Derivation of Galilean and Newtonian Mechanics with Infinite Energy Distributions

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Abstract: In this paper, we derive kinematic and Newtonian equations in terms of time. The paper sets out to prove that the kinematic equations are derived from infinite time convergences as predicted by Gauss and Boltzmann.

We can show mathematically, with the theory derived by Gauss and Ludwig Boltzmann, that the distribution of energy is distributed in an **infinite** Dimension of time. **[1][2]**

$$f(E) = Ae^{-E/kT}$$

$$f(v_z) = Ae^{\frac{-mv_z^2}{2kT}}$$

$$\int_{-\infty}^{\infty} e^{-x^2}dx = \sqrt{\pi}$$

$$x = \sqrt{\frac{m}{2kT}}v_z$$

$$A\sqrt{\frac{2kT}{m}}\int_{-\infty}^{\infty} e^{\frac{-mv_z^2}{2kT}}\sqrt{\frac{m}{2kT}}dv_z = 1$$

$$A = \sqrt{\frac{m}{2\pi kT}}$$

$$f(v_z) = \sqrt{\frac{m}{2\pi kT}} \cdot e^{-mv_z^2}$$

$$\left\langle v_z^2 \right\rangle = \sqrt{\frac{m}{2\pi kT}}\int_{-\infty}^{\infty} v_z^2 e^{-\frac{mv_z^2}{2kT}}dv_z$$

Notice the infinite integral. As the heat distribution converges in infinite systems.

$$\int_{-\infty}^{\infty} x^2 e^{-\frac{x^2}{a}} dx = \frac{\sqrt{\pi}}{2} a^{3/2}$$

$$x = v_z$$

$$a = \frac{2kT}{m}$$

$$\left\langle v_z^2 \right\rangle = \sqrt{\frac{m}{2\pi kT}} \frac{\sqrt{\pi}}{2} \left[\frac{2kT}{m} \right]^{3/2} = \frac{kT}{m}$$

This solution proves that the energy is stored in infinite convergent signals.

$$\frac{m}{2} \left\langle v_z^2 \right\rangle = \frac{3kT}{2} = \frac{GmM}{r}$$

We Begin by solving the Heat Kernel which while provides us the solution to study the distribution of heat in the universe. I used the following two papers.
Deriving the Heat Kernel in 1 Dimension by Ophir Gottliev **[3]** and Infinite Spatial Domains and the Fourier Transform by Matthew J. Hancock **[4]**. Matthew Hancock paper also shows that the energy of the universe converges with an infinite thermal distribution.

The solution for the heat kernel is as follows:

$$\gamma = \frac{1}{t}$$

$$\alpha = \beta = \frac{1}{\sqrt{t}}$$

$$G(x,t) = \frac{1}{\sqrt{t}} Q(\varepsilon)$$

$$\varepsilon = \frac{x}{\sqrt{t}}$$

$$G_t = k\Delta G$$

$$G_t = -\frac{1}{2} t^{\frac{-3}{2}} Q - \frac{1}{2} t^{\frac{-3}{2}} (t^{\frac{-1}{2}} x) Q'$$

$$G_t = -\frac{1}{2} t^{\frac{-3}{2}} Q - \frac{1}{2} t^{\frac{-3}{2}} (\varepsilon) Q'$$

$$G_t = -\frac{1}{2} t^{\frac{-3}{2}} (Q + \varepsilon Q')$$

$$G_{xx} = t^{\frac{-3}{2}} Q''$$

$$-\frac{1}{2} t^{\frac{-3}{2}} (Q + \varepsilon Q') = k t^{\frac{-3}{2}} Q''$$

$$Q + \varepsilon Q' + 2kQ'' = 0$$

$$(\varepsilon Q)' + 2kQ'' = 0$$

$$\varepsilon Q + 2kQ' = c$$

Now we note that we expect $G(\infty, t) = 0$. Consequently, we expect $Q' = 0$ as $x \to \infty$. Therefore c = 0. We have the ODE

$$\varepsilon Q + 2kQ' = 0$$

$$2kQ' = -\varepsilon Q$$

$$Q' = \frac{-\varepsilon Q}{2k}$$

$$\frac{Q}{Q}' = \frac{-\varepsilon}{2k}$$

Integrating and simplifying we get:

$$\ln Q = -\frac{\varepsilon^2}{4k} + C$$

$$Q(\varepsilon) = Ce^{-\frac{\varepsilon^2}{4k}}$$

Where $t = \frac{1}{4k}$ creates the initial function.

$$Q(\varepsilon) = Ce^{-\frac{x^2}{4kt}}$$

As the Velocity Increases the heat radiation diminishes. Where x is the velocity of the matter particle. As the velocity decreases radiation acceptance increases.

