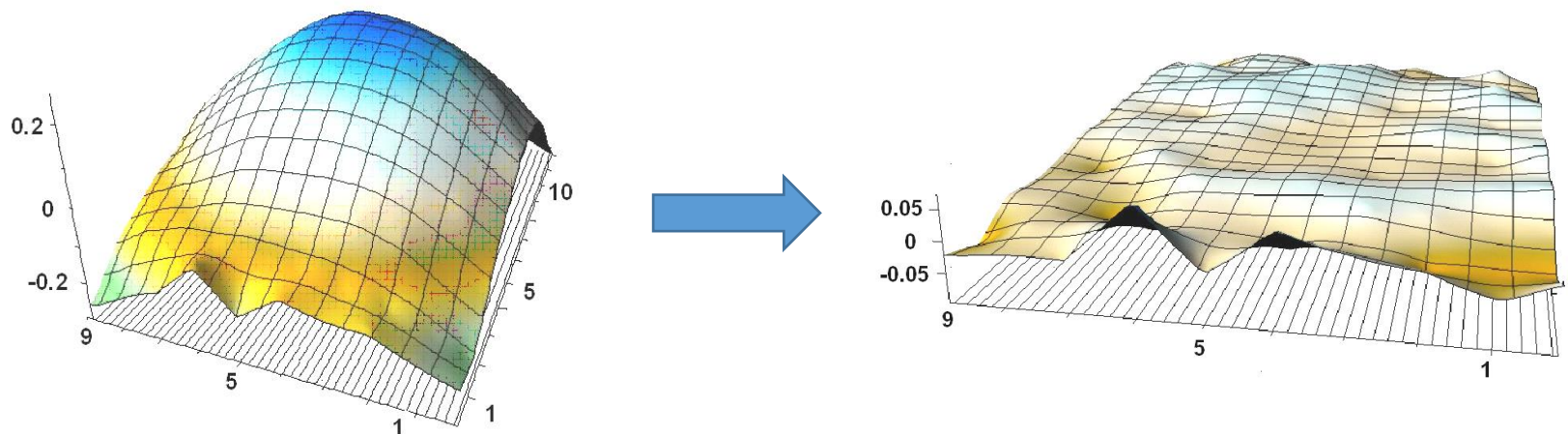
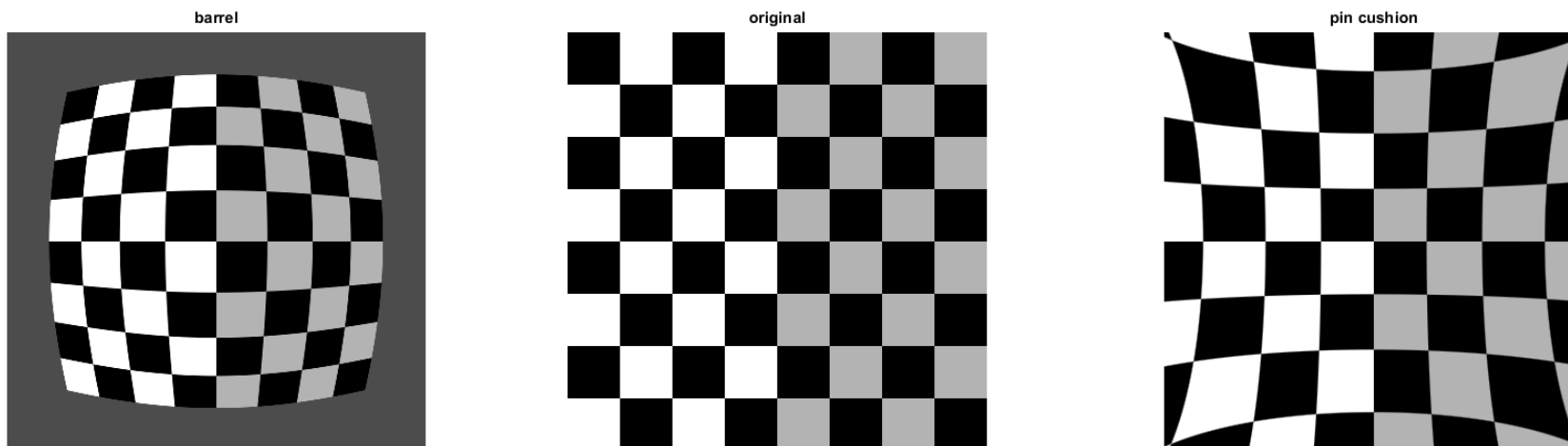
$$r = \sqrt{(\xi - \xi_0)^2 + (\eta - \eta_0)^2}$$

$$\xi' = \xi \cdot \left(1 - \frac{\Delta r_e}{r}\right)$$

$$\eta' = \eta \cdot \left(1 - \frac{\Delta r_e}{r}\right)$$



Torzítások főbb típusai és „kezelésük”



