A Generally Covariant Generalization of the Dirac equation that does not require gauges (Newpde)

David Maker

Abstract: My essay is simple: Penrose in a utube video implied that the Mandelbrot set (fractal) might contain physics. Here we merely showed how to find it from z'=z'z'+C'. Start with an:

Occam's razor *optimized* (i.e., $\delta C=0$, $||C||$=noise)

POSTULATE OF 1 So

z=zz (1) **is the algebraic definition of 1,o. So add constant C** (i.e., z'=z'z'-C, $\delta C=0$) (2))

Solve eqs.1,2 for z'. (Use this $z'\equiv 1+\delta z$ to find $\delta z\equiv\psi$ in the Newpde.)

So just postulate1

I Solving eqs.1,2 for z' requires z=0 iteration and successive approximation

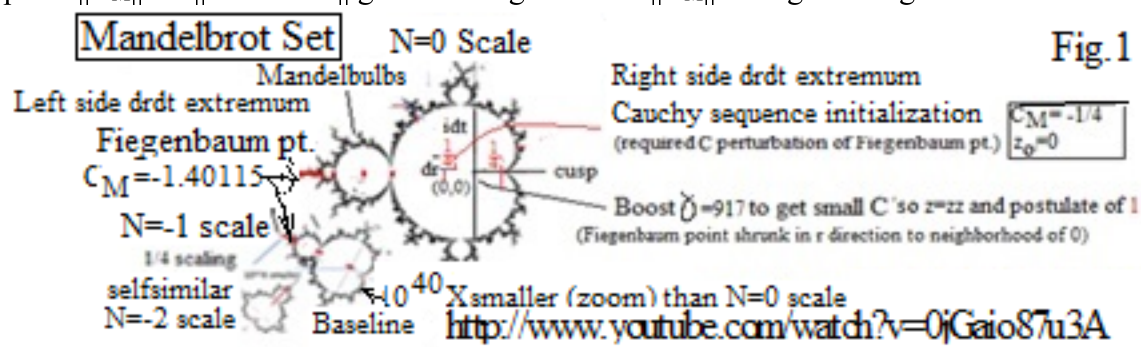
Iteration (eq.1 gives z=0)

Plug $z'=1+\delta z$ into eq.2 and get $\delta z+\delta z\delta z=C$ (3)

For real C<-¼ $\delta z = (-1\pm\sqrt{1+4C})/2=dr+idt$ (4)

is complex. To find C itself substitute z' on left (eq.2) into right z'z' repeatedly & get iteration $z_{N+1}=z_N z_N-C$. $\delta C=0$ requires us to reject the Cs for which $-\delta C=\delta(z_{N+1}-z_N z_N)=\delta(\infty-\infty)\neq 0$**.**

Eq1 solution is 1,**0** so initial **z**=z_o=**0** gets the **Mandelbrot set** C_M (fig1) out to some $||\Delta||$ distance from C=0. Δ is found from $\delta C\equiv(\partial C_M/\partial(||C||))d||C||=0$ extremum giving the Fiegenbaum point $||C_M||$ = $||-1.40115..||$ global max given this $||C_M||$ is largest in fig.1.



Successive approximation (to z=0)

N=-1 $C_M\equiv\Delta$ extremum solution $||\Delta||<<1$ *must perturb* **z≈0** with $C_M\equiv\delta z'=\Delta$ given $\delta z'\delta z'<<\delta z'$ for this $|\delta z'|<<1$ in eq.3. So **0≈z'**$\approx 1+\delta z$, $\delta z=-1+\Delta$ (4a) in eq.3: $\delta(\delta z+\delta z\delta z)=\delta\delta z(1)+2\delta\delta z(\delta z)=\delta\delta z(1)+2(\delta\delta z)(-1+\Delta)=\delta\delta z(-1+2\Delta)=\frac{1}{2}\delta(\delta z\delta z)+\delta\delta z\Delta\approx\frac{1}{2}\delta(\delta z\delta z)=0=$(plug in eq.4)$=\delta\delta z\Delta+\frac{1}{2}\delta[(dr+idt)(dr+idt)]$ (If δz C^2 at least locally $\delta\delta z=0$)$\approx\frac{1}{2}\delta[(dr^2-dt^2)+i(drdt+dtdr)]=0$ (5)

