FAKULTET TEHNIČKIH NAUKA

GEODEZIJA I GEOINFORMATIKA

INŽENJERSKA GEODEZIJA 3
- VEŽBA 8 -

NOVI SAD, 2023

Proračun tačnosti proboja tunela

- Relativne elipse grešaka

$$\Delta\mathbf{x} = \begin{bmatrix} \Delta\hat{X}_{ij} \\ \Delta\hat{Y}_{ij} \end{bmatrix} = \begin{bmatrix} \hat{X}_j - \hat{X}_i \\ \hat{Y}_j - \hat{Y}_i \end{bmatrix} = \mathbf{G}_{ij}\hat{\mathbf{x}}, \quad \mathbf{G}_{ij} = \begin{bmatrix} 1 & 0 & -1 & 0 \\ 0 & 1 & 0 & -1 \end{bmatrix}$$

$$\mathbf{Q}_{\Delta\mathbf{x}} = \mathbf{G}_{ij}\mathbf{Q}_{\hat{\mathbf{x}}}\mathbf{G}_{ij}^T, \quad \mathbf{K}_{\Delta\mathbf{x}} = \hat{\sigma}_0^2\mathbf{Q}_{\Delta\mathbf{x}}, \; \mathbf{Q}_{\Delta\mathbf{x}} = \begin{bmatrix} Q_{\Delta X\Delta X} & Q_{\Delta X\Delta Y} \\ Q_{\Delta Y\Delta X} & Q_{\Delta Y\Delta Y} \end{bmatrix}$$

$$A_R = \sigma_0\sqrt{\frac{1}{2}(Q_{\Delta X\Delta X} + Q_{\Delta Y\Delta Y} + k)\cdot\chi^2_{1-\alpha,f}}$$

$$B_R = \sigma_0\sqrt{\frac{1}{2}(Q_{\Delta X\Delta X} + Q_{\Delta Y\Delta Y} - k)\cdot\chi^2_{1-\alpha,f}}$$

$$k = \sqrt{(Q_{\Delta X\Delta X} - Q_{\Delta Y\Delta Y})^2 + 4Q^2_{\Delta X\Delta Y}}$$

$\chi^2_{1-\alpha,f}$ - kvantil χ^2 raspodele za nivo značajnosti α i broj stepeni slobode f.

$\chi^2_{0.95,2} = 5.99$, za $\alpha = 0.05$ i $f = 2$.

Excel: $\chi^2_{1-\alpha,f}$ → **CHIINV(α, f)**

Proračun tačnosti proboja tunela

- Relativne elipse grešaka

$$\theta_R = \frac{1}{2}\left(\arctan\left(\frac{2Q_{\Delta X\Delta Y}}{Q_{\Delta X\Delta X} - Q_{\Delta Y\Delta Y}}\right) + KV\right)$$

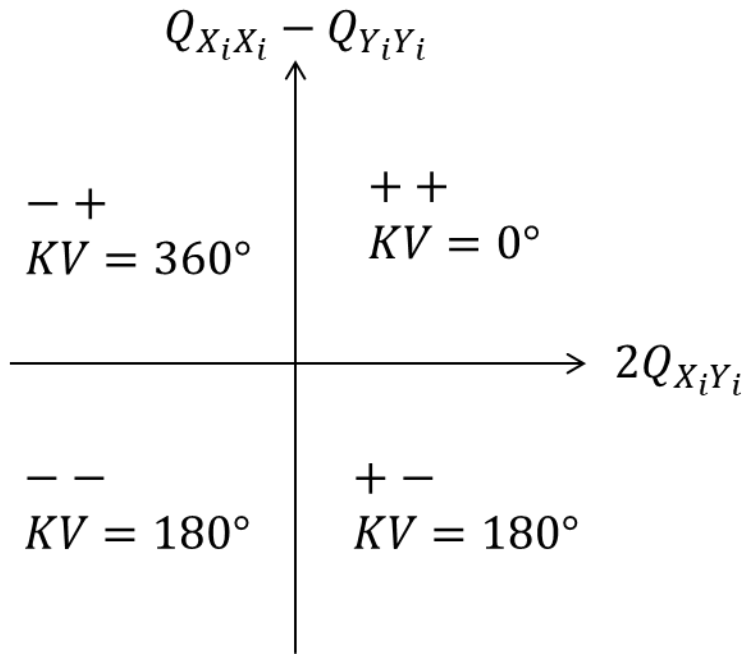
Primer:

$$2Q_{\Delta X\Delta Y} = -2$$

$$Q_{\Delta X\Delta X} - Q_{\Delta Y\Delta Y} = -2$$

$$KV = 180°$$

$$\theta = \frac{1}{2}\left(\arctan\left(\frac{-2}{-2}\right) + KV\right) = \frac{1}{2}(45° + 180°)$$



Proračun tačnosti proboja tunela

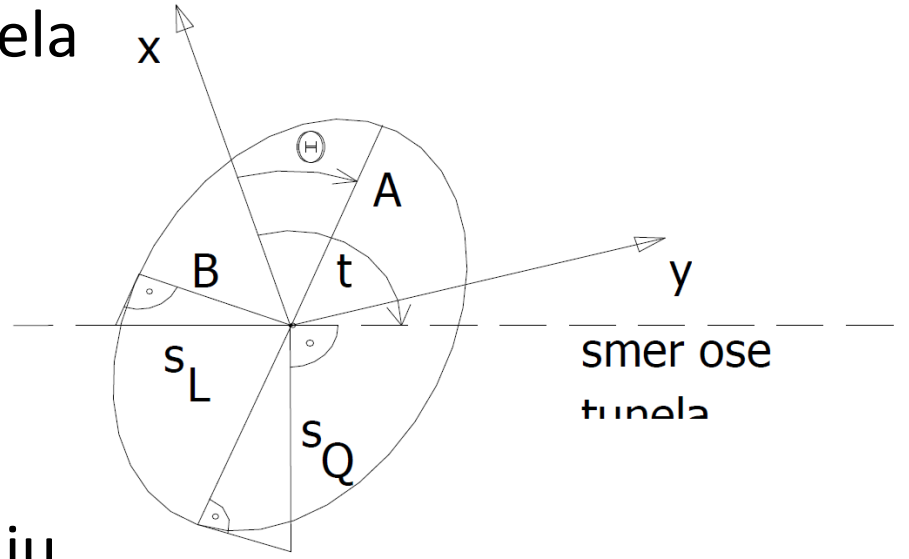
- Transverzalna i longitudinalna tačnost proboja tunela

$$\sigma_Q^2 = A_R^2 \sin(t - \theta_R)^2 + B_R^2 \cos(t - \theta_R)^2$$

$$\sigma_L^2 = A_R^2 \cos(t - \theta_R)^2 + B_R^2 \sin(t - \theta_R)^2$$

t – orijentisani pravac tunelske cevi

A_R, B_R i θ_R – parametri relativne elipse grešaka



- Dozvoljena odstupanja u postupku proboja računaju se na sledeći način:

$$\Delta Q = \pm 60\sqrt{L}\ \text{mm}$$

$$\Delta L = \pm 23\sqrt{L}\ \text{mm}$$

L – dužina tunelske cevi u kilometrima

Grafička interpretacija

- AutoCAD

  ELLIPSE

  C – Centar elipse

  Y_D, X_D – Koordinate tačke D

  Y_E, X_E – Koordinate tačke E

  B – Mala poluosa elipse

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5 ELLIPSE
6 C
7 1254.3438,1814.407
8 1264.63486860732,1813.8676466571
9 7.782867822
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