$$Q \to x$$

$$x \to Q$$

$$Q(x,t) = \frac{Ce^{-\frac{x^2}{4kt}}}{\sqrt{t}}$$

We can solve for the initial constant as follows.
Given a probability distribution, by conservation of energy and probability theory says that the probability distribution is equal to one when the curve is integrated, we find.

$$\int_{-\infty}^{\infty} Q(x,t) = 1$$

$$\int_{-\infty}^{\infty} \frac{Ce^{-\frac{x^2}{4kt}}}{\sqrt{t}} = 1$$

$$t = \frac{1}{4k}$$

Plugging in for t, and solving for the Gaussian Function we get:

$$\int_{-\infty}^{\infty} \sqrt{4k}Ce^{-x^2} = 1$$

$$\int_{-\infty}^{\infty} e^{-x^2} = \sqrt{\pi}$$

$$\sqrt{4k\pi}C = 1$$

$$C = \frac{1}{\sqrt{4k\pi}}$$

$$Q(x,t) = \frac{e^{-\frac{x^2}{4kt}}}{\sqrt{4kt\pi}}$$

For $C = \frac{1}{\sqrt{4k\pi}}$. When there is no heat transfer, When Q = 0, When $e^{-\infty} = 0$, the mass has a definite energy value.

$$\ln Q = -\frac{\varepsilon^2}{4k} + C$$

When Q = 0, When $e^{-\infty} = 0$,

$$\frac{\varepsilon^2}{4k} = C$$

$$C = \frac{1}{\sqrt{4k\pi}}$$

$$\frac{\varepsilon^2}{4k} = \frac{1}{\sqrt{4k\pi}}$$

$$\varepsilon^2 = \frac{4k}{\sqrt{4k\pi}} = \frac{\sqrt{4k}}{\sqrt{\pi}}$$

$$k = \frac{1}{16\pi}$$

$$\varepsilon^2 = \frac{1}{2\pi}$$

$$\varepsilon = \frac{x}{\sqrt{t}}$$

$$\frac{x^2}{t} = \frac{1}{2\pi}$$

$$x^2 = \frac{t}{2\pi}$$

This result is very important because x is really the speed of the signal.

$$v = x = \sqrt{\frac{t}{2\pi}}$$

We will use this result to derive the kinematic equations.

We can derive all the kinematic equations from the heat equation definition as follows:

The kinematic variables are D (distance), V (velocity), a (acceleration), t (time), c (speed of light.

Where the Speed of Light is given by epsilon:

Recall that

$$v = x = \sqrt{\frac{t}{2\pi}}$$

$$\varepsilon = \frac{v}{\sqrt{t}} = \left(\frac{\sqrt{t}}{(2\pi)^{1/2}}\right)\left(\frac{1}{\sqrt{t}}\right) = \frac{1}{(2\pi)^{1/2}} = c$$

Where the Velocity is given by:

$$v = x = \sqrt{\frac{t}{2\pi}} = \frac{t^{1/2}}{(2\pi)^{1/2}}$$

Where the Acceleration is:

$$a = \frac{v}{t} = \frac{t^{1/2}}{(2\pi)^{1/2}t} = \frac{1}{(2\pi)^{1/2}t^{1/2}}$$

Where the Distance is:

$$D = v \bullet t = \frac{t^{1/2}}{(2\pi)^{1/2}} \bullet t = \frac{t^{3/2}}{(2\pi)^{1/2}}$$

The kinematic equations derived by Galileo Galilei are as follows:

$$x = v_o t + \frac{1}{2}at^2$$

$$v^2 - v_o^2 = 2ax$$

$$\frac{v^2 - v_o^2}{2} = ax$$

$$x = \frac{1}{2}at^2$$

$$a = \frac{v}{t} = \frac{t^{1/2}}{(2\pi)^{1/2}t} = \frac{1}{(2\pi)^{1/2}t^{1/2}}$$

$$x = \frac{1}{2}at^2 = \frac{t^2}{2(2\pi)^{1/2}t^{1/2}} = \frac{t^{3/2}}{2(2\pi)^{1/2}}$$

Where this is an average thus it's divided by 2.

Thus, The distance is as follows.

$$D = \frac{t^{3/2}}{(2\pi)^{1/2}}$$

We can verify the velocity again with the kinematic expression. And we find that it's the same velocity derived from the heat equation Epsilon Relationship:

$$v = \frac{D}{t} = \frac{t^{3/2}}{(2\pi)^{1/2}t} = \frac{t^{1/2}}{(2\pi)^{1/2}}$$

When the dimensionality for D increases, in signals, you increase the kinetic energy of the particles.