Factor eq.5 real $\delta(dr^2-dt^2)=\delta[(dr+dt)(dr-dt)]=0=[[\delta(dr+dt)](dr-dt)]+[(dr+dt)[\delta(dr-dt)]]=0$ (6)

so ($\rightarrow\pm$**e**) $dr+dt=ds$, $dr-dt=ds\equiv ds_1$ for $+ds\rightarrow$ I, IV quadrants (7)

Note these quadrants are used in appendix A. Also note the positive scalar drdt of eq.7 (since I[st] quadrant) implies the eq.5 *non* infinite extremum imaginary $drdt+dtdr=0=\gamma^i dr\gamma^j dt+\gamma^j dt\gamma^i dr=(\gamma^i\gamma^j+\gamma^j\gamma^i)drdt$ so Clifford algebra $(\gamma^i\gamma^j+\gamma^j\gamma^i)=0$, $i\neq j$. (7a)

($\rightarrow$light cone ***v***) $dr+dt=ds$, $dr=-dt$, for $+ds\rightarrow$ II quadrant (8)

" " $dr-dt=ds$, $dr=dt$, " " III quadrant (9)

($\rightarrow$vacuum,z=1) $dr=dt$, $dr=-dt$ so $dt=0=dr$ (So eigenvalues of dt, dr=0 in eq.11) (10)

We square eq.7 $ds_1^2=(dr+dt)(dr+dt)=[dr^2+dt^2]+(drdt+dtdr)\equiv ds^2+ds_3=ds_1^2$. Since ds_3 (is max or min) and ds_1^2 (from eq.7) are invariant then so is **Circle** $ds^2=dr^2+dt^2=ds_1^2-ds_3$. also implying the rest of the Cifford algebra $\gamma^i\gamma^i=1$ in eq.7a, no sum on i. Note this separate ds is a minimum at

45° (that Mandebrot set rotation) given the eq.7 constraints and so Circle≡$\delta z = dse^{i\theta} = dse^{i(\Delta\theta+\theta o)} = dse^{i((\cos\theta dr+\sin\theta dt)/(ds)+\theta o)}$, θ_o=45°.We define k≡dr/ds, ω≡dt/ds, sinθ≡r, cosθ≡t. $dse^{i45°}$≡ds'. Take ordinary derivative dr (since flat space) of 'Circle' $\frac{\partial\left(dse'^{i\left(\frac{rdr}{ds}+\frac{tdt}{ds}\right)}\right)}{\partial r} = i\frac{dr}{ds}\delta z$ so $\frac{\partial\left(dse^{i(rk+wt)}\right)}{\partial r} = ik\delta z,\ k\delta z = -i\frac{\partial \delta z}{\partial r}$ (11). (<F>*= ∫(Fψ)*ψdτ=∫ψ*Fψdτ =<F> Hermitian). The observables dr→k→p_r condition gotten from eq.11 **operator formalism** thereby converting eq.7-9 into Dirac eq. pdes. Cancel that $e^{i45°}$coefficient then multiply both sides of eq.11 by ħ and define δz≡ψ, p≡ħk. Eq.11 then beomes the familiar:

