Ex 3.12: Steerable filters (Freeman and Adelson's)

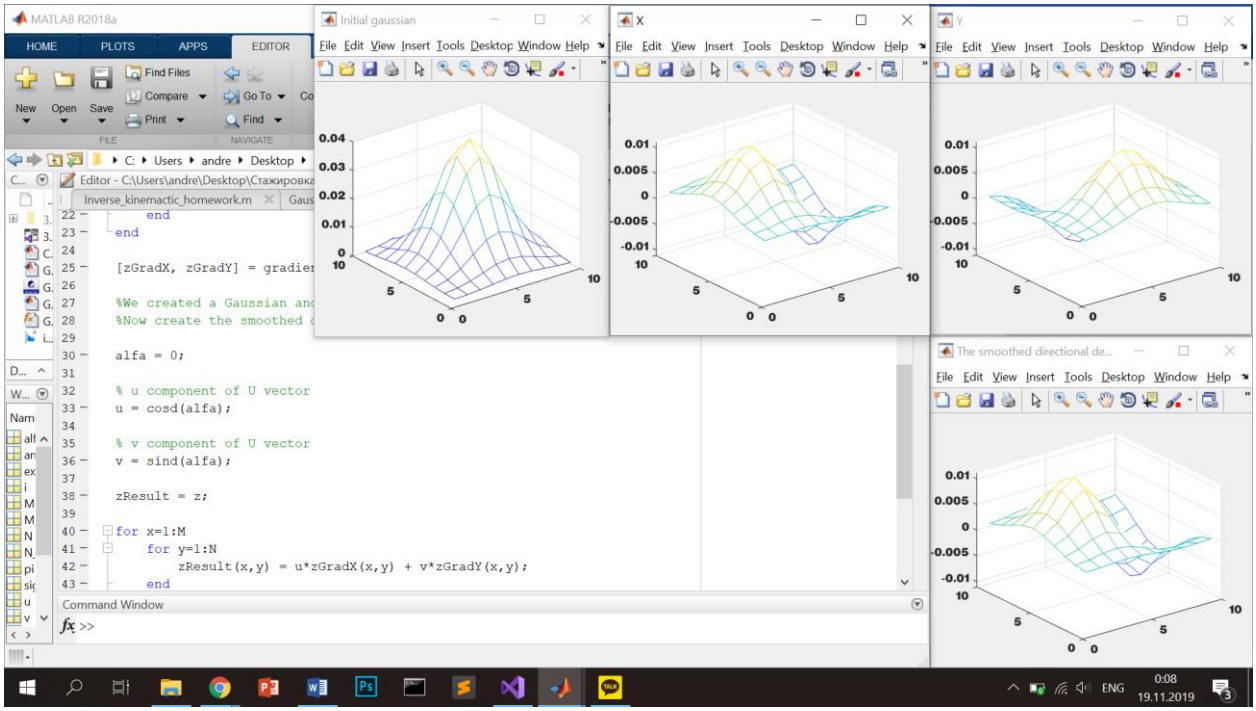
1. Get the initial Gaussian

$$G(x, y, \sigma) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

2. Get the gradient components G_x and G_y
3. Get the smoothed directional derivative filter,

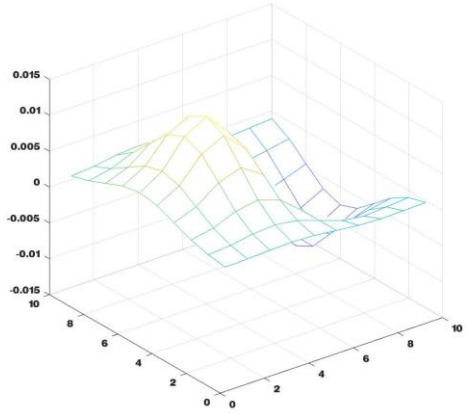
$$G_{\hat{u}} = uG_x + vG_y$$

where $\hat{u} = (u, v) = (\cos\theta, \sin\theta)$

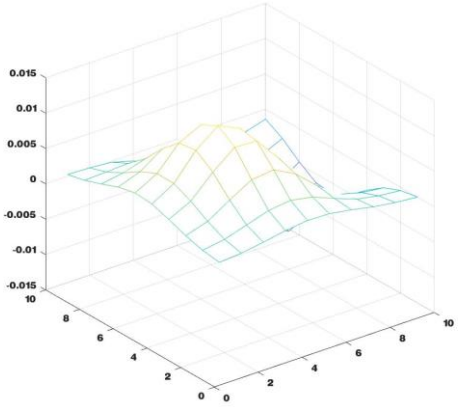


Then by changing the angle of rotation we can obtain different filters:

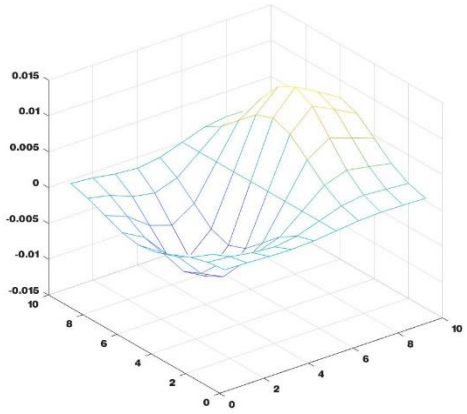
0 degrees



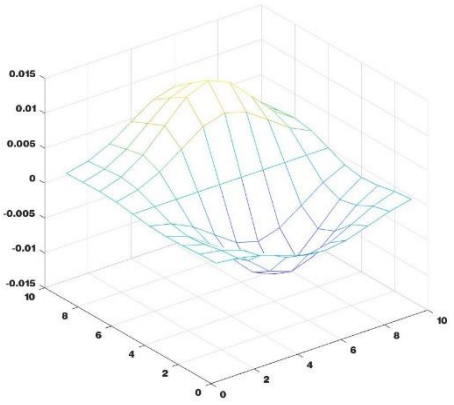
30 degrees



180 degrees



270 degrees



It can be used for detection of the boundaries of objects, analysis of oriented textures, determination of the volumetric shape of an object from the maps of its shading.