

Vyhľadávanie vzoru na obrazu pomocou rýchlej Fourierovej transformácie

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Vyhľadávanie vzoru na
obraze so zmenou škály,
rotáciou a posunom

Posun

$$f_{vzor}(x, y) = f_{obraz}(x - x_0, y - y_0)$$

$$F_{vzor}(\xi, \eta) = F_{obraz}(\xi, \eta) \cdot e^{-2\pi i(\xi x_0 + \eta y_0)}$$

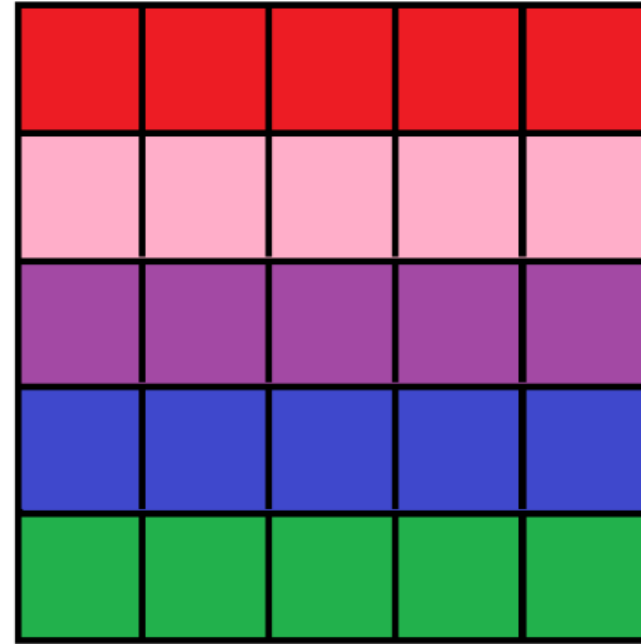
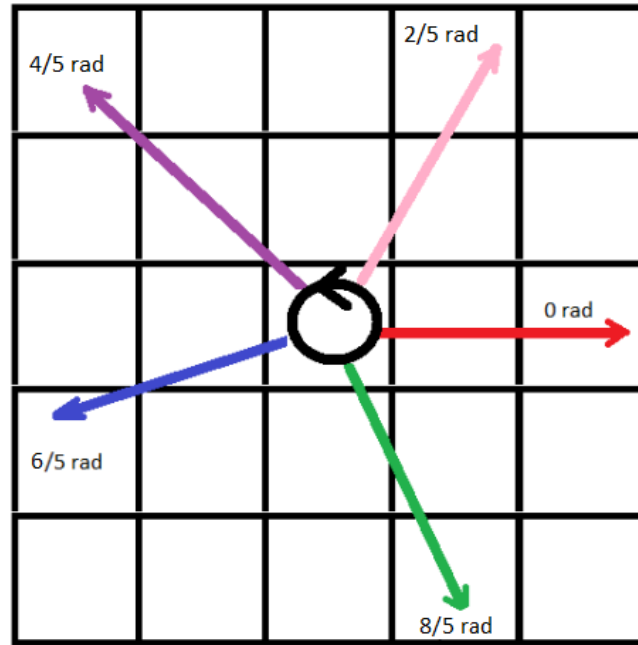
Rotácia

$$f_{vzor}(x, y) = f_{obraz}(x \cos \Theta_0 + y \sin \Theta_0 - x_0, -x \sin \Theta_0 + y \cos \Theta_0 - y_0)$$