$$p_r\psi = -i\hbar\frac{\partial\psi}{\partial r} \qquad (11)$$

Nonlocality: δδz≠0 so forces. Still δδzΔ≈0 so δds^2=0 in eq.5 (exactly 0 if new dr',dt' in eq.12 N=-1 extremum C_M/γ≡δz'=Δ still perturbs dr,dt so for θ_o=45° on that ds **Circle** that equation 4a small Δ must imply a slightly modified eq.7: (dr-Δ)+(dt+Δ)=(dr-δz')+(dt+δz')≡dr'+dt'=ds (12) δz'≡C_M/γ for small (Fitzgerald contracted γ) δz'. Eq.12 for z =0 implies a ±45° rotation, thereby generating the Standard electroweak Model (appendix A). But for **z=1**, implying that tiny Δ rotation, eq.12 generates GR (below). Thus Equation 7a, 12 implies metric coefficients $\kappa_{\mu\nu}$
Using eq.12 define κ_{rr}≡$(dr/dr')^2$=$(dr/(dr-(C_M/\xi_1)))^2$=$1/(1-r_H/r)^2$ =$A_1/(1-r_H/r)$ +$A_2/(1-r_H/r)^2$, r≡dr.
The partial fractions A_I term can be split off from RN and so $\kappa_{rr}\approx 1/[1-((C_M/\xi_1)r))]$ (13)
(C_M defined to be charge, γ≡ξ_1 mass). So we have: $ds^2=\kappa_{rr}dr'^2+\kappa_{oo}dt'^2$ +.. (14)
From eq.7a $dr'dt'=\sqrt{\kappa_{rr}}dr'\sqrt{\kappa_{oo}}dt'$=drdt so $\kappa_{rr}=1/\kappa_{oo}$ (15)
We do a rotational self similarity dyadic coordinate transformation of $\kappa_{\mu\nu}$ to get the Kerr metric which is all we need for our GR applications. So from eqs.4,5,14,15 we found the relation between x_i,x_j pairs: $\left(\sum_{i=1}^{2}\gamma^i\sqrt{\kappa_{ii}}dx_i\right)^2 = \sum_{i=1}^{2}\kappa_{ii}d^2x_i$ (14a). So given this added 2D Δ perturbation we get curved space 2D⊗2D=4D *independent* $x_1,x_2 \rightarrow x_1,x_2,x_3,x_4$. Also assuming orthogonality $dr^2 \equiv dx_1^2+dx_2^2+dx_3^2$ (as r→∞ in eq.13,15) the right side of eq.14a therefore has the 2 in the sum replaced by a 4 implying the left side then has to be in eq.14a for the 2D form to be a special case (of any 2 x_ix_j): Imposing orthogonality thereby creates 6 pairs of eqs.4&5. So eq.14a becomes: $(\gamma^x\sqrt{\kappa_{xx}}dx+\gamma^y\sqrt{\kappa_{yy}}dy+\gamma^z\sqrt{\kappa_{zz}}dz+\gamma^t\sqrt{\kappa_{tt}}idt)^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+\kappa_{zz}dz^2-\kappa_{tt}dt^2=ds^2$.
Multiplying the bracketed term by 1/ds & **δz≡ψ** so eq 11 implies 4D **Newpde:**

$\gamma^\mu(\sqrt{\kappa_{\mu\mu}})\partial\psi/\partial x_\mu=(\omega/c)\psi$ for e,ν , $\kappa_{oo}=1-r_H/r=1/\kappa_{rr}$ $r_H=e^2X10^{40N}/m$ **N**(=. -1,0,1.) (16)
=C_M/γ (from sect.2) C_M=Fiegenbaum point. So: **postulate1→Newpde.** syllogism

There are several important results that we see immediately follow from this Newpde and its $\kappa_{\mu\nu}$:
For **N=0** the third order Taylor expansion term of $\sqrt{\kappa_{\mu\nu}}$ gives the Lamb shift and anomalous gyromagnetic ratio (without the renormalization and infinities (see appendix D)).
For **N=-1** (i.e.,e^2X10^{-40}) κ_{ij} is by inspection the Schwarzschild metric g_{ij}; so we just **derived General Relativity and gravity constant G *from* Quantum Mechanics in one line**.
So κ_{uv} **provides the general covariance of the Newpde**. Eq 4 *even* **provides us space-time r,t.**
For **N=1** (so r<r_C) Newpde zitterbewegung expansion stage explains the universe expansion (For r>r_C it's not observed, per Schrodinger 1932 paper.).
For **N=1** zitterbewegung harmonic coordinates *and* Minkowski metric submanifold (after long time expansion) gets the De Sitter ambient metric we observe (D16).
For **N=0** Newpde r=r_H composite 3e is the baryons (appendixC) and Newpde r=r_H composite e,ν is the Standard electroweak Model (appendixA).
So Penrose's intuition was right on! There *is* physics in the Mandelbrot set, all of it