Atmoszférikus korrekció

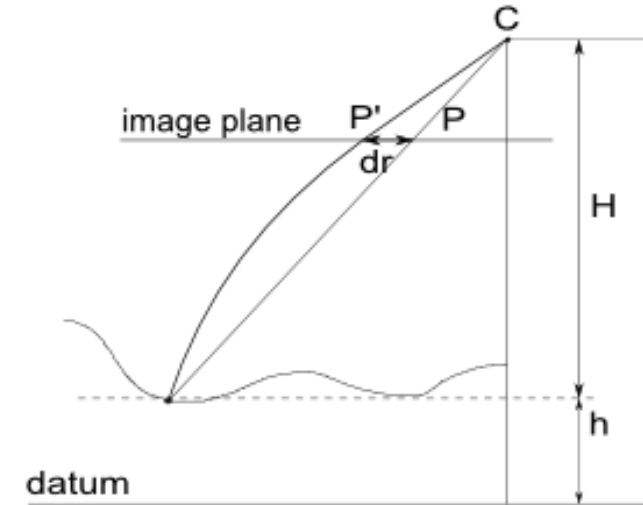
- (Atmoszférikus refrakció korrekciója)

$$\Delta r_a = -K \cdot \left(r + \frac{r^3}{c^2} \right)$$

$$K = 13 \cdot (H - h) \cdot [1 - 0.02 \cdot (2H + h)] \cdot 10^{-6}$$

$$\xi' = \xi \cdot \left(1 + \frac{\Delta r_a}{r} \right)$$

$$\eta' = \eta \cdot \left(1 + \frac{\Delta r_a}{r} \right)$$



[μm]	$r = 10$	$r = 50$	$r = 100 \text{ mm}$
$H = 1$	0.1	0.5	1.4
$H = 5$	0.5	2.7	7.0
$H = 10 \text{ km}$	0.8	4.6	11.9