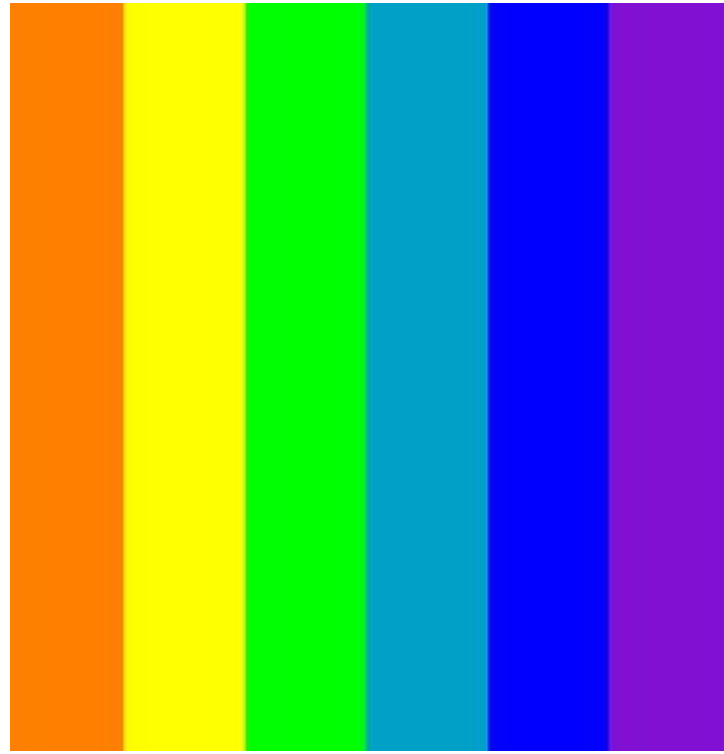
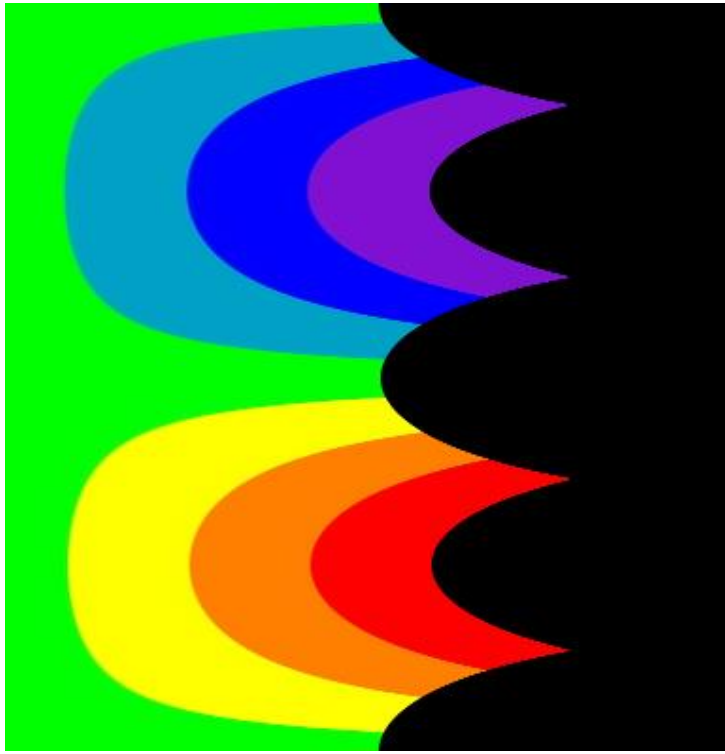
$$F_{vzor}(\xi, \eta) = F_{obraz}(\xi \cos \Theta_0 + \eta \sin \Theta_0, -\xi \sin \Theta_0 + \eta \cos \Theta_0) \cdot e^{-2\pi i(\xi x_0 + \eta y_0)}$$

$$M_{vzor}(\xi, \eta) = M_{obraz}(\xi \cos \Theta_0 + \eta \sin \Theta_0, -\xi \sin \Theta_0 + \eta \cos \Theta_0)$$

