Derivation of Gravity-Like Field from Quantum Uncertainty

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ABSTRACT: Using a linear combination of Heisenburg uncertainty equations, it is possible to derive a mathematical probability (field equation) in which has fundamental characteristics similar to gravity. This is accomplished by substituting universal minimum and maximum values to position and momentum uncertainties.

UNCERTAINTY EQUATIONS:

The table below shows the uncertainty principle with respect to position Δx (1) and momentum Δp (2). The corresponding minima and maxima are determined by the theoretical maximum velocity of any mass, and this is *approximated* to be the speed of light. For aesthetics, the conventional value of the right side of the equation $(h/4\pi)$ has been rewritten as n.

Uncertainty Principle : $\Delta x \cdot \Delta p \geq n$		
Relation	**Minimum**	**Maximum**
1. $\Delta x \geq \frac{n}{\Delta p}$	$\Delta x_{min} = \frac{n}{\Delta p_{max}}$	$\Delta x_{max} \approx ct$
2. $\Delta p \geq \frac{n}{\Delta x}$	$\Delta p_{min} = \frac{n}{\Delta x_{max}}$	$\Delta p_{max} \approx mc$

For single particle at $t = 0$, we can define the average of its possible positions as $\bar{x}_{t_o}$. Similarly, we can define the average of its possible momentum to be $\bar{p}_{t_o}$.

We can now define new values α, ω and create field equation $\Theta(t)$.

$$\alpha = \bar{x}_{t_o} + \Delta x_{min} = (\bar{x}_{t_o} + \frac{n}{mc})$$
$$\omega = \bar{p}_{t_o} + \Delta p_{min} = (\bar{p}_{t_o} + \frac{n}{ct})$$

$$\Theta(t) = \alpha\omega$$

$$\Theta(t) = \bar{x}_{t_o}\bar{p}_{t_o} + \frac{n\,\bar{x}_{t_o}}{ct} + \frac{n\,\bar{p}_{t_o}}{mc} + \frac{n^2}{mc^2 t}$$

For **M** indistinguishable particles with the same $\bar{x}_{t_o}$, $\bar{p}_{t_o}$:

$$\Theta(t) = M(\bar{x}_{t_o}\bar{p}_{t_o} + \frac{n\,\bar{x}_{t_o}}{ct} + \frac{n\,\bar{p}_{t_o}}{mc} + \frac{n^2}{mc^2 t})$$

The force field equation is given by $-\nabla^2\,\Theta(t)$. Avoiding the negative for aesthetics, we find:

$$\nabla^2\,\Theta(t) = \frac{2Mn\,(n + mc\,\bar{x}_{t_o})}{mc^2 t^3}$$

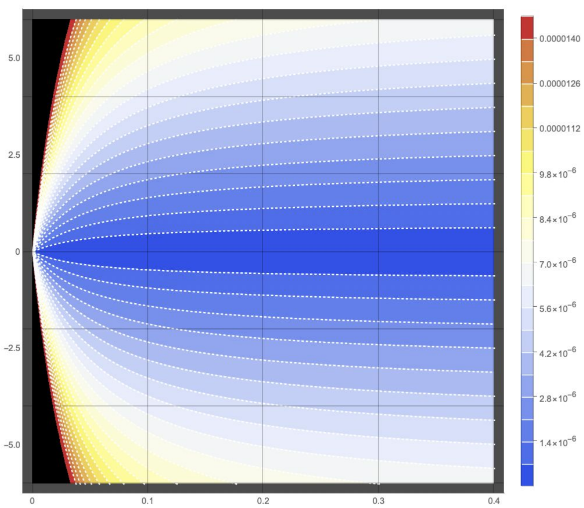
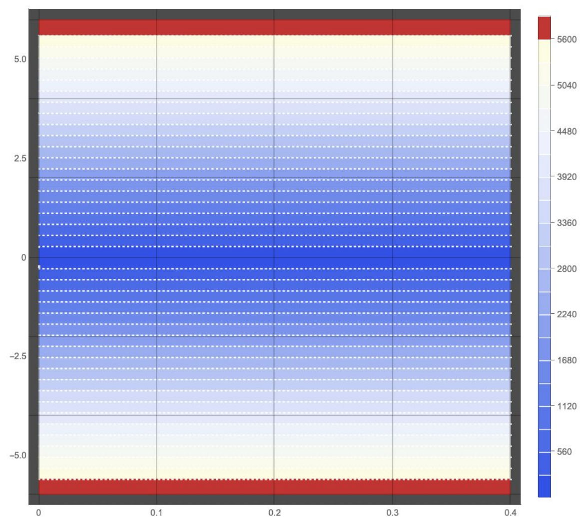
From observers perspective ($r = ct$):