We can solve for the next Kinematic Relationship.

$$\frac{v^2 - v_o^2}{2} = aD$$

$$v = \frac{t^{1/2}}{(2\pi)^{1/2}}$$

$$v^2 = \frac{t}{(2\pi)}$$

$$v_o^2 = 0$$

$$a = \frac{1}{(2\pi)^{1/2} t^{1/2}}$$

$$D = \frac{t^{3/2}}{(2\pi)^{1/2}}$$

Inputting the component parts into the expression we find that the energies are the same.

$$\frac{1}{2}\left(\frac{t}{2\pi}\right) = \left(\frac{1}{(2\pi)^{1/2} t^{1/2}}\right)\left(\frac{t^{3/2}}{(2\pi)^{1/2}}\right)$$

Where the half on the left side expresses the average energy.

$$\frac{1}{2}\left(\frac{t}{2\pi}\right) = \left(\frac{t}{2\pi}\right)$$

It is important to note that this kinematic relationship is an energetic relationship.

$$\frac{mv^2}{2} - \frac{mv_o^2}{2} = max$$

We can look at the energetic relationships.

$$W = F \bullet D = \text{ma}\, D$$

$$a = \frac{1}{(2\pi)^{1/2} t^{1/2}}$$

$$D = \frac{t^{3/2}}{(2\pi)^{1/2}}$$

$$W = m\left(\frac{1}{(2\pi)^{1/2} t^{1/2}}\right)\left(\frac{t^{3/2}}{(2\pi)^{1/2}}\right) = m\left(\frac{t}{2\pi}\right)$$

$$KE = \frac{mv^2 - mv_o^2}{2} = \frac{1}{2}\left(m\left(\frac{t}{2\pi}\right) - m\left(\frac{t_o}{2\pi}\right)\right)$$

Where this is an average energy value that depends on your rest mass energy.

We can derive what mass is in the following derivation. Given that pure light only has velocity and no mass. We equate it to a mass particle that has rest mass.

$$hf = mc^2$$

$$v^2 = mc^2$$

$$m = \frac{v^2}{c^2}$$

$$v = \frac{t^{1/2}}{(2\pi)^{1/2}}$$

$$v^2 = \frac{t}{2\pi}$$

$$c = \frac{D}{t^{3/2}}$$

$$c = \frac{1}{(2\pi)^{1/2}}$$

$$c^2 = \frac{1}{2\pi}$$

Plugging in for the terms:

$$m = \frac{v^2}{c^2}$$

$$m = \frac{v^2}{c^2} = \left(\frac{t}{2\pi}\right)(2\pi) = t$$

And thus mass is time! This result is extremely useful for advanced physical applications.

Thus we conclude from the Energetic relationship by substituting for time.

$$W = m\left(\frac{t}{2\pi}\right) = \frac{t^2}{2\pi}$$

$$KE = \frac{t^2}{2\pi}$$

Rest mass Energy is as follows:

$$c^2 = \frac{1}{2\pi}$$

$$E_{restmass} = mc^2 = \frac{t}{2\pi}$$

$$E_{total} = KE + E_{restmass}$$

$$E^2 = p^2c^2 + (mc^2)^2 = m^2v^2c^2 + m_o^2c^4$$

$$m^2 = t^2$$

$$c^2 = \frac{1}{(2\pi)}$$

$$E^2 = t^2\,\frac{t}{(2\pi)^2} + \frac{t_o^2}{(2\pi)^2}$$

$$E = \sqrt{\frac{t^3}{(2\pi)^2} + \frac{t_o^2}{(2\pi)^2}}$$

Solving Louis de Broglie Relationship

$$mv^2 = hf = \frac{h}{t} = \frac{h}{m}$$

$$m = t$$

$$mv = \frac{h}{mv}$$

$$tv = \frac{h}{mv}$$

$$\lambda = \frac{h}{mv}$$

Its important to note that this discovery applies to all equations in physics. Substituting the time you can simplify all advanced topics in physics and you can create advanced derivations by reverse engineering all of the physical equations by using unit analysis.

Data Availability:

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

References:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/Kinetic/molke.html#c1
2. Carl Friedrich Gauss,1809, *Theoria Modus Corporum Coelestium* [Theory of the Motion of Heavenly Bodies]
3. Ophir Gottliev, 3/20/2007, Deriving the Heat Kernel in 1 Dimension
4. Matthew J. Hancock, 2006, Infinite Spatial Domains and the Fourier Transform
5. Galileo Galilei, 1638, Discourses and Mathematical Demonstrations Relating to Two New Sciencies.