$$M_{vzor}(\rho, \Theta) = M_{obraz}(\rho, \Theta - \Theta_0)$$



Polárna transformácia



$$f(x, y) \rightarrow f(\rho, \Theta)$$

$$\rho = \sqrt{x^2 + y^2}$$

$$\Theta = \tan^{-1} \frac{y}{x}$$

Škálovanie

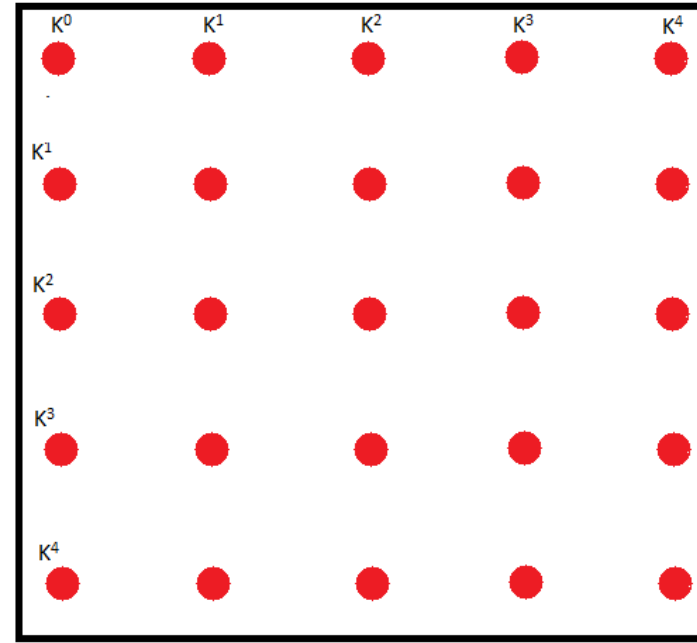
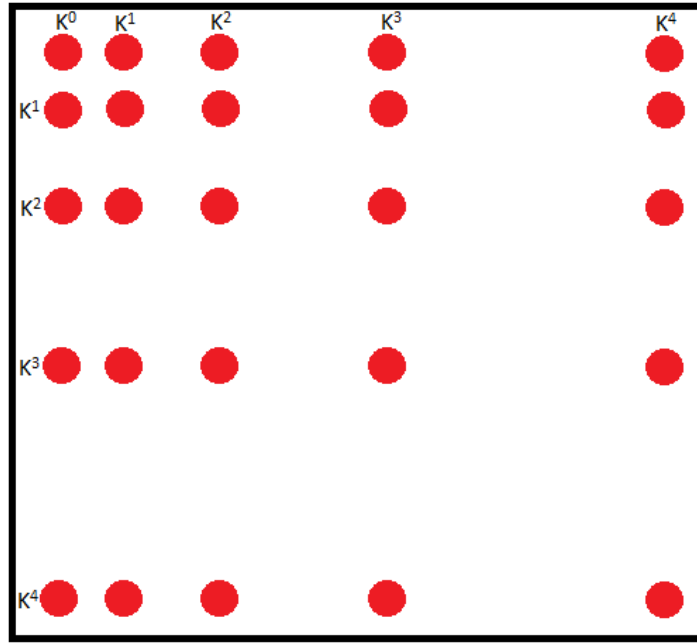
$$F_{vzor}(\xi, \eta) = \frac{1}{ab} F_{obraz}(\xi/a, \eta/b)$$

$$\begin{aligned} F_{vzor}(\log \xi, \log \eta) &= F_{obraz}(\log \xi/a, \log \eta/b) \\ &= F_{obraz}(\log \xi - \log a, \log \eta - \log b) \end{aligned}$$

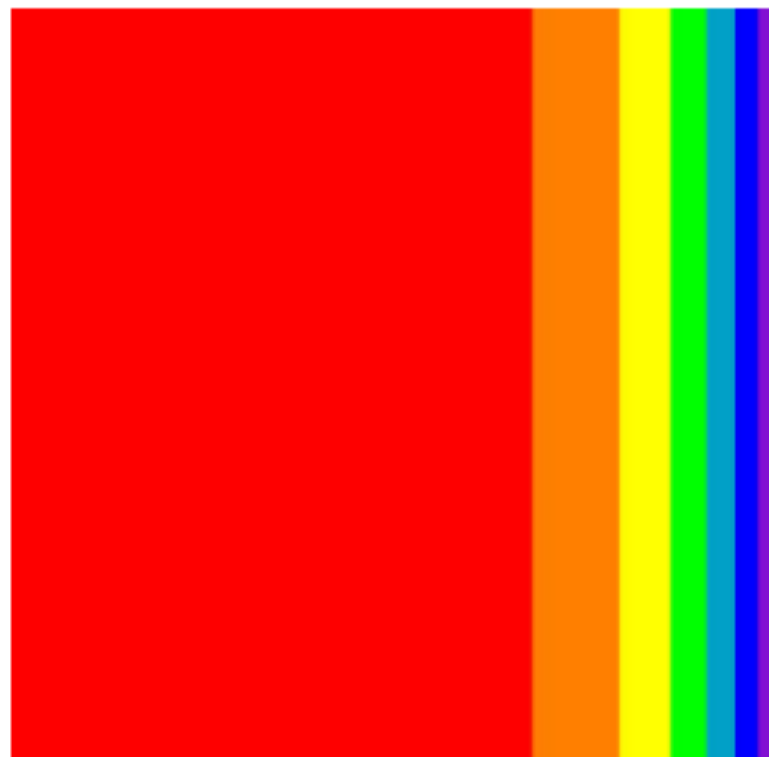
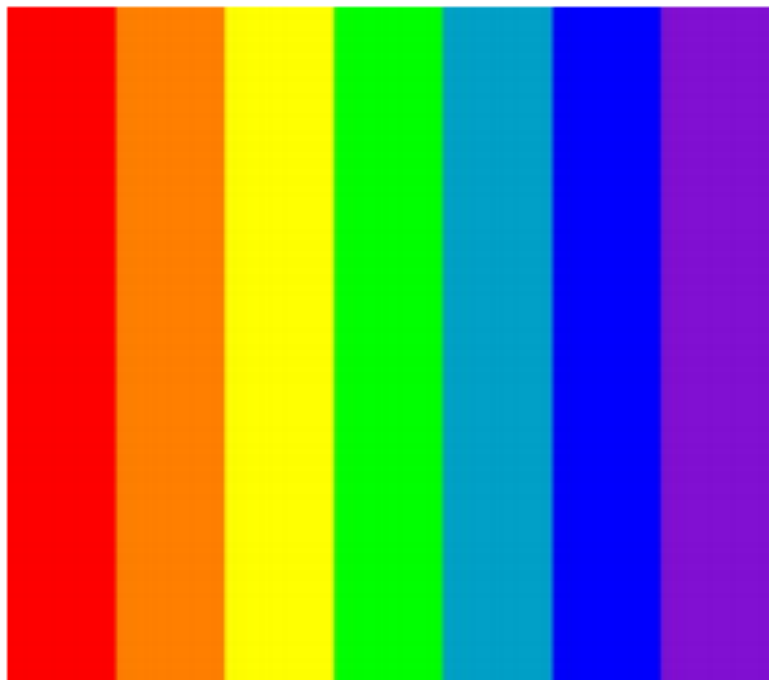
$$x = \log \xi, y = \log \eta$$

