HW3

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Written assignments

For a fixed point (x_0, y_0) in the (x, y)-image space, the line equation is

$$x_0 \sin(\theta) - y_0 \cos(\theta) + \rho = 0$$

$$\rho = y_0 \cos(\theta) - x_0 \sin(\theta)$$

$$\rho = \sqrt{{y_0}^2 + {x_0}^2}(\frac{y_0}{\sqrt{{y_0}^2 + {x_0}^2}} \cos(\theta) - \frac{x_0}{\sqrt{{y_0}^2 + {x_0}^2}} \sin(\theta))$$

$$\rho = \sqrt{{y_0}^2 + {x_0}^2} \cos(\theta + \varphi) = \sqrt{{y_0}^2 + {x_0}^2} \sin\left(\theta + \varphi + \frac{\pi}{2}\right)$$

Where $\cos(\varphi) = \frac{y_0}{\sqrt{{y_0}^2+{x_0}^2}}$ and $\sin(\varphi) = \frac{x_0}{\sqrt{{y_0}^2+{x_0}^2}}$.

Thus a point in image space results in a sinusoid in Hough space.

The amplitude is $\sqrt{{y_0}^2 + {x_0}^2}$ and the phase is $\varphi + \frac{\pi}{2}$ (where $\cos(\varphi) = \frac{y_0}{\sqrt{{y_0}^2+{x_0}^2}}$ and $\sin(\varphi) = \frac{x_0}{\sqrt{{y_0}^2+{x_0}^2}}$).

The period does not change when the position of the image point moves. In a sinuous function $f(x) = Asin(\omega\theta + \varphi)$ the period depends only on parameter ω. As shown in the equation above, ω is independent of x and y and in thie case ω is always 1, thus the period does not change.