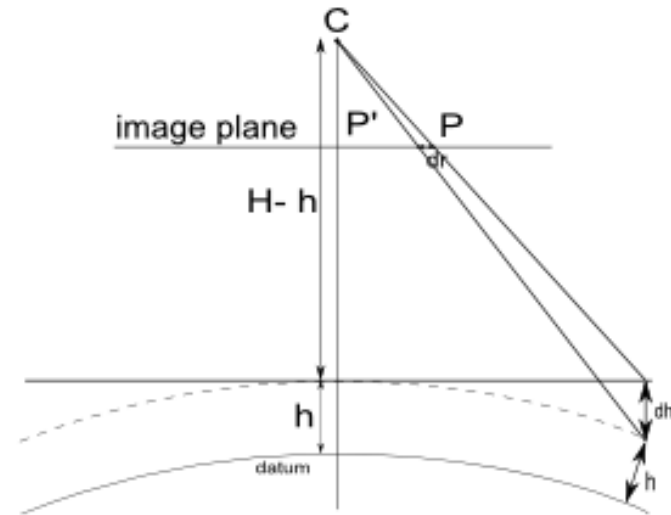
$c=152 \text{ mm}, h=0 \text{ m}$

Földgörbületi korrekció

$$\Delta r_g = -\frac{r^3(H-h)}{2c^2R}$$

$$\xi' = \xi \cdot \left(1 + \frac{\Delta r_g}{r}\right)$$

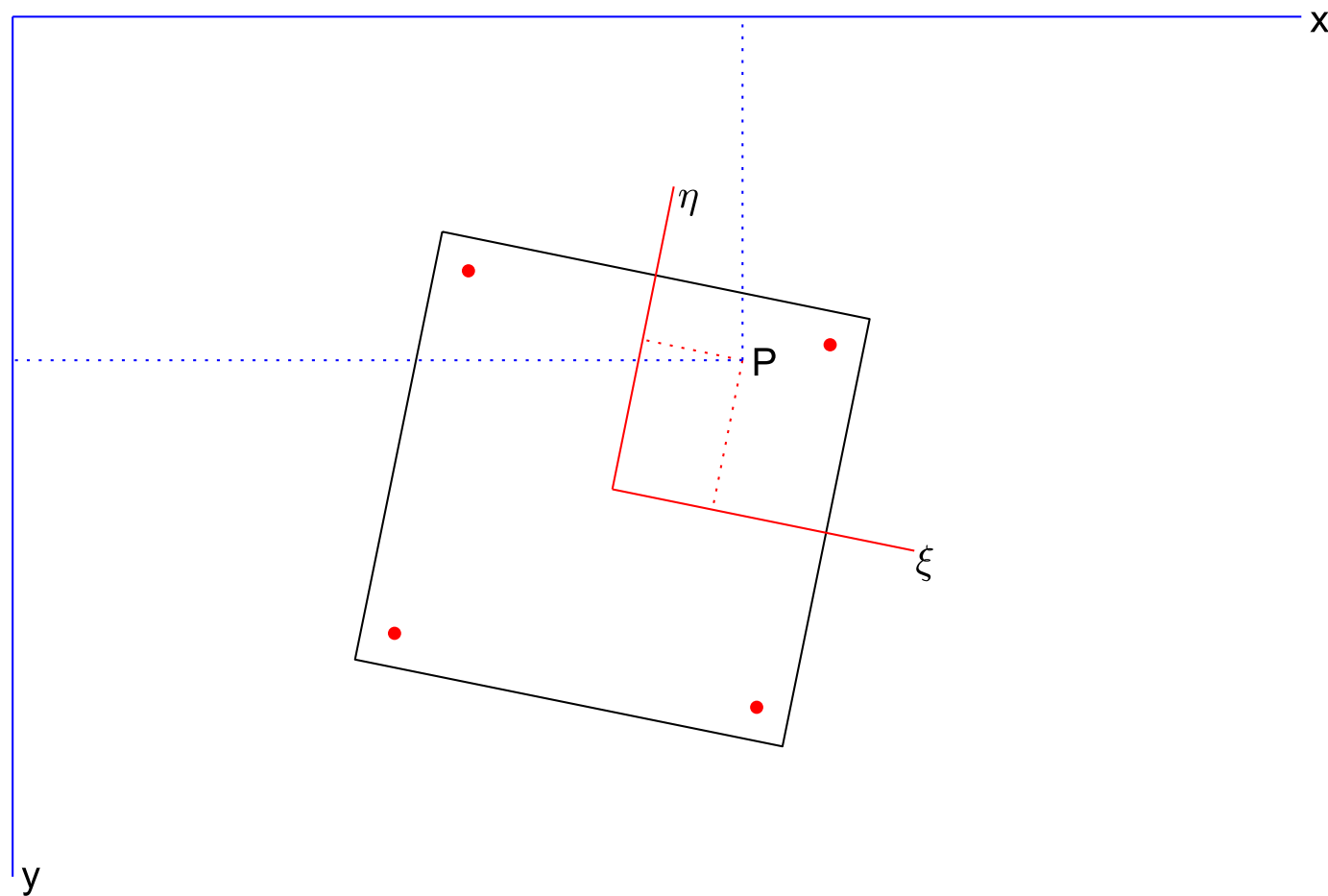
$$\eta' = \eta \cdot \left(1 + \frac{\Delta r_g}{r}\right)$$



[μm]	$r = 10$	$r = 50$	$r = 100 \text{ mm}$
$H = 1$	0.0	0.4	3.4
$H = 5$	0.0	2.1	17.0
$H = 10 \text{ km}$	0.0	4.2	34.0

$c=152 \text{ mm}$, $h=0 \text{ m}$, $R=6372.2 \text{ km}$

Koordináta rendszerek a belső tájékozás során



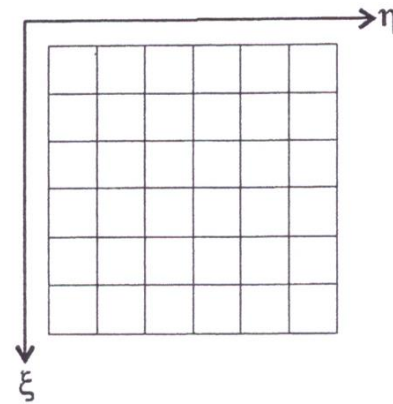
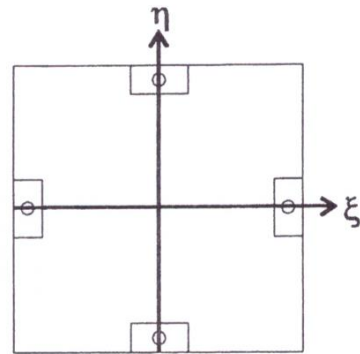
Belső tájékozás, mint mérés (keretjelek mérése)

- A tájékozás célja
- Geometriai transzformáció
 - Típusa
 - Paraméterek száma
 - Mérések (keretjelek) száma
 - RMSE
- Automatikus mérés =
Automatic Interior Orientation
(AIO)

The screenshot shows the 'Frame Camera Frame Editor' window. The main view displays a camera frame with a red fiducial marker labeled '#1' in the center. A smaller inset in the top right shows a zoomed-in view of the marker. Below the main view is a control panel with tabs for 'Sensor', 'Interior Orientation', and 'Exterior Information'. The 'Interior Orientation' tab is active, showing 'Fiducial Orientation' and 'Viewer Fiducial Locator' options. The 'Fiducial Orientation' section includes a table with columns for Point #, Color, Image X, Image Y, Film X, Film Y, Residual X, and Residual Y. The 'Viewer Fiducial Locator' section includes a 'Auto Locate...' button and a 'Solve' button. The 'Solve' button is highlighted, and the RMSE is displayed as 0.42 pixels or 8.82 microns. The status bar at the bottom shows the coordinates 11083.60, -7712.82.

Point #	>	Color	Image X	Image Y	Film X	Film Y	Residual X	Residual Y
1	>	Green	10721.930	10582.994	106.000	-106.000	-0.350	-0.232
2		Green	629.391	10573.526	-106.000	-106.000	0.350	0.232
3		Green	639.734	481.291	-106.000	106.000	-0.350	-0.232
4		Green	10730.872	489.830	106.000	106.000	0.350	0.232

Digitalizált vs digitális kép képkordináta-rendszere



Köszönöm a figyelmet!