$$c = \log a, d = \log b$$

$$F_{vzor}(x, y) = F_{obraz}(x - c, y - d)$$



Logaritmická transformácia



Všetko
spolu

$$\rho_1 = \sqrt{x^2 + y^2}$$

$$\Theta_1 = \tan^{-1} \frac{y}{x}$$

$$\rho_2 = \sqrt{(x/a)^2 + (y/a)^2} = \frac{1}{a} \sqrt{x^2 + y^2} = \frac{\rho_1}{a}$$

$$\Theta_2 = \tan^{-1} \frac{y/a}{x/a} = \tan^{-1} \frac{y}{x} = \Theta_1$$

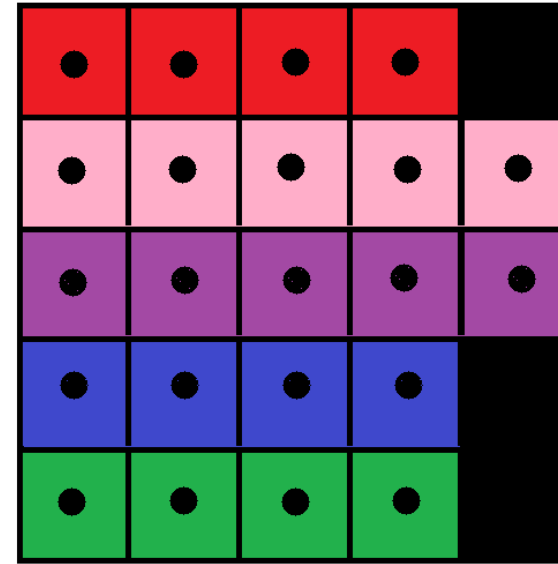
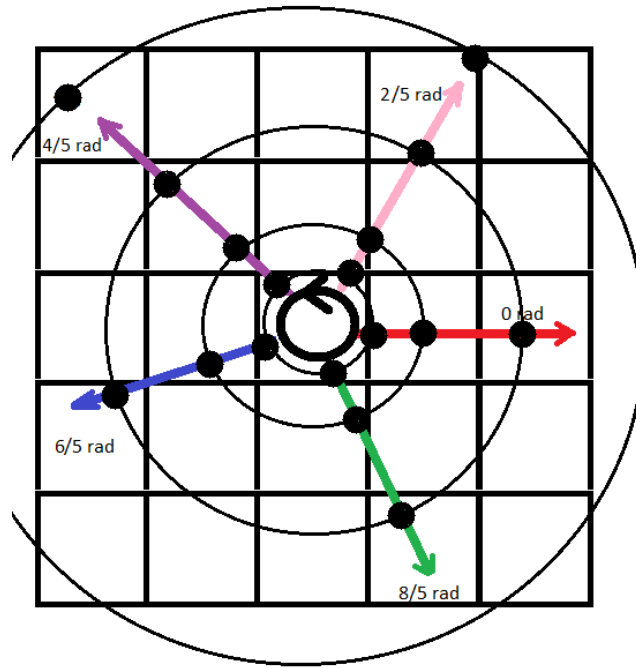
$$M_1(\rho, \Theta) = M_2(\rho/a, \Theta - \Theta_0)$$