$$\nabla^2\,\Theta(t) = \frac{2Mn\,(n + mc\,\bar{x}_{t_o})}{mr^2 t}$$

$$\nabla^2\,\Theta(t) = \frac{2Mn\,(n + mc\,\bar{x}_{t_o})}{mt}\,\frac{1}{r^2}$$

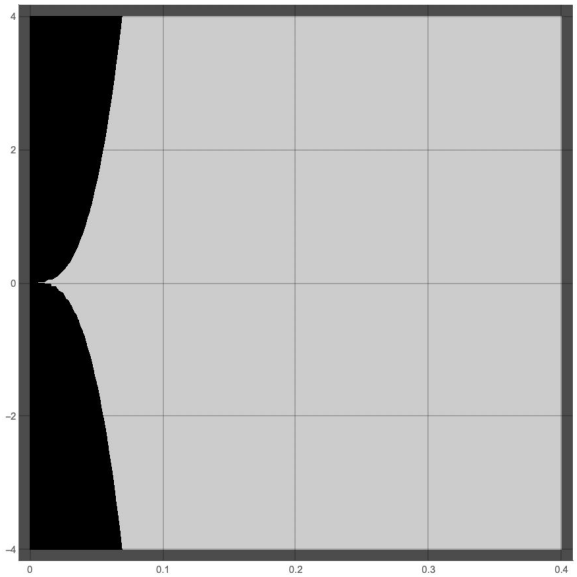
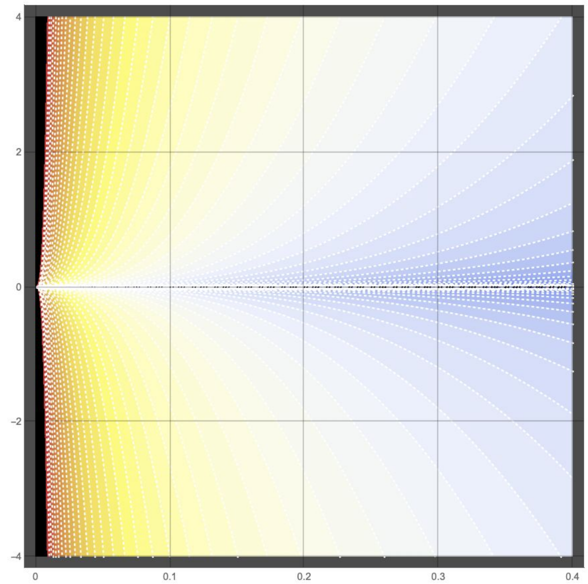
FIELD VISUALIZATIONS:

The following tables contain different field visualizations for the probability and force field equations. For all visualizations, the y-axis corresponds to $\bar{x}_{t_o}$ and the x-axis corresponds to t. The phenomena observed significantly resembles that of a gravitational field.

$\Theta(t) = \bar{x}_{t_o}\bar{p}_{t_o} + \frac{n\,\bar{x}_{t_o}}{ct} + \frac{n\,\bar{p}_{t_o}}{mc} + \frac{n^2}{mc^2 t}$	
	
When particle has mean initial momentum ≈ 0	When particle has mean initial momentum ≈ mc

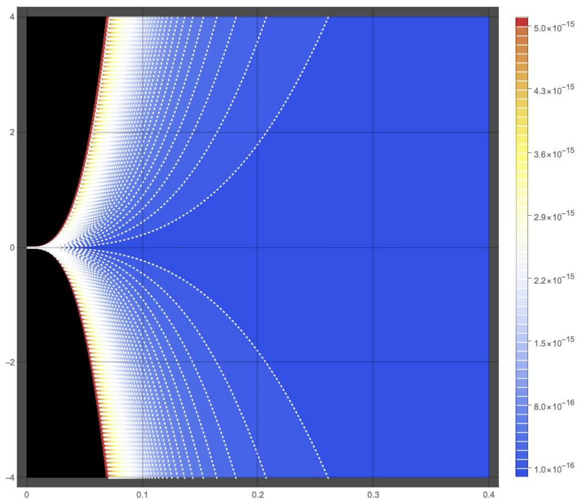
$$\nabla^2 \Theta(t) = \frac{2Mn\,(n + mc\,\bar{x}_{t_o})}{mc^2 t^3}$$

M = 1

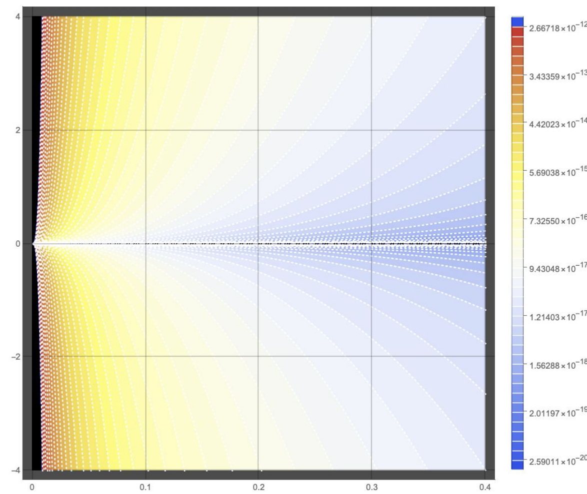
	
Regular Time Scale	Log Time Scale

$$\nabla^2 \Theta(t) = \frac{2Mn\,(n + mc\,\bar{x}_{t_o})}{mc^2 t^3}$$

M >>1



Regular Time Scale



Log Time Scale