

PHYS 114 HWK 8**Due: 4/26/10**

1. Go again to Wikipedia page http://en.wikipedia.org/wiki/Gaussian_function, and read the section on 2D Gaussians. Cut and paste the example MatLAB code into MatLAB and run it. It is not obvious from the formula they give, but there are 6 distinct parameters to solve for. Show that you can write the formula in terms of $z = Ae^{-\frac{1}{2}[a'(x-x_0)+b'(y-y_0)]^2}$, where

$$a' = \sqrt{\frac{\cos^2 \theta}{\sigma_x^2} + \frac{\sin^2 \theta}{\sigma_y^2}}; \quad b' = \sqrt{\frac{\sin^2 \theta}{\sigma_x^2} + \frac{\cos^2 \theta}{\sigma_y^2}}. \text{ Hint: Just square the above and show that the}$$

result has the form given on the Wikipedia page. Show your work. The 6 parameters are x_0 , y_0 , A , σ_x , σ_y , and θ . Create a noisy model of such a rotated Gaussian as shown in class, and modify the `gaussfit2d.m` program from the web page to do the brute-force search for best fit parameters. Be sure to construct your model and choose your search ranges so that you will find the best fit (which we did *not* do correctly in the lecture 19). Write a report showing publication quality images of your noise data, the best fit solution, and the residuals (data-fit). Label your axes.

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