$$M_1(\log \rho, \Theta) = M_2(\log \rho - \log a, \Theta - \Theta_0)$$

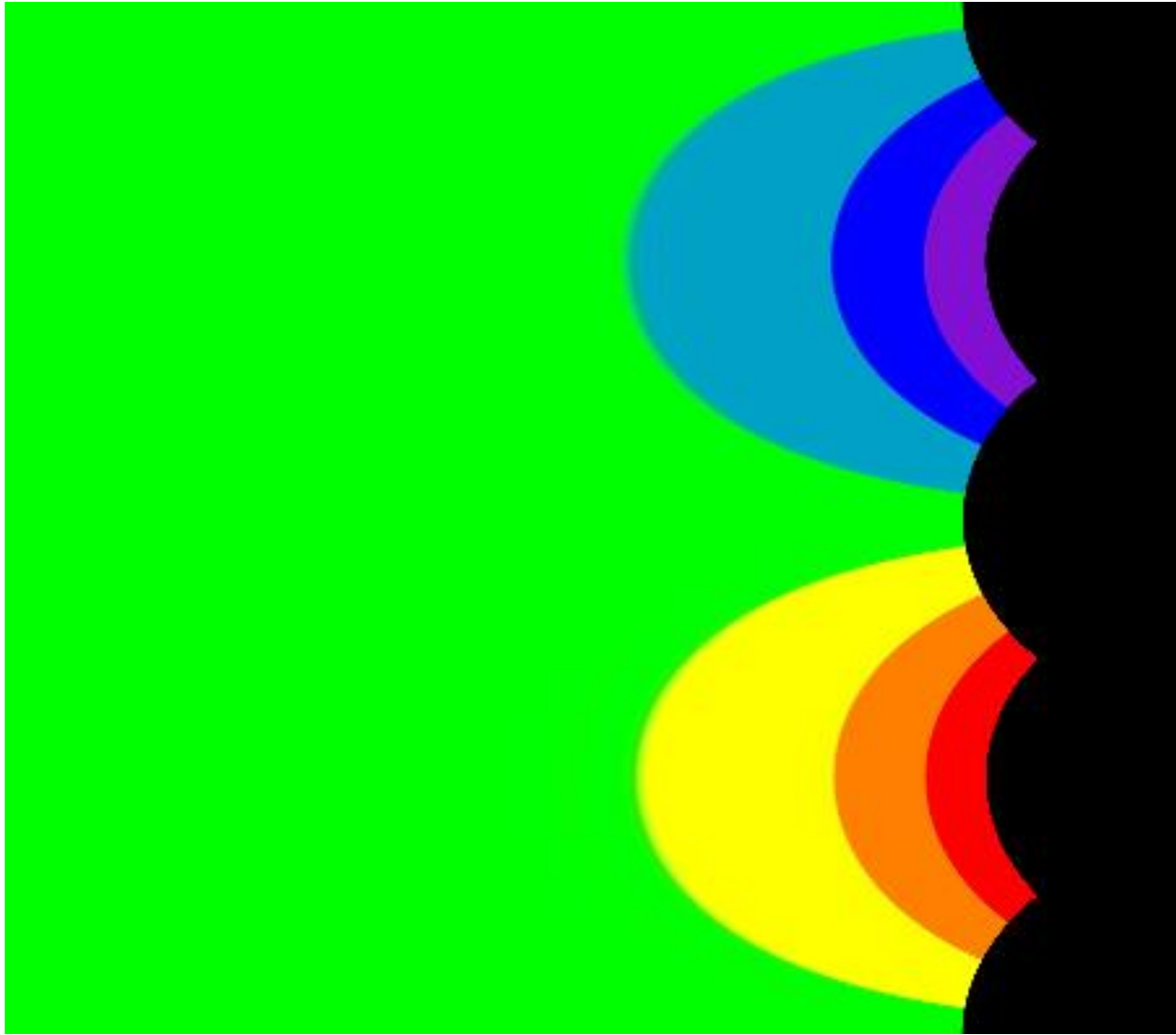
$$\psi = \log \rho$$

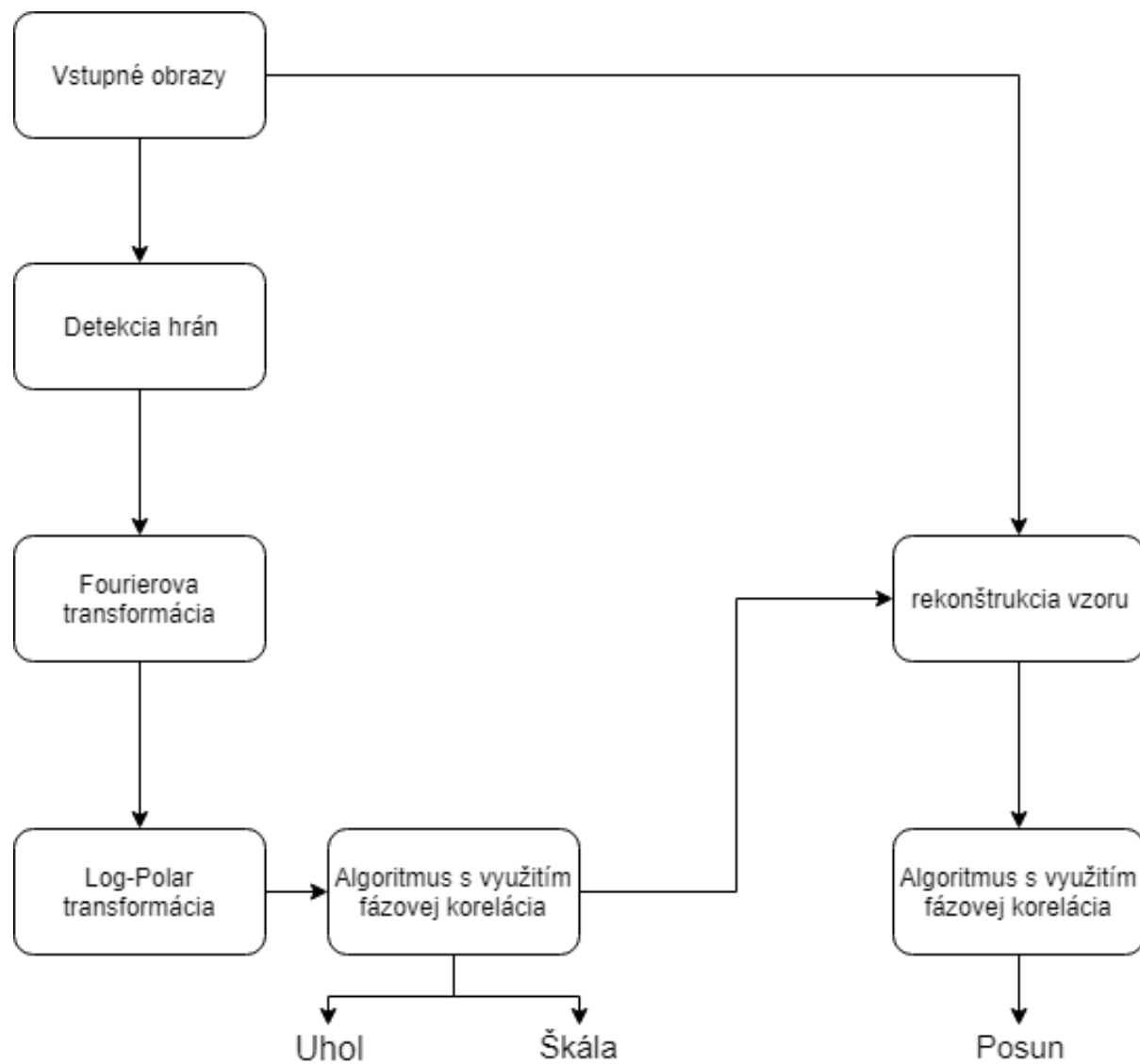
$$d = \log a$$

$$M_1(\psi, \Theta) = M_2(\psi - d, \Theta - \Theta_0)$$



Logaritmicko-polárna transformácia





Algoritmus

Ďakujem
za pozornosť