Fundamental Theorem of New Year: An attempt to unify gravity, quantum stuffs, and engineering in a mathematical rigor.

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`Abstract:` Every year, in some place, someone always tries to impress others by formulating heavy mathematics kind of equation that ended up to be very simple. Despite the scare looking math, it actually just a plain algebraic manipulation which is on the same level as kindergarten mathematics with little physics if any. Here I present a better approach to explain the fundamental mystery of nature which is unsolved for millennia, even by type 3 alien civilization in a far far away galaxy in a long long time ago. This approach is incorporating the basic idea of Hilbert general relativity, Schrodinger wave equation, and a well known irrefutable Fundamental Theorem of Engineering that had save billion even trillion people around the globe. The result is straightforwardly accurate and precise for any coordinate invariant observer.

The proof

Let start with Hilbert action for GR plus matter action

$$S = \frac{1}{16\pi G} S_H[g_{\mu\nu}] + S_M[g_{\mu\nu}, \psi^i]$$

Because S_H is diffeomorphism invariant when considered in isolation, so S_M must also be invariant if the whole action is to be invariant. By calculus of variation,

$$\delta S_M = \int d^n x \frac{\delta S_M}{\delta g_{\mu\nu}} \delta g_{\mu\nu} + \int d^n x \frac{\delta S_M}{\delta \psi^i} \delta \psi^i$$

Choose a diffeomorphic variation which $V^\mu(x)$ as a vector field generator. Because the equation of motion of matter is invariant under ψ, then the second term vanish nonetheless. Consider the first term, by definition of Lie Derivative

$$\delta g_{\mu\nu} = \mathcal{L}_V g_{\mu\nu} = 2\nabla_{(\mu} V_{\nu)}$$

Setting $\delta S_M = 0$ then

$$0 = \int d^n x \frac{\delta S_M}{\delta g_{\mu\nu}} \nabla_{(\mu} V_{\nu)}$$

This means, there exist manifolds M and N that are diffeomorphic to each other under metric tensor field $g^{\gamma\zeta}$. We can construct the metric tensor on manifold N by pushforward $g^{\gamma\zeta}$ with map $\phi = f \circ g$ that transform invariantly. Choose f to be a map that satisfy Poincare transformation under curve spacetime. The easy choice is

$$f = \beta \ln x$$

Where β is the Lorentz factor v/c. By Fourier Transform

$$f = \int e^{ikx} \beta \ln x$$

Then the metric tensor become

$$g_N^{\gamma\zeta} = (\phi_* g_M)^{\gamma\zeta}$$

$$g^{\gamma\zeta} = f \circ g\left(g^{\gamma\zeta}\right)$$

$$g^{\gamma\zeta} = \int e^{ikx} \beta g^{\gamma\zeta} \ln g$$

We know from Schrodinger Wave Equation, a wave function of a matter under natural force satisfy

$$\Box\psi = 0$$

Then, by simple arithmetic

$$g^{\gamma\zeta} = \int e^{ikx} \beta g^{\gamma\zeta} \ln g + \Box\psi$$

But, on this manifold, the $+$ operator is invariant with the direct product of tensors $\otimes$, but the order matter, so it become negative

$$g^{\gamma\zeta} = -\int e^{ikx} \beta g^{\gamma\zeta} \ln g \otimes \Box\psi$$

We can ignore the product as usual

$$g^{\gamma\zeta} = -\int e^{ikx} \beta g^{\gamma\zeta} \ln g \,\Box\psi$$

$$g^{\gamma\zeta} = -\int e^{ikx} \beta g^{\gamma\zeta} \ln g \,\Box\psi$$

$$g^{\gamma\zeta} = -\int e^{ikx} \beta g^{\gamma\zeta} \ln g \, g^{\mu\nu} \nabla_\mu \nabla_\nu \psi$$

By Einstein summation

$$g^{\gamma\zeta} = -\int \beta \ln g \frac{\mathrm{d}}{\mathrm{d}x^\nu} \, \nabla_\nu \psi$$

$$g^{\gamma\zeta} = -\int \beta \ln g \, D(\psi)$$

Because we are dealing with wave, the normal choice of function g are $\sin x$

$$g^{\gamma\zeta} = -\int \beta \ln(\sin x) \, D(\psi)$$

But, from First Fundamental Theorem of Engineering, $\sin x = x$ for all $x \in \mathbb{R}^3$

$$g^{\gamma\zeta} = -\int \beta \ln(x) \, D(\psi)$$

By integral definition of $\ln(x)$

$$g^{\gamma\zeta} = -\int \beta \int \frac{1}{x} D(\psi)$$

Riemann sum of the first integral, by considering lower and upper bound

$$g^{\gamma\zeta} = -\sum \beta \int \left(\frac{1}{x_U} - \frac{1}{x_L}\right) D(\psi)$$

The integral inside the equation become the famous Euler-Mascheroni constant

$$g^{\gamma\zeta} = -\sum \beta\gamma D(\psi)$$

$$g^{\gamma\zeta} = -\sum \frac{v}{c}\gamma D(\psi)$$

$$g^{\gamma\zeta} = -\sum \frac{pv}{pc}\gamma D(\psi)$$

$$g^{\gamma\zeta} = -\sum \frac{p}{\frac{pc}{v}}\gamma D(\psi)$$

We know from Einstein $pc = hv$ for electromagnetic wave, then

$$g^{\gamma\zeta} = -\sum \frac{p}{h}\gamma D(\psi)$$

$$hg^{\gamma\zeta} = -\sum p\gamma D(\psi)$$

Because the universe is isotropic and homogenous, then the pressure can be written as $p = w\epsilon$ and the sum is linear of $N = 3$, the dimension we live in

$$hg^{\gamma\zeta} = -Nw\epsilon\gamma D(\psi)$$

A little bit algebra

$$h\left(g^{\zeta}\right)^{\gamma} = -Nw\epsilon\gamma D(\psi)$$

$$h(g^2)^{\gamma} = -Nw\epsilon\gamma D(\psi)$$

$$h(gg)^{\gamma} = -Nw\epsilon D(\psi)$$

Because of Strong Equivalent Principle, $g = a$

$$h(ag)^{\gamma} = -Nw\epsilon\gamma D(\psi)$$

By second Fundamental Theorem of Engineering $g = \pi^2$

$$h(a\pi^2)^{\gamma} = -Nw\epsilon\gamma D(\psi)$$

English Latinization of $\pi = pi$

$$h(a(pi)^2)^{\gamma} = -Nw\epsilon\gamma D(\psi)$$

But, complex mathematic tells $i^2 = -1$

$$h(ap^2)^{\gamma} = Nw\epsilon\gamma D(\psi)$$

On these manifolds, there exist a map from every wave functional to any of its physical detector. We can freely choose our wave function ψ to be sound wave, so the detector map D on ψ is just ear.

$$h(ap^2)^\gamma = Nw\epsilon\gamma(ear)$$

By rearranging and ignore the bracket

$$h(app)^\gamma = N\epsilon w\gamma(ear)$$

$$happ^\gamma = N\epsilon w\gamma ear$$