RULES FOR QUANTUM MEASUREMENT

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The probability of measuring the particle to be in a region between x=a and x=b at time t is given by:

$$\int_a^b |\psi(x,t)|^2 dx \tag{1}$$

Note that if you take the formula I gave you for the initial $\psi(x, t = 0)$:

$$\psi(x,0) = \frac{1}{\sigma^{1/2}\pi^{1/4}} \exp\left(-(x-x_0)^2/2\sigma^2\right) \exp\left(ik(x-x_0)\right) \tag{2}$$

and plug it into formula (1) with $a = -\infty$ and $b = +\infty$, you will get:

$$\int_{-\infty}^{\infty} |\psi(x,0)|^2 dx = \int_{-\infty}^{\infty} \frac{1}{\sigma\pi^{1/2}} \exp\left(-(x-x_0)^2/\sigma^2\right) dx = 1 \tag{3}$$

meaning that the probability of measuring the particle *somewhere* is one, as it should be.

Since you're calculating ψ on a grid, the easiest thing to do would probably be to check the probability of measuring the particle at each grid point, which is given by (roughly):

$$|\psi(x,t)|^2 * \Delta x \tag{4}$$

where Δx is the spacing between grid points.

So when the user hits the "measure" button, you randomly choose which grid point the new wave function is centered at, but the probability is given by formula 4, rather than there being an equal probability of being found anywhere.

Also, after measurement, the new wave packet should have a width of $\sigma = 0.1$. (The reason for this is that when you measure it, you localize it in a narrow region.) But don't change the initial width slider, since this refers to the initial width when you hit the restart button, not the width when you make a measurement.

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