EWT Simulation

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1 Theory

1.1 Laws

The laws i used:

- waves move freely in space given by wave equations.
- wave centers reflect waves
- wave centers move to lower potential (potential $\sim$ wave amplitude^{2}).

1.2 Initial Problem

Simulations which use discretization of space have a complexity O(n^{3}) with n the finite elements of one space axis. This needs a lot of calculation and memory for bigger systems.

1.3 Approach

To reduce computational complexity we us a more analytical approach without discretization of space.

First we need a background radiation otherwise absolutely nothing happens. We can interpret this case as the absolute zero temperature point 0 Kelvin?

Given an background longitudinal wave

$$y(x,t) = A_l \cdot \vec{e}_x \cdot \cos(\omega \cdot (t - \frac{x}{c}))$$

In simulation we have three background waves for each axis. The amplitude of any point in this system is the background waves plus reflections of all wave centers. Plus the reflections of reflections and again their reflections and so on. A reflection of the background wave on a wave center at point x_p creates spherical wave

$$y(r,t) = A_l \cdot \frac{r_0}{r} \cdot \vec{e}_r \cdot \cos(\omega \cdot (t - \frac{x_p}{c} - \frac{r}{c}))$$

with r the distance to the reflection point x_p, r_0 is the hypothetical radius of the wave center and $\cdot\vec{e}_r$ is the vector directing away from the reflecting wave center.

Multiple reflections at wave centers with distances of $r_0, .., r_n$ to each other can be written as:

$$y(x, r_1, ..., r_n, t) = A_l \cdot (\frac{r_0}{r_{prod}}) \cdot \vec{e}_r \cdot \cos(\omega \cdot (t - \frac{x_p}{c} - \frac{r_{sum}}{c})$$

with x_p as the first wave center point starting. $\vec{e}_r$ is the vector pointing away from the last reflecting wave center. $r_{sum} = \sum^n r_i$ and $r_{prod} = \prod^n r_i$.
To avoid an infinite sum of reflections we make an approach to ignore higher order reflections as those amplitudes are inverse proportional to r_{prod} and have smaller contributions. If we consider only waves reflected at maximum twice we get a complexity O($\mathrm{n}^{\mathbf{2}}$) with n the number of wave centers. This way we can calculate the amplitude of any space point in a static system.

1.4 Dynamic Approach

If we want a dynamic system we calculate the potential Energy V ($\sim$amplitude$^{\mathbf{2}}$) at close distance delta x around a wave center in every direction. So we get numerically ∇ V. This creates a force and accelerates the wave center.

$$V = \frac{1}{2} \cdot k \cdot amplitude^2,\ \nabla V = -F,\ F = m * a$$

What is k and what is m in this case? Mass should come later as a result from these equations. When we have moving wave centers we save the events (space time points) of the past. When we now want to calculate reflections of waves like above in the static case, we must find the event of the reflecting wave center which is within the light cone of our point. As the wave speed is c, the position when the wave center emitted the signal was somewhat in the past.

2 Resulting Problems

Considering the easiest case of two wave centers and finding their stable distance. There are many open parameters regarding the force and the geometry r_0. If this is the Planck Length the reflection amplitudes become quiet small. What is the resulting acceleration due to the potential differential. How does the background radiation look like. All those parameters can change the result.